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LILAVATI-3

(Contributions of Women Scientists-2010)

3ND NATIONAL WOMEN'S SCIENCE CONGRESS

Rashtriya Mahila Vijnana Sammelana

7-10th November 2010, Davangere

PROCEEDINGS

Organised by

MATRU VEDIKE (Women Scientists Forum)

SWADESHI VIJNANA ANDOLANA-KARNATAKA

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Indian Space Research Organisation, Bangalore

C O N T E N T S

Foreword

Swadeshi Vijnana Andolana-Karnataka (SVAK) has the largest percentage women members, and they constitute the Women Scientist's Forum, more expressively popular as the Matru Vedike. The main activity of Matru Vedike is the conduct of "National Women's Science Congress"(NWSC) annually, thus initiating fellow women into the realm of science education and research. The main aim of NWSC is essentially to bring all women scientists into a single platform and instil a sense of pride, confidence and camaraderie amongst them and guide them on to positions of power and leadership. This does not mean that "women's liberation" or "women's empowerment" etc are given any overriding scope in this scheme of things. SVAK recognizes the fact that women have some unique role in society, including their role in the leadership of scientific research. Madame Marie Curie is the role model and the NWSC is held every year on 7th November, in commemoration of the birth anniversary of Madame Marie Curie. The highest recognition for a women scientist is the "Marie Curie Mahila Vijnana Puraskara". Incidentally, it may be recalled that 7th November also happens to be the birth anniversary of Dr. C. V. Raman, the first-Indian scientist to receive a Nobel Prize. SVAK has hence established the C. V. Raman Mahila Vijnana Puraskara in the field of Physical & Mathematical Sciences.

The receipients for Marie Curie Mahila Vijnana Puraskara include:
(1) Prof. Vijayalakshmi Ravindranath, Director (Retd), NBRC & Professor, IISc
(2) Dr. G. V. Satyavati, DG-ICMR(Retd)
(3) Dr. B. Meena Kumari, DDG-ICAR, New Delhi.

And the receipients of C. V. Raman Mahila Vijnana Puraskara include:
(1) Prof. Sujatha Ramadorai, TIFR, Mumbai; and
(2) Prof. Rohini M Godbole, IISc, Bangalore.

We are indeed glad that our Country has such veteran women scientists in India who have reached the positions of power and leadership in scientific research and administration. In the context of a Women as the President of the Republic, a Women as Prime Minister, a women as a Supreme Court Juidge, several women Chief Ministers and Governors, and hundreds of leading women professionals in the Country, we find an equally great women scientists.

The most vexed question is that their number is so small, and that only a very few reach the top positions of power in the field of science, engineering and technology. Opportunities are aplenty. It is here that Matru Vedike (Women Scientist's Forum of SVAK) should take some more initiative. Motivation should come from women themselves. Those who had reached top positions should be sources of inspiration. And they should act as Role Models.

A career in science, engineering and technology is highly demanding and requires total concentration, dedication, commitment, and involvement. At the same time, a women has her natural and unique duty of motherhood. Madame Marie Curie is thus the ideal model for women scientists. But modern day situations are quite distinct from the time of Madame Marie Curie, especially in modern India. It is essential that Matru Vedike takes up this issue of the dual role of women scientists in India.

PROF. K. I. VASU
Stapaka/ Poshaka/ Margadarshaka of
Swadeshi Vijnana Andolana-Karnataka

H. RAMESH
General Secretary
Swadeshi Vijnana Andolana-Karnataka

ABOUT SWADESHI VIJNANA ANDOLANA-KARNATAKA (SVAK)

Swadeshi Vijnana Andolana-Karnataka (SVAK) is indeed a vibrant Science Movement with a Swadeshi Spirit with intense concern for Bharatiya contributions to Science. It is an equally dynamic movement for "Swadeshi Sciences" like Ayurveda, Siddha, Unani, Yoga, Vaastu Vidya, etc. As a Swadeshi Movement, it intends to adopt and adapt the best sciences for the welfare of the people and the environment.

Swadeshi Vijnana Andolana is the Karnataka unit of Vijnana Bharati, the biggest popular-cum-professional science movement of Bharat with the longest chain of the largest number of independent State Units. In fact, SVAK is evolving itself into a model State Unit (not just a model, but an ideal model), in terms of (a) its pan-Karnataka sweep with District Units throughout the State: (b) the large percentage of Women as the life members and office bearers, and (c) its comprehensive mode of activities through academic faculties:

(1) Paniniyam: Lingustic Science & Humanities; (2) Patanjaliyam: Psychospiritual & Philosophical Sciences; (3) Dhanvantariyam: Ayurveda & Modern Health Sciences; (4) Parashariyam: Agricultural, Horticultural, Fisheries & Animal Sciences; (5) Kautlyiyam: Economic & Management Sciences, History, Politics & Commerce; (6) Bharatiyam: Socio-cultural Sciences, Arts, Music & Natyasastra; (7) Bhaskariyam: Physical & Mathematical Sciences; (8) Nagarjuniyam: Chemical, Biological & Materials Science; (9) Bharadvajiyam: Civil, Mechanical, Aerospace & Transportation Sciences; (10) J. C. Boseeyam: Energy, Electrical, Electronics & Communication Sciences; (11) Vasundariyam: Earth Sciences, Archaeology, Ecology & Environmental & Biodiversity; (12) Arvacheena Vijnana: IT, ICET, BT, NT & Food Technology. In addition, there are three forums (i) Matru Vedike-the Women Scientists Forum; (ii) Yuva Vidyarthi Vedike for Youth and Students and (iii) Veda Vijnana Vedike as well as three centres-one for Techno-Entrepreneurship Development; the second for Education and Science Talent Motivation and the Third Centre for Education.

Preface from

Matru Vedike (Women Scientists Forum) of Swadeshi Vijnana Andolana-Karnataka

There are those who talk about women's "liberation". And women's liberation is indeed the path for men's liberation from the shackles of outmoded thought processes resulting in the current differentiation in the social and societal status of women vis-à-vis men.

There are also those who talk about women's "empowerment" – economically, legally, and socially. This is taking place through out the world, and we are glad.

"Liberation" and "empowerment" are laudable issues, but they are however one-sided. They create more animosity than amity in society, more harshness or hatred than harmony, more friction than fraternity.

We in the Women Scientists Forum of SVAK have much more noble ideals and idealogy. We work for amity and harmony in society; equity and equality in society; fraternity and camaraderie in society; and the name that we gave to Women Scientists Forum viz Matru Vedike, is indicative of this basic philosophy. "Motherhood" of humanity is the greatest and noblest asset of humanity, and while retaining motherhood, women in large numbers should work for a successful career in science-as a researcher, as dedicated teacher, as an entrepreneur, as a science administrator and ultimately as a leader in science. The world trend is indicative of this phenomenal growth of women leadership in science. In 2009, five women scientists received Nobel Prize out of a total of thirteen !! The march of women in science from Madame Marie Curie in 1903 to Dr. Ada Yonath, Dr. Elizabeth H. Blackburn, Dr. Carol W. Greide and Dr. Elinoor Ostrom in 2009 in addition to the one in literature is indeed impressive as well as gratifying. We look forward to a future where women will outnumber men in science. We look forward to a future when women and men would work together zealously towards greater achievements in their joint efforts. We have the example of Madame Marie Curie and her husband Piere Curie sharing the Nobel Prize for Physics in1903, before Marie Curie alone received the Nobel Prize for Chemistry in 1911. And their daughter also became a famous scientist on her own right. And we were impired by this story for naming our Women Scientists Forum as Matru Vedike. Motherhood is the greatest and noblest feature of Nature, and it is "science" that reveals the truth and reality of Nature. Here emotional fruition joins the intellectual and creative fruition of humanity.

In the first Women's Science Congress at Bijapur in 2008, we had just 62 papers and 130 delegates. There is a fantastic improvement in the response to the 2nd National Women's Science Congress at AIISH, Mysore: There are over 120 papers and about 300 delegates (200 was the maximum that we planned!). In 3rd National Women's Science Congress at Davangere Univeristy, there are 85 papers and 158 Delegates. We could not reach out to all Universites and R&D Institutions (DRDO, CSIR, ICAR, ICMR, ISRO, DAE etc). If we can reach out to Industries in addition to these Institutions, unimaginable participation could be expected. We are planning with that objective in our future programs. We seek your help and cooperation.

This is the only Science Congress organized exclusively for Women Scientists, exclusively by the Women Scientist Forum of Swadeshi Vijnana Andolana, covering the entire spectrum of science, engineering and technology, spanning over traditional as well as modern sciences, spreading over spiritual, social and secular materials sciences.

This leads us to the broader field of activities planned for Matru Vedike-the Women Scientists Forum. ***The National Women's Science Congress*** is of course our prime activity. But the creativity of women does not begin and end with modern science alone. For those wo do not have a flair to express their creativity and creative power towards motherhood, their creativity could very well be expressed in a scientific career. Perhaps, they could be better in this sphere of creative activity. Or, they could show their creative capability in music or Natyasastra in its widest sense. Or, they could be equally creative and original in literature. Matru Vedike is thus essentially a forum of women with creativity or originality in any field of activity. Indeed, we have plans to take up all these aspects of women's creativity power one by one. Our strength is our solidarity and our camaraderie-Let us begin with "women in science"

By : **DR. K. S. RAMAA, DR. Y. S. GAYATHRI, PROF. M. V. PRAPHULLA AND TEAM MATRU VEDIKE**

THEME:-01

CHEMICAL, BIOLOGICAL AND MATERIALS SCIENCES

C.B.M.Sc:-01

A NOVEL, EFFICIENT AND SIMPLE ONE POT- FIVE COMPONENT SYNTHESIS OF PYRAZOLOPYRANOPYRIMIDINES USING IMIDAZOLE IN AQUEOUS MEDIUM

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Introduction:

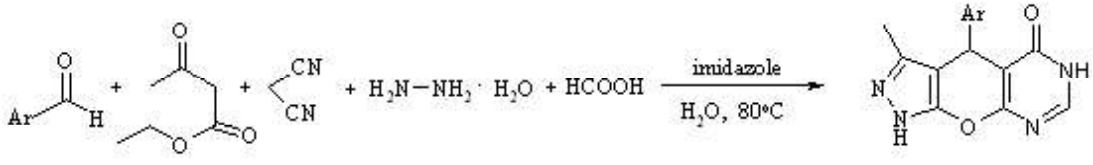
The efficient synthesis of organic compounds is one of the most important objectives in modern drug discovery. Organic reactions should be fast and facile, and the target products should be easily separated and purified, at the same time satisfying *green-chemistry* norms. From this point of view, there is much interest in the implementation of new synthetic strategies replacing the conventional methods of synthesis which are environmentally compatible. In this regard, microwave-assisted synthesis, ultrasonic irradiation, multicomponent reactions are being used to achieve the goal of developing the eco friendly synthetic methods of preparation of organic compounds.

Reactions that use more than two different starting materials to give a product in a single step under suitable reaction conditions are called multicomponent reactions (MCRs). There is a growing interest for the development of MCRs and replacing the conventional methods of preparation of organic compounds, from both industrial and academic chemistry research groups. MCRs occupy a special place in combinatorial chemistry due to their productivity, facile execution, yield and convergence. After inspection of the literature one can find a large number of MCRs [1]

A wide variety of heterocycles like pyrido[2,3-d]pyrimidine derivatives [2], 4*H*-benzo[*b*]pyran derivatives [3], tetrahydropyrimidines [4], pyranopyrazoles[5], 3,4-dihydropyrimidin-2-ones [6] and many other compounds have been reported to be synthesized by multicomponent strategy. These heterocyclic compounds are biologically active and possess interesting pharmacological properties. Pyrimidine derivatives are reported to exhibit antiviral [7], anticancer [8], anti-inflammatory [8], antimicrobial [9], anti-fungal [10], and antihistaminic [11] activities. They are also effective as antiplatelet agents with analgesic activity [12] and as a new drug for treatment of insomnia [13]. Pyrazoles are an important class of heterocyclic compounds with prominent properties as they form the parent skeleton of pyrine drugs and other pharmaceutical compounds [14–15]. Pyrazolo-pyrido (or pyrano) pyrimidines have known to show the antimicrobial activity [11]. Thus, the biological activity of fused pyranopyrazoles and pyrimidines has attracted the interest of organic chemists worldwide.

Few methods for preparation of these fused heterocyclics have been reported in the literature. Synthesis of pyrano [2,3-c]pyrazole ring system fused to a pyrimidine moiety has been reported by El-Assiery et al [16] and by Zaki et al [17] using β-enaminonitrile precursor and acetic anhydride. Al-Thebeiti [18, 19] has reported a method wherein Pyrano derivatives were cyclized to pyranopyrimidines with acetic anhydride/pyridine, formamide and formamide/formic acid. Al-Matar et al [20] have used cyanoacetic acid and acetic anhydride for the cyclization of 3-methyl-2-pyrazolin-5-one to give pyrazopyranopyrimidines. In all these reported methods the derivatives of pyranopyrazoles were later cyclized to the Pyrazolo-pyrido (or pyrano) pyrimidine in presence of suitable catalysts. However, some of the reported methods have drawbacks such as: use of hazardous solvents like pyridine [18], benzene [20]; long durations and more than one step is required to get the products.

In continuation of our recent studies on the synthesis of various bioactive heterocyclic compounds [21], herein, we report a one pot-five component synthesis of pyrazolopyranopyrimidines. The method reported is more eco-friendly as water is used to carry out the reaction, and is catalyzed by a simple and viable organocatalyst imidazole



Scheme 1

Results and discussion:

In order to optimize the reaction conditions, the reaction of 2-chlorobenzaldehyde (1 mmol), ethyl acetoacetate (1mmol), hydrazine hydrate (1mmol), malononitrile (1mmol), and formic acid 1mmol), in presence of organocatalyst imidazole (0.5mmol), in aqueous medium was selected. Initially, Lewis acids like $FeCl_3$, $ZnCl_2$, $AlCl_3$ and Iodine were examined as catalysts at room temperature and under reflux for the synthesis of pyrazolopyranopyrimidines. The expected product was not obtained in the presence of these catalysts even after the reaction was carried for 2hours under the said both conditions. Then the reaction was carried out in presence of the organocatalyst Imidazole at room temperature and at reflux. It was observed that, in the presence of this catalyst the product was obtained in good yield under reflux. In order to optimize the catalyst loading for the reaction, reaction was carried out with 0.1mmol, 0.2 mmol, 0.5mmol, 0.75 mmol and 1 mmol of catalyst. The results showed that very little product was obtained with 0.1mmol, 0.2 mmol, maximum yield was obtained with 0.5 mmol catalyst loading and higher amounts (0.75 mmol and 1 mmol) did not improve the yield of the product to a greater extent.**(Table 1)**

Table 1. The condensation reaction of 2-chlorobenzaldehyde under different catalyst loading.

Catalytic amount (mmol)	Yield (%)
0.1	40
0.2	51
0.5	89
0.75	90
1	90

After establishing these optimal conditions for the reaction, other aromatic aldehydes were taken up to examine the scope and limitations of this transformation. The nature of substituents, either electron withdrawing or electron donating on the arene ring in aldehydes, did not contribute either towards increasing or decreasing the yield of the product under similar reaction conditions as shown in **Table 2**. A plausible mechanism for the formation of pyrazolopyranopyrimidines is given in **Scheme 2.**

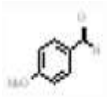
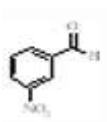
Experimental

All chemicals and solvents were commercial and used without any purification. Reactions were monitored on TLC. The products were characterized by FT-IR and ^{1}H NMR spectral analysis. The FT-IR and ^{1}H NMR spectra were recorded on a Shimadzu FT-IR-8400s and Bruker AMX (400-MHz) spectrophotometers respectively.

General Procedure for the synthesis of pyrazolopyranopy rimidines:

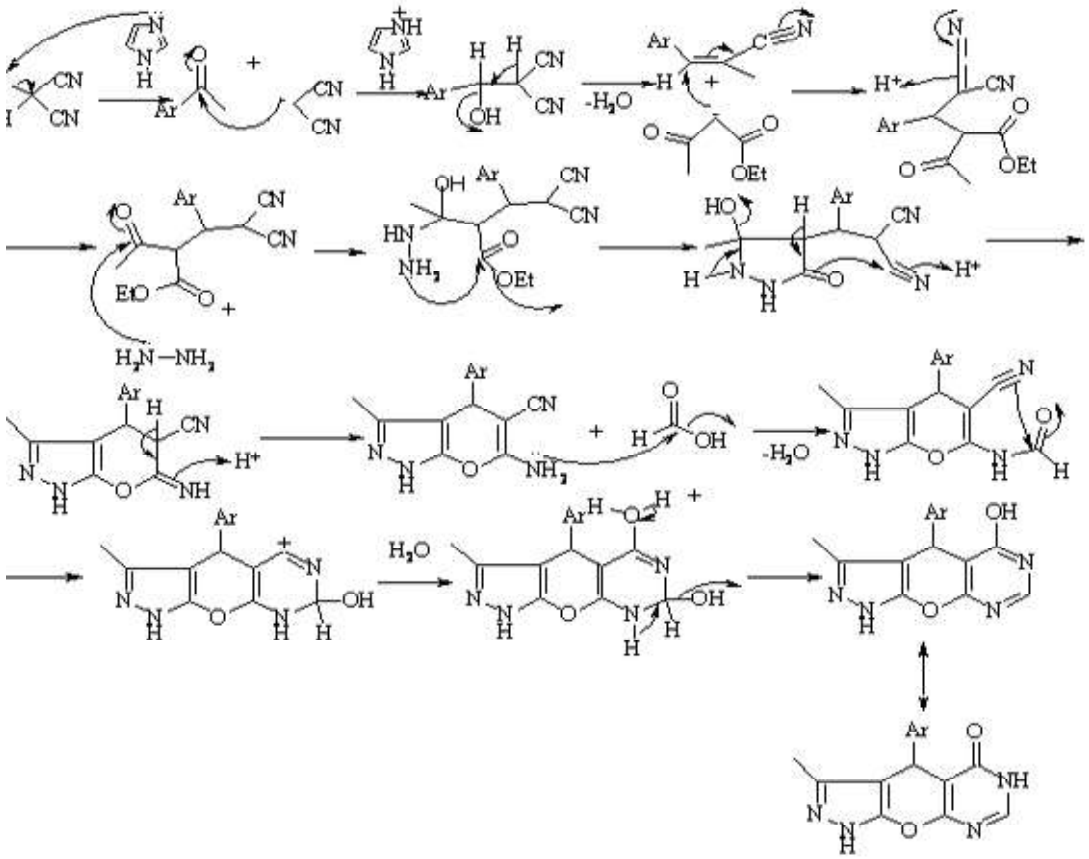
A mixture of an aromatic aldehyde (1 mmol), ethyl acetoacetate (1mmol), hydrazine hydrate (1mmol), malononitrile (1mmol), and formic acid (1mmol), in presence of organocatalyst imidazole (0.5mmol), was stirred in water (5 ml) for 30 minutes. The progress of the reaction was monitored by TLC. The solid thus obtained was filtered, washed with water to get nearly pure products. Analytical grade products were obtained by column chromatography using ethyl acetate-hexane system.

TABLE 2: Synthesis of pyrazolopyranopyrimidines from various aromatic aldehydes, malononitrile, ethylacetoacetate hydrazine hydrate and formic acid

Entry	Aromatic aldehydes (**1**)	Time (min)	Yield (%)[b]
a		30	83
b		30	85
c		30	83
d		30	80
e		30	83

[a]All the products are known and were identified by either comparison of their IR spectra or ^{1} NMR spectral analysis.
[b]Isolated yield

Mechanism:



Scheme 2: A plausible mechanism for the formation of pyrazolopyranopyrimidines

3. Conclusion

In summary, we have developed a novel, efficient and straightforward one- pot procedure for the synthesis of biologically active pyrazolopyranopyrimidines. The salient features of this protocol are: simple procedure, short reaction time, mild reaction conditions, and easier work-up procedure. The present is superior to the reported methods.

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C.B.M.Sc:-02

STUDY OF RECENT TRENDS IN MEMS PRESURE SENSOR APPLICATIONS

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Introduction

Microelectromechanical systems (MEMS) are small integrated devices or systems that combine electrical and mechanical components. Due to their reduced size there can be any number of these devices, from a few to millions, in a particular system. MEMS extend the fabrication techniques developed for the integrated circuit industry to add mechanical elements such as beams, gears, diaphragms, and springs to devices. New applications are emerging as the existing technology is applied to the miniaturization and integration of conventional devices. The micro fabrication technology enables miniaturization of complex systems by integration of diverse set of functions like sensing controlling and actuating on to a single package. The history of MEMS can be traced to the 1954 paper by C.S. Smith describing the piezoresistive properties of silicon [1] and since then MEMS devices have advanced rapidly, transitioning into many defense and commercial applications. A number of interesting MEMS components and circuits have been developed over the past decade

The significant features of MEMS over conventional mechanical devices are a) reduced size leading to reduced cost b) The excellent mechanical properties of silicon comparable to steel c) benefits from the sophisticated designing, processing and packing technology developed for the IC industry d) integration with IC circuitry to produce mechanical, optical and biological systems on a chip and e) the potential for being used as a packaging vehicle for nano devices [2]

The most popular applications of MEMS include inkjet-printer cartridges, accelerometers, gyroscopes biosensors miniature robots, micromirrors, micro actuators microptical scanners, fluid pumps, and chemical, pressure and flow sensors.

Some of the promising applications which can be batch processed are highlighted in this article

Accelerometers

These devices were developed for military and aerospace applications and currently the market is dominated by airbag applications. The first micro machined accelerometer was designed in 1979 at Stanford University, but it took over 15 years before such devices became accepted mainstream products for large applications. In the 1990s MEMS accelerometers revolutionized the automotive-airbag system industry.

Since then they have enabled unique features and applications ranging from hard-disk protection on laptops to game controllers[2]

An accelerometer is an electromechanical device that measures acceleration forces. These forces may be static, like gravity or dynamic caused by the movement or vibration of the accelerometer. A typical accelerometer consists of a "proof mass" supported by a spring and a "dashpot" for damping of the vibrating proof mass as shown in fig(1)

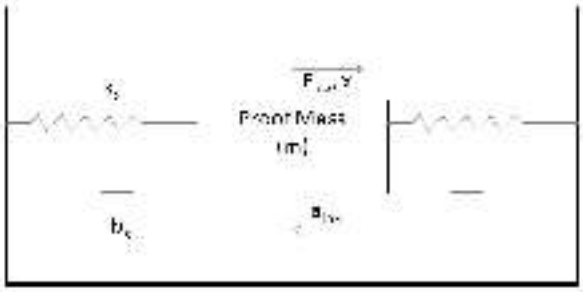

Fig. 1 Mechanical model of Accelerometer

The instantaneous displacement of the mass induced by the attached moving solid body is measured and recorded with respect to time using this the acceleration can be measured by the equation

$$F_{inx}(t) = m\frac{d^2x}{dt^2} + b_x\frac{dx}{dt} + k_x(t) = ma_{inx}(t) \qquad (1)$$

Where 'Fin' is the feedback force, 'm' is the proof mass, 'x' is the displacement of the proof mass, 'b' is the damping coefficient and 'k' is the spring constant [3-4] MEMS accelerometers are mainly capacitive or piezoresistive. Capacitive accelerometers employ a differential capacitor whose balance is disrupted by the movement of the proof mass. Piezoresistive accelerometers generally rely on strain induced within a flexural element that attaches the proof mass to the sensor housing for identification of the mass movement [5]. Capacitive-based MEMS accelerometers, such as the ADXL MEMS series have enjoyed more commercial success than piezoresistive designs. This is a direct result of piezoresistive accelerometers having not been capable of keeping pace with the reduced fabrication costs associated with capacitive architectures. Problems associated with temperature coefficients and drift properties of piezoresistive materials have necessitated careful packaging and compensation circuitry that have added to piezoresistive accelerometer costs. However, capacitive accelerometers suffer from electromagnetic interference (EMI), due to the high impedance of their sense node. This can be rectified by suitable packaging and by shielding the accelerometer and its interface circuit[40].

The important parameters of an accelerometer are the nature of output which could be digital or analog, the axis and measurement range. A ±1.5g accelerometer will be more than enough for gravity measurements, ±2g to measure the motion of a car and at least ±5g or more for a project that experiences very sudden starts or stops. The sensitivity and bandwidth of the device play an important role in the accuracy of the device. Since MEMS accelerometers are used in many systems, noise characteristics of these devices will influence the performance of the accelerometers especially when operating at lower g conditions. Shock survivability and power consumption are also some of the important specifications [6]. Devices fabricated earlier were single axis and 50g or higher accelerometers and they could only detect large acceleration in a single direction. Currently accelerometers can now be used for five different types of motion sensing like linear acceleration, vibration, shock, tilt, and rotation and they are available in a wide variety of ranges up to thousands of g-force. Apart from this dual axis and three axis models are also available.

The main issue in miniaturizing the accelerometers to micro-scale is that there is no room for the coil spring and the dashpot for damping on the vibrating mass. Alternative substitutes for the coil spring, dashpot, and even the proof mass have to be found.[18]

Gyroscopes

Gyroscope is a form of accelerometer that measures angular rotation rates. It is based upon the principle that the change of the rotational speed (Ω) of a solid can induce Coriolis force (Fc). For a moving solid with a linear velocity v, any rotation at the rate Ω can be related to the induced Coriolis force Fc by the expression.

$$\vec{Fc} = 2m\vec{v} \times \vec{\Omega} \qquad (2)$$

The typical architecture of a MEMS gyroscope consists of a resonating microstructure that uses an electrostatic comb drive actuator to induce oscillation along one sensor in-plane axis, called the actuation-axis. The other orthogonal in-plane axis is called the sense-axis, while the orthogonal axis normal to the plane of the device is called the rotation-axis. When the sensor is rotated about the rotation-axis, Coriolis force results in sinusoidal microstructure motion along the sense-axis where the amplitude is proportional to the applied angular rate [7]

Basically gyroscopes can be categorized into three types,

Tuning fork gyroscopes: The operating principle is based upon a standard tuning fork's response to rotation. In this design the proof masses are driven at resonance along the x-axis, and the Coriolis acceleration in-

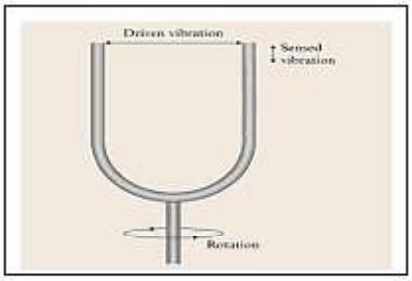

Fig. 2 Schematic representation of a gyroscope [7]

duced by rotation around the z-axis is sensed capacitively along the y-axis [8].

Vibrating-Wheel Gyroscopes have a wheel that is driven to vibrate about its axis of symmetry, and rotation about an in-plane axis results in the wheel's tilting, a change that can be detected with capacitive electrodes under the wheel.

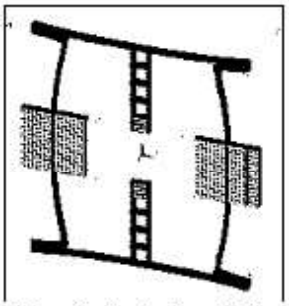

Fig. 3 A tuning fork gyroscope [8]

The vibrating wheel gyro made by Bosch Corp. [9], with capacitive sensing under the wheel, can be used to detect two in-plane rotational axes as shown in Fig. 4.

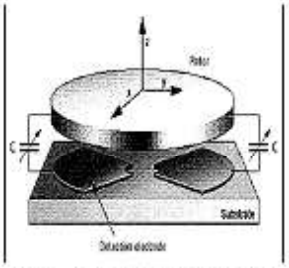

Fig. 4 Vibrating wheel gyroscope

Wine Glass Resonator Gyroscopes. A third type of gyro is the wine glass resonator. In a wine glass gyro, the resonant ring is driven to resonance and the positions of the nodal points indicate the rotation angle[10]. Most of the micromachined gyroscopes use vibrating mechanical elements (proof-mass) to sense rotation. The absence of rotating parts means that no bearings are needed therefoe miniaturization is easier [40].

Resolution, drift, zero-rates output (ZRO), and scale factor are important factors that determine the performance of a gyroscope.

Gyroscopes are widely used in the military navigation aviation and automotive industries and the emerging new applications are in camera phones, GPS services, gaming etc

Gyroscopes are basically two high performing MEMS devices integrated into one single device that have to work together to produce results. The Intelli-G gyroscopes contain a self tuned resonator in the drive axis, and a micro-g sensor in the sensing axis. The absolute magnitude of the Coriolis force sensed is quite lower compared to any MEMS accelerometer therefore fabrication of Gyroscopes is more demanding than accelerometers or pressure sensors [2]. The performance of a Gyroscope depends on the fabrication and packaging process and is sensitive to temperature variations hence the designing of a gyroscope must be fine tuned to achieve greater functionality and lower prices

Bio MEMS

Interest in MEMS for biological applications (BioMEMS) is growing rapidly, in areas such as biosensors, pacemakers, immunoisolation capsules, and drug delivery. The crucial factor in many of these applications lies in the leveraging of features unique to MEMS for maximum impact. The ability of MEMS to act on a short time scale and under physiologically relevant conditions, coupled with their ability to deliver an electrical stimulus and/or drugs from a device, offer the potential for these devices to actuate systems in the body [11]. BioMEMS can be broadly classified as follows

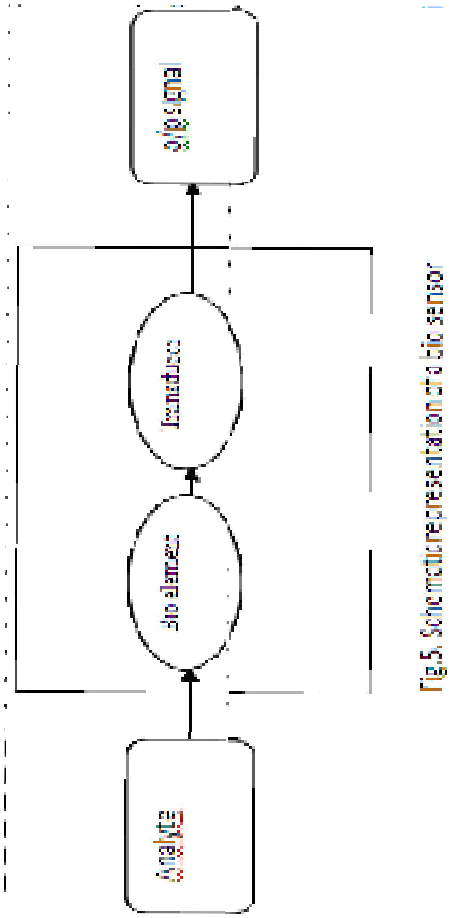

Fig.5. Schematic representation of a bio sensor

Biosensors These sensors work on the principle of interactions between the bio molecules in the sample and the analyte (usually in solution) in the sensor. It contains a bioelement like enzyme antibody nucleic acid etc and a sensor element whose sensing strategies include optical [12], mechanical [13], magnetic [14], and electrochemical [15-16] detection methods, as well as combinations of the above.

Bio instruments and surgical tools Here MEMS technology enhances the functionality of existing surgical tools and enables surgeons to perform new procedures like minimal invasive surgery ,surgical robotics and tactile feedback by using microfabricated needles ,endoscopes, catheter, ultrasonic cutting tools micropositioners stents etc[17]

Bio analytical systems for testing and diagnosis In these systems minute samples of the analyte are passed through microchannels and species in these samples are separated by applying an electric field and by making use of their different electro osmotic abilities .A number of such channels can be built on a single chip and can be tested simultaneously[18]

Micro fabricated pressure sensors also have the potential for *in vivo* application This system could be implanted in small mammals to measure blood pressure during studies of hypertension and cardiovascular physiology or to measure intraocular pressure. [13&19]

The microfabrication of bio compatible stents and drug delivery through stents is another area of growing interest [20&21]. Microneedles can be fabricated from silicon, glass (silicon dioxide), and metal and can deliver drugs transdermally without pain. The growing interest in combining living cells with microfabricated devices, and in using microfabrication technology for tissue engineering and drug delivery, may ultimately lead the way to fully integrated,MEMS-based devices that could augment or replace entire biological systems in the human body [1]

The major issues in BIOMEMS are (a) Functionality for the intended biomedical operations. (b) Adaptivity to existing instruments and equipment.(c) Compatibility with biological systems of the patients.(d) Controllability, mobility, and easy navigation for operations such as those required in laparoscope's surgery and (e) Functions of MEMS structures with high aspect ratio (defined as the ratio of the dimensions in the depth of the structure to the dimensions of the surface). Applications for these devices are in the fields of medicine, agriculture, biotechnology as well as the military and bioterrorism detection and prevention [41].

RF MEMS

The acronym RF MEMS refers to the design and fabrication of MEMS for Radio Frequency (RF) integrated circuits. Though RF functionality can be provided by other devices like FETs and PIN diodes, RF MEMS devices score high in power handling, linearity, Q factor, reliability, size and cost. Some of the most important RF MEMS devices are

- **Switch** mainly used as transmit/receive duplexers, in reconfigurable antennas, phased arrays, signal routing sys tems phase shifters etc
- **Varactors** used in high-performance switches and ana logue controlled circuits (e.g. phase shifters, impedance tuners and filters).
- **High Q inductors**
- **Filters** find applications in cell phones as duplexers in two way data or voice transmission and in GSM RF front end modules [2].

With RF MEMS devices there are many conflicting parameters involved in the design process like the

1. Intrinsic RF performance (e.g. insertion loss, isolation and return losses);
2. Actuation mechanism (e.g. electrostatic, piezoelectric, magnetic and electrothermal);
3. Control parameters (e.g. voltage, current, power, residual energy and speed);
4. Fabrication technologies (surface and bulk machining, wafer bonding and hermetic packaging);
5. Layout (e.g. area, topology and topography);
6. Packaging (e.g. standardization and extrinsic parasitic effect on overall RF performance);
7. Subsystems integration (e.g. self-actuation and cost). [22]

Generally trade-offs are resorted to in the design of RF MEMS due to the practical constraints in the required application [23].

Switch

The most important and widely studied RF MEMS device is the switch. MEMS switches are devices in which operation is based on the use of mechanical movement to achieve a short circuit or an open circuit in the RF transmission line. At radio frequencies (RF) the switching processes become complicated due to the introduction of capacitance and resistance in signal to signal or signal to ground path. Currently RF integrated circuit switching is performed by PIN diodes FETs MESFETs etc among which the performance of PIN diode is superior compared to the others. For example, M/A-COM's MA4AGSW1 AlGaAs SPST reflective PIN diode switch can achieve a measured: ON state insertion loss of less than 0.4 dB, from DC to 50GHz; OFF state isolation better than 45 dB, from 18 to 50GHz; and input and output return losses better than 15 dB, from DC to 50GHz[22].

Though RF MEMS switches have the advantage of Near-Zero power consumption, very high isolation low insertion loss linearity etc, they suffer from Relatively low speeds, requirement of a high voltage or current drive ,limited power handling capability and reliability[25].

Varactors

There are many broadband applications like low noise amplifiers harmonic frequency generators voltage-controlled oscillators (VCOs) with specific design requirements, in which the capacitor controls critical electrical parameters. Due to the difficulties in implementing high-Q (Quality) on-chip variable capacitors they are often designed as an external component in many circuits. Generally varactor diodes are used in these circuits but they suffer from low Q factor medium RF power handling capabilities and non linear frequency tuning characteristics. In comparison with solid-state varactors, the MEMS tunable capacitors have the advantage of low loss and greater tuning range but a slower speed [24].

Inductors A high-Q inductor is a key element for high performance RF ICs such as a voltage controlled oscillator (VCO) and power amplifier (PA). Off-chip inductors are frequently used in RF applications due to their excellent characteristic in high frequency, but their size is pretty large. Conventional spiral inductors on silicon chips have suffered from a low-Q factor due to ohmic loss as well as substrate loss.

MEMS inductors are promising for communication tools with proper packaging since the quality factor of the MEMS inductor is a few times higher than that of the CMOS inductor due to its low substrate loss [38].

Pressure sensors

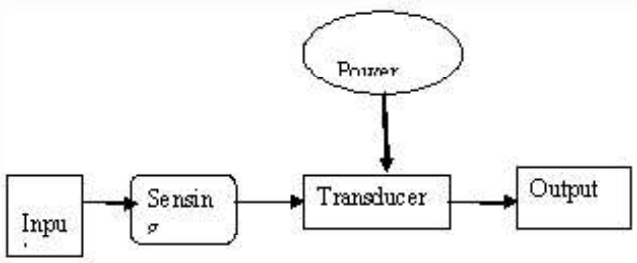

Fig. 6 Block diagram of MEMS sensor

Micro pressure sensors are used to monitor and measure minute gas pressure in environments or engineering systems, e.g. automobile intake pressure to the engine. They are among the first MEMS devices ever developed and produced for real world applications.

A wide variety of differential, gauge, and absolute pressure micro sensors based on different transduction principles have been realized using MEMS technology

Micro pressure sensors work on the principle of mechanical bending of thin silicon diaphragm by the contact medium like gases, fluids etc. The diaphragm which is the active mechanical element can be square circular or rectangular [26]. For the case of a clamped circular plate with small deflections the form of deflection is [27]

$$\omega(r) = \frac{Pa^4}{64D}\left[1 - \left(\frac{r}{a}\right)^2\right]^2 \qquad (3)$$

Where, ω r, a, and P are the deflection, radial distance from the centre of the diaphragm, diaphragm radius, and applied pressure, respectively. D is the flexural rigidity, given by

$$D = \frac{Eh^3}{12(1-\vartheta^2)} \qquad (4)$$

where E,H and ϑ are the Young's modulus, thickness, and Poisson's ratio, respectively of the diaphragm. From the above equations it is clear that the total deflection is directly proportional to the applied pressure. However, this direct proportionality no longer holds true. In general, a deflection measurement scheme that is linear with pressure is preferred as such systems are simple to calibrate and measure.

Due to the vastly diverse conditions, ranges, and materials for which pressure must be measured; there are a variety of pressure sensor designs. Often pressure can be converted to some intermediate form, such as displacement. The sensor then converts this displacement into an electrical output such as voltage Most strain based pressure transducers will produce an output in millivolts. Once we have obtained a measurable voltage signal, that signal must be converted to actual units of pressure. A typical conversion formula is

$$\text{Pressure} = \left(\frac{C_{fs}}{V_{ex}}\right)\left(\frac{V_{meas}}{CF}\right) \qquad (5)$$

Where

C_{fs} =Full scale capacity-the maximum pressure which the sensor should receive

V_{ex} =Excitation Voltage-the recommended input voltage

V_{meas} = Measured Voltage-the raw voltage returned by the sensor

CF= Calibration Factor-the output of the transducer [28]

Types of pressure sensors

Piezo resistive

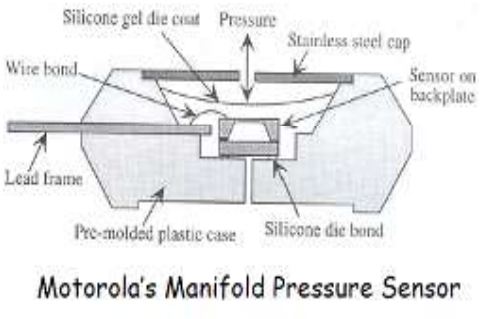

Fig.7

Piezoresistive pressure sensors are based upon the principle of piezoresistance in which there is a change of resistance with applied stress. The strains associated with the deformation of the diaphragm are measured by tiny piezoresistors placed in strategic locations on the diaphragm these tiny piezoresistors are usually made from doped silicon [18]. Piezoresistive effect in silicon produces resistance change that is approximately two orders of magnitude larger compared to that of dimensional changes[1]. Typically four piezoresistors are connected into a Wheatstone bridge configuration to reduce temperature errors. The positioning of the piezoresistors, their shape, and the membrane material usually silicon, along with the crystal orientation plays an important role in optimizing the sensor's performance [29]

Capacitive sensors

Capacitive sensors are based upon the principal of parallel plate capacitors. Capacitive pressure sensors work by detecting the change in capacitance between a fixed plate and the flexible plate the capacitance, *C*, of a parallel plate capacitor is given by

C - € A/d (6)

Where € *A*, and *d* are the permittivity of the gap, the area of the plates, and the separation of the plates, respectively.

Since the capacitance between the electrodes is a non-linear function of the gap, most sensor designers like to work in the linear range of pressure-displacement response. The maximum deflection at full scale is chosen such that it does not exceed 25-30% of the capacitance gap.

Optical sensors

Many diaphragm-based optical sensors have been reported

which measure pressure induced deflections by Mach–Zehnder interferometry and Fabry–Perot interferometry. The deflection derived from these devices varies linearly with pressure as in equation (3).Sensors which measure quantum-well spectrum deformation have also been demonstrated. Optical MEMS sensors have the advantages of immune to EMI, larger bandwidth and higher sensitivity compared to electronic counter parts[42]. Optical sensors though accurate, are temperature sensitive. Furthermore, aligning the optics and calibrating the sensors can be challenging and expensive.

Resonant sensors

These sensors operate by monitoring the resonant frequency of a mechanical structure like a beam or cantilever. The resonant beam is the sensing element and there is a shift in the resonance frequency when stress is induced in the beam due to the applied pressure. There are different methods by which the structures can be driven into resonance while the resonant frequency is sensed. One such method is electrostatic excitation and piezoresistive sensing, here the sensing beam is connected to an AC voltage supply and the resonant frequency is measured by the resultant strain in the piezoresistors. Structures can also be optically excited by laser and sensed by a photodetector or electrostatically excited and capacitively sensed. Resonant pressure sensors have been shown to exhibit better pressure sensitivity and lower temperature sensitivity than pure piezoresistive sensors [26]. Furthermore, a frequency output is more immune to noise than piezoresistive and capacitive signals and these sensors have a higher resolution.

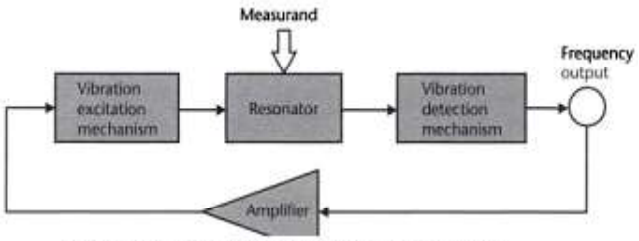

Fig 8. Block diagram of a resonant sensor [37]

Various factors like the operating pressure range, geometry of the sensing diaphragm sensitivity of the device linearity resolution, signal to noise ratio ,dynamic range, bandwidth reliability in harsh environments, cost and time factors have to be taken into consideration while designing a sensor .

Diaphragms are the most important mechanical components of pressure sensors they can be either circular square or rectangular. As far as the induced stress for a given pressure is concerned stress, the square diaphragm has the highest induced stress hence it is the favored geometry for pressure sensors because the high stresses generated by applied pressure loading – result in high sensitivity. Also it is easy to dice the diaphragm from standard wafers the circular diaphragm has the lowest stress on its edges when applying the same pressure but the largest centre deflection can be seen in circular diaphragm. So, in applications which maximum deflection plays the prime role the circular diaphragm is suggested. The circular diaphragm is most favored from design engineering point of view. The vibration frequency of the diaphragm also plays an important role in the design of the sensor. [18 &30]

The development of a high-performance diaphragm is of critical importance in the design of pressure sensors. In particular, diaphragms capable of linear deflection are needed in many pressure sensors. In order to get high sensitivity, the diaphragm thickness should be thin to maximize the load-deflection responses. On the other hand, thin diaphragm under high pressure may result in large deflection and nonlinear effects that are not desirable. And for the purpose of dynamic measurement, resonant frequency of the diaphragm is also an important parameter. It is therefore important to characterize the relationships among diaphragm thickness, side length, sensitivity, and resonant frequency in a pressure sensor. [40]

The principal advantages of capacitive pressure sensors over piezoresistive pressure sensors are increased pressure sensitivity and decreased temperature sensitivity However, excessive signal loss from parasitic capacitance is a serious disadvantage, which hindered the development of miniaturized capacitive sensors until on chip circuitry could be fabricated[32-35] Historically, capacitive sensors have benefited from the same advances in diaphragm etching and wafer bonding that piezoresistive sensors have. However, the piezoresistive approach generally has a complex transducer with simple circuit requirements, while the converse is true of the capacitive approach. For this reason, capacitive sensors have benefited more from advances in circuit design than piezoresistive sensors [34] Major problems in pressure sensors are in the system packaging and protection of the diaphragm from the contacting pressurized media, which are often corrosive, erosive, and at high temperatures [18].
The method of assembly also has a substantial effect on the sensor's characteristic performance. The sensors convert mechanical tension to an electrical signal and cannot distinguish between tensions due to the signal (pressure) and those caused by thermal changes or other effects. The sensor data therefore tend to have a thermal dependency. [36]

Pressure sensors are characterized by parameters that depend on the target application. Comparisons are difficult because manufacturers are currently using different terminologies for the same sensor performance parameters. The user should therefore consider the condition of supply voltage and current corresponding to a particular data specification. [36]

While the performance of a MEMS-based silicon pressure sensor will vary among manufacturers, a maximum nonlinearity of ±0.1% (BFSL) at 25°C is available from a number of suppliers, including All Sensors, GE NovaSensor, and Measurement Specialties.

Table 1. Performance features of Resonant ,Piezoresistive and Capacitive sensing[37]

Feature	Resonant	Piezoresistive	Capacitive
Output form	Frequency	Voltage	Voltage
Resolution	1 part in 10^8	1 part in 10^5	1 part in 10^4 -10^5
Accuracy	100-1000ppm	500-10000ppm	100-10000ppm
Power Consumption	0.1-10mw	~10mw	<0.1mw
Temperature and cross sensitivity	-30 x 10	-1600 x 10	4 x 10

Fabrication techniques

The fabrication technologies which are commonly used are a) Surface micro machining b) Bulk micro machining c) Fusion bonding and d) LIGA. Surface micro machining involves the formation and Lithographic patterning of thin films on a suitable substrate like Si, GaAs, Quartz, Glass etc., some of these films can be made 'free standing' by a suitable release method. For this, sacrificial films made of copper, Gold, Aluminum, SiO2, Si3N4 etc., are deposited below the films to be released and then etched out during the final process. Complicated components, such as movable parts, are built using these sacrificial layers. Basically surface micromachining is based on the deposition and etching of different structural layers on top of the substrate. As the structures are built on top of the substrate and not inside it, the substrate's properties are not as important as in bulk micromachining, and the expensive silicon wafers can be replaced by cheaper substrates, such as glass or plastic. This is in tune with present IC fabrication technology. But, there are limitations in forming 3 D complex structures in this method.

Bulk micromachining

Unlike surface micromachining, which uses a succession of thin film deposition and selective etching, bulk micromachining defines structures by selectively etching inside a substrate. Whereas surface micromachining creates structures on top of a substrate, bulk micromachining produces structures inside a substrate .Usually, silicon wafers are used as substrates for bulk micromachining, as they can be anisotropically wet etched, forming highly regular structures. Bulk micromachining starts with a silicon wafer or other substrates which is selectively etched, using photolithography to transfer a pattern from a mask to the surface. Like surface micromachining, bulk micromachining can be performed with wet or dry etches, although the most common etch in silicon is the anisotropic wet etch. Apart from wet etching RIE (Deep Reactive Ion Etching) is also used to release the MEMS structures. The most common RIE technique used is SCREAM (Single Crystal Reactive Etching and Metallization process. Surface Micromachining requires more fabrication steps than Bulk Micromachining, and hence is more expensive. It is able to create much more complicated devices, capable of sophisticated functionality. Surface Micromachining is suitable for applications requiring more sophisticated mechanical elements.

Conclusion

While IC technologies are used to advantage in MEMS processing, the thermal and mechanical properties of MEMS materials must be understood, measured, and optimized to achieve accuracy and reproducibility. MEMS devices are now well established in commercial markets which will continue to grow in the foreseeable future. The future lies in Monolithic integration of piezoresistive, capacitive, optical, and resonant pressure sensors with controlling electronics or optics thus producing A-Lab on Chip device. Suitable combinations of micromachining and traditional methods, intelligent choice of materials, and skillful packaging will be the criteria to success

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QUASI-ONE DIMENSIONAL ZNO NANOSTRUCTURES FOR GAS SENSING APPLICATION: A REVIEW

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1. Introduction

Today nanotechnology is being heralded as a frontier science. Exploring novel functional nano structured materials and enhancing their application domain is attracting optimum research efforts. Advances in nanotechnology have ushered in more sensitive detection systems in miniaturized formats, for air and water quality monitoring. These sensing systems allow simultaneous measurement of multiple parameters and have real time response capability.

Of the various kinds of sensors, the relevance of gas sensing systems can never be over emphasized. Alarmingly upward spiraling levels of pollution that impact public health and safety have generated a compelling need to scrutinize the air quality through gas sensing. The sheer range of areas that require gas sensing has propelled research work in this field. Theoretically it is possible to use several materials for detection of gases. However, metal oxides being heterogeneous and active materials, are eliciting growing interest for sensor fabrication. Metal oxides can be conductors, semiconductors or insulators. Among these, semiconducting metal oxides have two unique features: mixed cation vacancies and adjustable oxygen difficiency, which are the bases for creating and tuning many novel electric, chemical, optical and magnetic properties [1].

Among Metal oxides, Zinc oxide (ZnO) is one of the most prominently investigated nanomaterials for gas sensing, due to its well established manufacturing techniques. ZnO has a hexagonal wurtzite structure with lattice constants a= 0.324-0.326 nm and c= 0.513-0.543nm, high band gap energy (~3.4eV) and large exciton binding energy (60 meV) at room temperature [2-4]. ZnO is an improtant functional Metal oxide semiconductor because of its outstanding optical, electrical and piezoelectrical properties [5]. Its exceptional physical and chemical properties have made it an ideal material for applications like photocatalysts [6,7], optoelectronic devices [8,9],Transducers [10,11] and sensors[12-15]. It has been demonstrated that ZnO is an excellent sensing material for detection of both oxidizing and reducing gases [16-22].

Many morphological varieties are prepared from metal oxide semiconductors. Among them, Q1D metal oxide nanostructures have several special features unique to them. These salient aspects include very large surface-to-volume ratio, dimensions comparable to the surface charge region, greater stability due to high degree of crystallinity, lower power consumption, simple preparation techniques, prospects of functionalizing their surface, tuning of the operating temperature and use of catalysts for promoting probe specific reactions [23-26].

Q1D ZnO nanostructures are excellent materials for producing quality gas sensors. This review article attempts to reflect huge efforts invested towards improving the vapour phase preparation techniques of Q1D ZnO nanostructures, multiple Q1D nano ZnO morphologies achieved, and Q1D ZnO conductometric, Single Nanowire Transistor based and Photo Luminesence (PL) based gas sensors.

2. Synthesis and growth mechanisms

The synthesis of Q1D nanostructures requires a preferred direction along which the growth rate is higher. As with the other nanomaterials, even ZnO nanostructures can be prepared either by top-down approach or bottom-up approach. Top-down method involves downsizing of the lateral dimensions of 2D structures through lithographic techniques like etching. This approach does not suit industry needs because of high costs and long preparation periods involved. The bottom-up technique achieves nanofabrication by integrating building blocks such as molecules or by chemical synthesis employing growth methods like vapour phase transport, solution based methods and electrochemical deposition.

The bottom-up approach yields high purity and good miniaturization of the product at economical rates. There are innumerable bottom-up growth techniques explored till date for nanofabrication. This review article focuses on vapour phase growth, as it is the cheapest and most favoured preparation mode for metal oxide Q1D structures. In this method, the source material whose nanostructure is to be prepared, will be evaporated first. Then these vapours are conveyed onto and condensed on a substrate. The VS (Vapour-Solid) process and the VLS (Vapour-Liquid-Solid) process are two important techniques of preparation in vapour phase growth.

2.1 Vapour-Solid Process (evaporation-condensation process).

In the VS growth, the nano-wires crystallize by direct condensation from vapour phase without the use of a catalyst. This anisotropic growth was initially ascribed to the presence of lattice imperfections. But when the growth of defect free nanowires was observed, this explanation could not be justified. There have been reports of nanowire growth rate higher than the calculated rate of condensation from the

vapour phase. This peculiar fact could possibly be due to the adsorption of molecules onto non-wire faces, which later diffuse to the principal growth surface of the wire [27].

In V-S process, the two main methods of vaporizing the source material are the thermal vaporization and laser ablation. During thermal vaporization, elevated temperature is used to vaporize the powder source material and the resultant vapours condense on a particular substrate under predetermined experimental conditions. Source materials, growth temperature, temperature gradient, substrate, gas flow rate and pressure influence the morphology and phase structure of the product [28]. The present review article focuses only on thermal vaporization due to its simplicity and low cost.

The V-S technique was first used by Sears in 1955 to grow mercury whiskers of diameter of ~200nm and length of 1-2mm [29]. Since then abundant research efforts have been put forth for the production of one dimensional nanostructures of various materials. Wang and his coworkers have reported the growth of ZnO single crystal ultralong nanobelts with typical widths of 30-300nm, width to thickness ratio of 5-10 nm and lengths of a few mms, by thermal evaporation at 1400° C [30]. In subsequent works they have also fabricated nanorings of Shell thickness 10-30nm and diameter 1-4μ [31], nanohelixes of diameter 300-700nm [32] and nanosprings of radius ~500-800nm [33] by VS process. Xubo song and associates have synthesized ZnO nanonails by VS method at 440°C using O_2 /Ar as the carrier gas. No metal catalyst or impurities have been used in this preparation [34].

Though the VS process is a self catalytic growth technique without needing external catalytic help, there are a few studies that have employed different growth conditions, such as catalysts. For example, Wang X et al have synthesized ZnO nanowires by vapour phase process by employing a thin film of tin as a catalyst and reducing source temperature through carbothermal reduction. As prepared ZnO nanowires had tips devoid of catalyst. This has been considered to be an outcome of VS process [35].

2.2 Vapour-Liquid-Solid process

Wagner and Ellis discovered the VLS process in 1964 for preparing Silicon nanowhiskers, using Au particles as catalysts and named the technique after the three phases involved in this method: the vapour precursor, the liquid catalyst droplet, and the solid product. VLS is one of the most important methods for preparing one dimensional nanostructures.

A catalyst forms a liquid droplet by itself or by alloying with the growth substance and traps the growth species. Then the growth material in vapour phase diffuses into the catalyst droplets. It eventually precipitates at the growth surface giving rise to unidirectional growth [36]. Wagner has enlisted the conditions to be satisfied by a catalyst for the successful growth of nanostructures [37]. These include requirements like, the catalyst must form a liquid solution with the growth compound, its distribution coefficient should be less than unity, it must be chemically inert and its equilibrium vapour pressure must be very small. Generally after the nanostructure growth by VLS process, the metal catalytic particle is found at the tip of the nanostructure.

Plenty of literature citing the use of Au as the catalyst in the VLS fabrication of one dimensional nanostructures shows that Au is the preferred choice for a catalyst. Initiating and guiding the growth of ZnO nanowires has been first demonstrated on α-plane orientated single-crystal sapphire substrates using gold particles as catalysts [38]. Gao P X and Wang Z L have used Sn as the growth directing catalyst for forming ZnO nanorods [39].

An interesting comparative study involving the ZnO nanowire growth using four different metal catalysts and substrates of different materials, structure, and crystal orientation was carried out by Zhu Z et al [40]. It was found that the growth type depends on the choice of surface catalysts. For example, when the Fe catalysts are used, the growth of ZnO nanowires may take place by Vapour–solid process. In the case of Au, Ag, and Ni catalysts, the wire growth occurs predominantly by VLS process. This study revealed that, compared to noble-metal catalysts, using transition metal catalysts triggers growth at a relatively rapid rate and yields thicker wires with higher aspect ratio.

The density of nanowires grown depends on the thickness of the catalyst used. Hence a catalyst deposited on the substrate either as separate dots or as a thin continuous film or as disarrayed particles produces nanowires of different densities over a large surface area. This has been shown in the study by Wang X et al [41]. This work also dispels the long held notion that the size of the catalyst particles decides the width of the nanowires, showing that this is true only in the case of small catalyst particles of size below 40nm.

Chen.Z. and coworkers showed theoretically that the smaller the nanowire radius, the slower the growth rate [42]. Several experiments have also supported this view. But this does not appear to be the ultimate conclusion but seems to be true only for particular growth conditions like temperature and gas phase composition. D.S. Kim et al have prepared well separated ZnO nanowires on GaN substrate using Au clusters instead of Au particles. They found an inverse relation between the length and diameter of the nanowire i.e., nanowires with smaller diameters grow faster than larger ones. They attributed this unexpected result to the surface diffusion of ZnO admolecules along the side walls of the nanowires [43].

2.3 Solution phase growth

Solution phase growth is almost as popular as the vapour phase growth. Solution phase growth employs methods such as Solution-Liquid-Solid method (SLS), Template assisted growth and Template free growth. SLS is very similar to VLS

method except for the fact that the precursor in SLS process is a solid. In the Template involved growth, the most commonly used templates are anodic aluminium oxide (AAO), molecular sieves, polymer membranes and Carbon nanotubes. This simple technique normally yields polycrystalline products. Template free growth encompasses surfactant assisted growth, sonochemical mehod, hydrothermal method, organometallic method and the like.

2.4 Doping

The objective behind doping of nanomaterials is to modify their morphological details as well as electrical, magnetic or optical properties, with control. Doping produces effects that differ from those achieved by metallic catalytic particles and metal-oxide nanomaterials that yield heterostructures. Introduction of dopants preserves the crystalline nature of the one dimensional nanostructures. It also avoids formation of precipitates and genesis of second phases.

Dopant addition is done by modifying the composition of the precursor in the evaporation–condensation process, though the capability of managing the amount of dopant eventually introduced in the nanowires is limited [44].

In recent years, doping several elements into ZnO crystal lattice and assessing the effect has been the subject of many a study. The group III elements like Al, Ga, and In have been used to replace Zn site to enhance n-type semiconductivity [45-47]. Group I elements such as Li, Na, and K of small ionic radii have been induced to improve the optical properties of ZnO by occupying the interstitial site [48-50]. p - ZnO has been tried by doping ZnO with V-group elements such as As, P, and N has also been documented [51-54], and also doping with Tm, Yb, and Eu using ion implantation has been reported in the literature [55]. Conversion of the usually n-type ZnO into p-type through doping is a very challenging deed. Very recently, Lili Wu et al has investigated the possibility of obtaining p-type one dimensional ZnO nanobelts through codoping of ZnO with N-In. It has been suggested that stable p-ZnO could be attained if shallow donors could be reduced [56].

3. Types of ZnO nanostructured gas sensors.

Q1D ZnO gas sensors can be configured mainly in three important types. They are the conductometric gas sensors, Single Nanowire Transistors (SNWT) based gas sensors and the Photoluminiscence (PL) based gas sensors.

3.1 Gas sensing phenomenon in conductometric sensors

Conductometric sensors are based on the resistance or conductance variations effected by the their exposure to target gases. For most semiconducting oxide gas sensors, the sensing mechanism is surface controlled. The surface species and the amount of oxygen ions (O_{ads}^-, O_{2ads}^- and O_{ads}^{2-}) on the surface control the conductivity. On exposing the ZnO NWs to air, Oxygen molecules adsorb on the surface of the ZnO. Then an electron from the conduction band is captured forming oxygen ion and on the surface regions depletion regions are created. In the temperature range 100°C to 500°C, the adsorbed oxygen leads to ionized molecular (O_{2ads}^-) or atomic species (O_{ads}^- and O_{ads}^{2-}), depending on the temperature. The reaction kinetics can be described as follows [57]:

$$O_{2gas} \rightarrow O_{2ads} \quad (1)$$

$$O_{2ads} + e^- \rightarrow O_{2ads}^- \quad (2)$$

$$O_{2ads} \rightarrow 2O_{ads} \quad (3)$$

$$O_{ads} + e^- \rightarrow O_{ads}^- \quad (4)$$

$$O_{ads}^- + e^- \rightarrow O_{ads}^{2-} \quad (5)$$

When a reducing gas like CO comes into contact with the surface, the following reaction may take place:

$$CO_{gas} \rightarrow CO_{ads} \quad (6)$$

$$CO_{ads} + O_{ads}^- \rightarrow CO_{2gas} + e^- \quad (7)$$

The adsorbed gas accepts ionosorbed oxygen and changes the electrical conductance of metal oxide. A change in the density of ionosorbed oxygen brought about in this process is detected as an increase in sensor conductance. For strongly electronegative gases like NO_2, the effect is to reduce sensor conductance perhaps by direct adsorption:

$$NO_{2gas} \rightarrow NO_{2ads} \quad (8)$$

$$e^- + NO_{2ads} \rightarrow NO_{2ads}^- \quad (9)$$

An increase in the surface potential that reduces the overall conductance is effected by occupying the surface states, that are much deeper in the bandgap compared to oxygen [58]. This is the working principle behind conductometric gas sensors. Conductometric gas sensors can be configured either in FET device mode or in the usual resistor design. In conductometric gas sensors, transduction involves the measurement of DC resistance of the sensing material as a function of the atmosphere surrounding it. The response of the sensing element towards the target gas is called the sensor response. The response of an n-type semiconductor sensor is defined as follows:

$$S = \frac{\Delta R}{R_{air}} \quad \text{(for oxidizing gases)} \quad (10)$$

$$S = \frac{\Delta G}{G_{air}} \quad \text{(for reducing gases)} \quad (11)$$

Where ΔR is the variation in sensor's electrical resistivity, ΔG is the variation in sensor's electrical conductivity and R_{air} and G_{air} are the values that sensor shows in air.

3.2 Q1D ZnO conductometric gas sensors:

Seiyama and coworkers pioneered research in the field of Metal oxide gas sensors in 1962 [59]. Since then tremendous attempts have been made towards enhancing the sensing properties of various semiconducting metal oxides. Among Q1D ZnO nanostructured gas sensors, there is a relative abundance of studies reporting the use of a mesh/web or array of nanostructures rather than an individual nanoentity.

Very recently, Barreca et al have reported the preparation of 1D ZnO nanorods assemblies on Al_2O_3 substrates at low

temperatures by plasma enhanced chemical vapour deposition (PR-CVD) and characterization of the sample by FE-SEM, EDXS and XPS to find out its morphology and chemical composition. Conductivity tests for the detection of Carbon monoxide, hydrogen and methane revealed very good responses, directly dependent on the specific gas and the adopted concentration [60].

Qun Xiang and group have prepared an Ag nanoparticle embedded ZnO nanorod samples by facile photochemical method [61]. They made a gas sensing paste out of this product and coated it onto an alumina tube with two platinum wires installed at both ends. This was followed by drying and sintering at 600°C for 2 hrs. A small Ni-Cr coil was passed through the tube as a heater and provided the working temperature for the gas sensor (Fig 1).

Ethanol, hydrogen, methane, ammonia, methanol, formaldehyde, carbon monoxide and acetone were the target gases. Highest sensitivity and selectivity were found for ethanol. The gas response of the Ag-ZnO nanorods (photochemical) was found to be higher than ZnO nanorods doped with Ag (impregnation) and pure ZnO nanorods. Moreover, the long term stability of the gas sensor was evident when it continued to work for 100 days with no obvious change in its response. This research work has successfully developed a new method of introducing catalysts on gas sensing materials.

Fig. 1. Sketch of the gas-sensor structure [61]

Rout and coworkers prepared ZnO nanostructures of different morphologies like nanorods, nanowires and nanotubes. They used each of these for gas sensing. Of all these morphologies, nanowire gas sensors gave highest response to H_2 upto 10 ppm at low temperature of 150°C, especially when impregnated with Pt [62]

Hwang et al have prepared highly crystalline ZnO-SnO_2 core-shell nanowires by a two-step vapour phase deposition. The gas response of these core-shell wires at 10ppm NO_2 at 200°C and 300°C was found to be 66.3 and 12.4 which were ~33 and 8.9 times higher than the respective values for ZnO NWs [63]. The response and recovery time to 0.5-10ppm NO_2 were decreased by 15.8-65 and 5.0-11.4 times respectively when the temperature of the sensor was increased to 300°C. A change in temperature also brings about a change in the selectivity in the gas sensing reaction. At 400°C, the sensor showed maximum detection to 200 ppm ethanol as compared to the other gases. Their response was 7 times higher than that of pure ZnO nanowires.

Yu Zhen Lv and coworkers have fabricated ZnO nanorods based Triethylamine sensor by a simple solution route using dodecyl benzene sulfonic acid sodium salt as a modifying agent. A study of the sensor response as a function of operating temperature and the gas concentration showed that higher the concentration, higher the response. The response of this sensor was found to be superior to those made from nanorods of SnO_2, $NiFe_2O_4$ and $CoFe_2O_4$ nanocrystals as detect TEA at very low concentrations [64].

Liang Peng et al studied the formaldehyde sensitivity of ZnO nanorods irradiated with UV light. ZnO nanorods of diameter ~40nm showed maximum response to formaldehyde. This was attributed to large surface to volume ratio and high photogenerated charge carriers. The photovoltage results show that the photo-generated charge efficiency of sensing element decreases as the surface-to-volume ratio increases or when the size of crystal decreases. Therefore, the particles with highest sensitivity are of a certain size, not too large or small [65].

Of late, several investigations have been devoted to scrutinize the efficacy of single Q1D ZnO nanostructures as gas sensors [66]. O.Lupan et al have reported the preparation of a single ZnO NW based nanoscale sensor for the selective detection of hydrogen gas. The dependence of the gas response on the diameter of ZnO NW sensors was studied recording maximum response (about 34%) for a single wire diameter of 100nm.UV irradiation of the sample facilitated desorption of the gas and improved the recovery time, at 10ppm of H_2. This work elucidated the great potential of single ZnO nanowires as gas sensors.

3.3 Single Nanowire transistor (SNWT) based Q1D ZnO gas sensors

In several studies, one dimensional metal oxide nanowires have been incorporated into electronic devices like FETs that function as gas sensors. An oxidized p-type silicon substrate supports the FET and the underlying conducting silicon acts as the back gate electrode to vary the electrostatic potential of the nanowire. Using lithographic techniques two metal contacts, corresponding to the source and drain electrodes are designed.

Source–drain voltage (Vds) and Drain current (I_D) vs. gate voltage (Vg) are noted. As metal oxides are n-type semiconductors, for the typical I_D–V_{ds} curves, an increase in conductance for $Vg > 0$ and a decrease in conductance for $Vg < 0$ are obtained [67]. The introduction of target gases around the device alters its conductance. This is the principle behind gas sensing using ZnO SNWTs. A typical SNWT is illuatrated in fig.2.

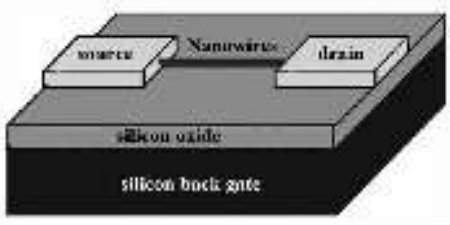

Fig.2 A Single NanoWire Transistor [67]

Fan et al carried out chemical sensing studies with ZnO SNW FET. They found that when the sensor was exposed to 5ppm NO_2, the threshold voltage V_T increased from -7.9 V (value of V_T in the carrier gas Argon) to -5.2 V. They also noticed that when the gate voltage is made highly negative, about -60V, NO_2 electrodesorption resulted and there was fast recovery of conductance at room temperature [68].

The same researchers carried out chemical sensing studies for gases such as O_2, NO_2, NH_3, and CO using SNW ZnO FETs. It was observed that SNW FET showed decrease in conductance to NO_2, NH_3, and O_2 at room temperature. However, it showed an increase in conductance for NH_3 at 500 K. This behavior was attributed to the shift in Fermi energy at elevated temperature. Also, when exposed to CO gas mixed with O_2 the device shows a conductance increase. Also, sensitivity dependence on nanowire radius was demonstrated using O_2 sensing as an example and it was shown that thinner nanowire achieves higher sensitivity [69].

Q.H.Li and associates fabricated SNW ZnO FETs and exposed it to high purity oxygen. From the transfer characteristics it was found that the Source-Drain current decreased and V_T shifted towards positive direction as concentration of Oxygen increased. The sensor being UV responsive, opposite results were obtained for the same experiment when irradiated with UV light [70].

3.4 PL based gas sensors

Photoluminescence based gas sensing is relatively a new area that has not yet been explored extensively. The physical change on which this mechanism rests is the alteration in the photoluminescence sensitivity to the adsorbed molecules of the target gases.

One dimensional ZnO nanostructures exhibit emission in the visible region on exciting in the UV range. The typical photoluminescence (PL) spectrum of ZnO exhibits two emission bands located at about 370–385 and 550 nm. The emission band at about 370–385nm is typically originated from the exciton combination of ZnO, and can be attributed to UV near-band-edge emission. The lattice defects of ZnO, such as oxygen vacancies, are known to cause a green emission at 550 nm [71]. The PL emission of ZnO nanostructure depends on the fabrication conditions, morphological variations and annealing temperatures in different environments.

There have been ample attempts to study the photoluminescence of pure and doped ZnO nanostructures but very few investigations regarding the PL based gas sensing. Lettieri and coresearchers have carried out studies regarding photoluminescence of ZnO nanowires in air as well as NO_2 diluted in dry air. They have investigated the effect of temperature on PL spectrum of ZnO nanowires in air and found that as temperature increases, quenching occurs. On passing 10ppm NO_2 diluted in dry air, there was a pronounced PL green emission quenching. This implies that the origin of PL quenching lies in the introduction of non-radiative recombination paths for surface electrons [72].

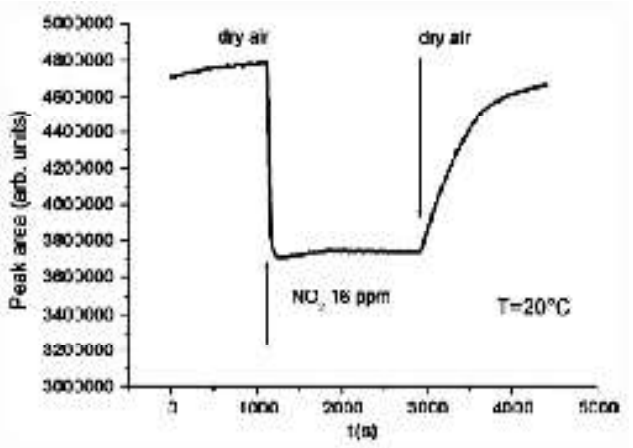

Fig.3. Dynamic of PL quenching on ZnO nanowires caused by NO_2 introduction [73]

Comini et al investigated the dynamic PL quenching in uniform ZnO NWs caused by the introduction of 16 ppm of NO_2 in dry air [73]. PL spectra was taken every 5s and area below the PL curve was calculated. This variation was plotted against time [fig.3]. The response time was less than 30s. But the recovery time was longer. This research group also studied PL quenching using other target gases like ethanol, CO and humid air. CO did not inspire any response. However when the target gas was changed from dry air to 30% humid air, there was a 4% quenching and for 990ppm ethanol 7% quenching was observed. Excellent electrical response also has been observed for concentrations lesser than 200ppm of NO_2 at low operating temperature of 100°C

The same authors in a subsequent investigation [74] have found that the sensor was able to detect NO_2 values as low as 0.1ppm in dry air. Time-resolved photoluminescence measurements in presence of NO_2 showed small modification of recombination rates and lifetimes. These findings support the surface static quenching model, according to which the gas molecules suppress a fraction of radiative transitions and not simply of reducing their probabilities.

4. Conclusion

This review article presents the highlights of the recent and important research endeavours regarding Q1D ZnO nanostructures. In this article the vapour phase growth of these structures has been dealt with in some detail, as it continues to be a preferred growth mechanism. A mention of various solution phase growth processes has been made. Doping that helps to tune the electronic, optical and magnetic properties of ZnO has been briefly elucidated. The principle behind gas sensing application has been explained. Research developments in the areas of conductometric, SNWT based and PL based gas sensors have been featured succinctly.

The accelerated progress in Q1D ZnO nanostructure promises commercially viable gas sensing devices in future,that ensure quality, swift as well as satisfactory performance and cost effectiveness. To this end, the literature survey indicates that the future research should focus on specific areas like the development of a growth process that incorporates the best features of top-down and bottom-up approaches, comparative studies between the efficacies of Q1D nanostructures and thin films as gas sensors, finding appropriate metal contacts and improving the selectivity in conductometric sensors, probing the possibility of fabricating multi target gas sensors, intense work regarding PL based sensors and better understanding of the underlying phenomena.

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C.B.M.Sc:-04

PHARMACOLOGICAL STUDY OF CASSIA SPECTABILIS IN RATS

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INTRODUCTION

The genus *Senna* (previously described as *Cassia*) is a pantropical shrub of the family leguminosae comprising of more than 300 species (Randell and Barlow,1998). It is widely distributed in the tropical countries such as USA, India, Thailand, Malaysia, Indonesia and the Australian region. It is a robust annual plant 35 – 70 inches or taller with an erect, somewhat ribbed stem bearing several stout, ascending branches. The alternating leaves are 4 to 7 inches long and dark green. The flowers are yellow, pea-shaped and borne on upright spikes on the top of the plant. The seed pods are smooth and nearly 2 inches long. They are light green when young, becoming nearly black when ripe.

This species of plants are reported to contain alkaloids, sitosterols, anthraquinone glycosides, tannins and flavonoids. Various species of *Cassia* are reported to have laxative, purgative, antidiabetic, anti-inflammatory, antimicrobial, antifungal, hepatoprotective, antipyretic, antineoplastic, antimalarial, antiasthmatic, antiviral and wound healing properties. In the Ayurvedic system of medicine these plants were also used for the treatment of fever and headache. *Cassia,* and about hundreds of species of this genus which are distributed all around the world and many of them which occur in India.

MATERIALS AND METHOD

Fresh leaves of *C. spectabilis* were collected and fresh leaves of *Cassia spectabilis* was mixed with methanol and contents were filtered through Buchner's funnel in a conical flask and it was further concentrated by rotary flash evaporator at 39-40°C till the solvent got completely evaporated and extract settled down to bottom. The residual methanol from the extract was evaporated after keeping the extracts in a petri dish in a vacuum oven at 60°C at the pressure of 25 psi.

Phytochemical analysis of the *Cassia spectabilis* leaf extract was carried out using HPTLC technique (Wagner *et al.,* 1984) for the presence of alkaloids, anthracenes, bitter principles, glycosides, flavonoides, saponins and coumarins.

The study was conducted on Wistar albino rats (six per group, weighing 200±20 g) to test the anti-inflammatory activity of methanol extract of *Cassia spectabilis* by the formalin -induced paw oedema the method described by Hossein and Hani, (2002). Rats were divided into groups of five consisting of six animals in each group. The rats that received oral doses of methanol extract of *Cassia spectabilis* were fasted with free access to water for 12 h prior to the test. The skin thickness of right hind paw was measured using vernier callipers. The inflammation was produced by subaponeurotic injection of 0.1 ml of 2 % formaldehyde in the right hind paw.

Group	Dose type	Dose
Group I	20% DMSO	2 ml
Group II	Extract	25 mg/kg
Group III	Extract	50 mg/kg
Group IV	Extract	100 mg/kg
Group V	Aspirin	300 mg/kg

The change in skin thickness was measured using vernier callipers after 3 h

$$\text{Percent inhibition} = \frac{\text{1- Percent swelling of drug-treated group}}{\text{Percent swelling of control group}} \text{X } 100$$

and the percent swelling of the paw was determined using the following equation:

Percent swelling = (V-Vi/Vi) ×100

Where V is the paw volume 3 h after the formalin injection and Vi is the initial paw volume (DiRosa *et al*., 1971 and Gopalkrisna *et al*., 2006). The average paw swelling in the group of the drug-treated rats was compared with control rats and the percent of inhibition of the edema formation was determined using the following equation:

The t-test was used to statistically compare the difference in the anti-inflammatory activity (percent inhibition) observed after the application of the different doses, or formulation of *Cassia* extract was tested.

RESULTS AND DISCUSSION

Phytochemical analysis of the *Cassia spectabilis* leaf extract was carried out using high performance thin layer chromatography technique (HPTLC) and found positive for presence of alkaloids, anthracenes, flavanoids, bitter principle and coumarins. This finding is in contrast with the findings of Claudio Viegas *et al*. (2004) reported that the flowers of *Cassia spectabilis* had three new piperidine alkaloids Similarly, Ayo and Amupitan (2007) reported *Cassia spectabilis* contained sennosides, rhein emodin, aloe-emodin, 1,3,7-trihydroxy-2-methyl anthraquinone. Nanik *et al*. (2006) reported a dimer flavonoid from the acetone extract of the stem bark of *Cassia spectibilis*.

The anti inflammatory activity of the, methanol extract of *Cassia spectabilis* was evaluated by formalin induced rat paw oedema method. The extracts were tested at three different dose levels (25, 50 and 100 mg/kg). The results showed that the methanol extract with a dose of 100 mg/kg showed a maximum anti-inflammatory activity of 43.55±2.67% as compared to the reference drug aspirin, which showed 68.14±1.87% inhibition of formalin induced rat paw edema at third h.

Methanol extract with two different doses 25 and 50 mg/kg showed 22.95±2.68 and 29.23±2.37% inhibition respectively. *Cassia spectabilis* produced significant (P<0.001) anti-inflammatory activity at all the tested doses when compared with vehicle control. Many plant extracts exhibited anti-inflammatory activity which was attributed to the presence of flavonoids (Ramesh *et al*., 1998) such as, quercetin, luteolin, hesperidin and biflavonoids which produced marked anti-inflammatory activities (Mishra *et al*., 2001). The methanol extract of the plant *Cassia spectabilis* also had flavonoid as one of the major phytochemical constituent for which the anti-inflammatory activity might be attributed. The role of the other phytochemical constituent in the plant like anthroquinones in the anti-inflammatory activity could not be ruled out.

The above findings are in accordance with the finding of Viegas *et al*. (2008) who reported that carrageenan-induced rat paw edema, only (-)-spectaline exhibited an anti-inflammatory profile, showing an ED_{50} value of 56.6μ mol/kg. In the formalin-induced pain, only LASSBio-776 was able to inhibit by 34.4% the paw licking response of the inflammatory phase.

SUMMARY

The present study was conducted to evaluate the pharmacological properties like anti-inflammatory. The phytochemical analysis of the *Cassia spectabilis* leaf extract revealed for the presence of alkaloids, anthracene derivatives, flavonoids, bitter principles and coumarins.

Cassia spectabilis produced significant (P < 0.001) anti-inflammatory activity at all the tested doses when compared with vehicle control.

This result indicated that *Cassia spectabilis* leaf extract with a dose of 100 mg/kg produced maximum inhibition of formalin induced paw oedema which was comparable to standard drug aspirin.

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C.B.M.Sc:-05

STUDY OF FITNESS IN A FEW SPECIES OF *DROSOPHILA* (DIPTERANS)

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Introduction

The microhabitat differences in a closely related species are an important approach. These species coexisting in nature are of special interest to ecologists to understand the similarities and differences among species. Discovery of the mechanism which underlie their coexistence provide information on whether niche differences are essential for multi species equilibrium (Nunney, 1990). *Drosophila* is the most frequently used animal to measure different facets of fitness. The environmental condition at which species can carryout its vital life stages will directly influence its geographical and habitat distribution. Fecundity is a major determining factor and fitness (Roff, 1992; Stearns, 1992) an important problem of studying egg production and fertility traits, in general is their sensitivity to environmental variations. *Montium* a subgroup of *Drosophila* is one such coexisting, widely distributed together with the wealth of species diversification made the *montium* subgroup an attractive system for evolutionary studies. Literature survey, ecologically, biochemically and at molecular level studies revealed that they are closely related. However, diversification of species depends upon how an individual species responds to different environmental condition, competing individual etc. Conversely, in a given environment how an individual species perform or carrying capacity of an individual plays an important role for the survival. Present study is an attempt to understand carrying capacity in terms of fertility of three species namely *D. melanogaster*, *D. jambulina* and *D. kikkawai*.

Materials and Methods

Fly stocks used for the present analysis was *D. melanogaster* and its *montium* subgroup such as *D. jambulina* and *D. kikkawai*. They were maintained in quarter pint milk bottles containing wheat cream agar medium seeded with a granule of live yeast at 20¡À1oC with 75% relative humidity. The stocks were subjected to analyze fitness parameters such as fecundity, male fertility and female fertility.

Fecundity

Fecundity was analyzed by following the modified procedure of Ramachandra and Ranganath, 1996. Virgin males and females were isolated within 3hr of eclosion and aged for five days. Pairs of flies were put into a food vial (2.5cmX9.5cm) containing 6ml of food medium. 25 replicates were maintained for each species. A pair of flies from each vial was transferred to fresh vial and number of eggs laid by each female was recorded regularly.

Fertility

It was assessed by using the modified procedure of Singh and Chatterge, 1987. Virgin females and males were collected from all the three groups and aged for five days. A pair of flies was transferred into a food vial (2.5cmx9.5cm) containing approximately 6ml of wheat cream agar media. Like wise 10 replicates were maintained for each group. Male fertility was assessed by providing virgin females to males once in three days. For female fertility, vials with fresh media were provided everyday until death. As soon as the emergence begins from previous vials, male and female flies were counted and recorded once in 24h.

Statistical analysis

Data obtained from fecundity, male and female fertility was subjected to one way ANOVA using SPSS 11 software.

Results

Fecundity

Mean¡ÀSE of fecundity in three species is depicted in Table.1.

There is significant differences among three species with F=19.307 (P<0.05) and df=74. The eggs laid by 25 pairs of flies were 14,613, 15,746 and 7,036 respectively in *D. melanogaster*, *D. jambulina* and *D. kikkawai*. Fecundity is depicted in Fig.1. Pairwise comparison has shown that fecundity was greater in *D. jambulina* when compared to other two species. However in *D. melanogaster* fecundity is more than *D. kikkawai*.

Male fertility

The results of male/female fertility are depicted in Table.1. The number of viable offspring's produced by males of three species are 5,896, 2,829 and 1,054 *D. melanogaster, D. jambulina* and *D. kikkawai*. Male fertility was more in *D. melanogaster* than other two species (Fig.2). Mean difference is statistically significant with F=61.818 (P<0.05) and df=29. Interestingly there is no difference in sex ratio among all the species.

Female fertility

The total number of individuals produced by females was 4,961, 3,557, and 1,123 in *D. melanogaster, D. jambulina* and *D. kikkawai* respectively. Mean difference is statistically significant with F=14.713 (P<0.05) and df=29. Intraspecies difference between sex is non significant. Pairwise comparisons are significant. *D. melanogaster* with highest fertility the opposite is true in *D. kikkawai* (Fig.3).

Discussion

The estimation of fitness is the first step in understanding the adaptive evolution of a population (Yamazaki, 1984). The fitness of a genotype is defined as the average number of progeny left by the carriers of the genotype relative to the other genotype in a given environment. *Drosophila* is the most frequently used animal to measure different facets of population fitness (Ramachandra and Ranganath, 1996; David *et al.,* 1983, Markow, 1996; Shakunthala, 2000). An important problem of studying egg production and fertility traits in general is their sensitivity to environmental variation (Krstevska and Hoffmann, 1994). In a given environment performances of the species varies. Here the two sympatric species has been compared to their egg laying capacity, ability to produce fertile offspring's. The present study has revealed that egg laying capacity seems to be more in *D. jambulina* compared to other two species. There is 50% more eggs observed in *D. melanogaster* compared to *D. kikkawai*. Statistically it is highly significant. Though there are closely related but difference in their ability to lay eggs in a given environment. Fecundity is also strongly influenced by environmental factors temperatures, densities, nutrition etc. (David *et al.,* 1983; Markow, 1996). Further, several reports showed that a given females fecundity can be influenced by her genetics, body size, age and also by her partner (Partdrige *et al.,* 1986; Pitnick, 1991; Hoffmann and Harshman, 1985). In the present study number of viable individuals produced was greater in *D. melanogaster* and decreased in *montium* species. More progeny is directly proportional to the duration of copulation (Macbean and Parsons, 1967; Speiss, 1970; Sisodia and Singh 1996). There is a positive correlation between mating activity and fertility in certain species (Maynard Smith 1956; Singh and Chatterjee, 1987). Several studies also have demonstrated the importance of male and female fertility in *Drosophila* (Kvelland, 1965; Fowler and partridge, 1989).

Conclusion

Even though these species were morphologically closely related and belongs to the subgroup of *melanogaster* species group, they showed a significant difference in their fitness. There was remarkable reduction in fecundity, male, female fertility in *montium* subgroup when compared to the *D. melanogaster*.

Though *D. melanogaster* showed less fecundity, they produced more fertile individuals when compared to the other two species.

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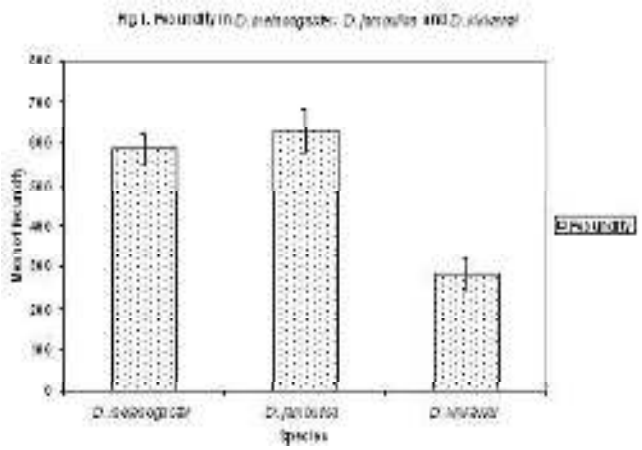
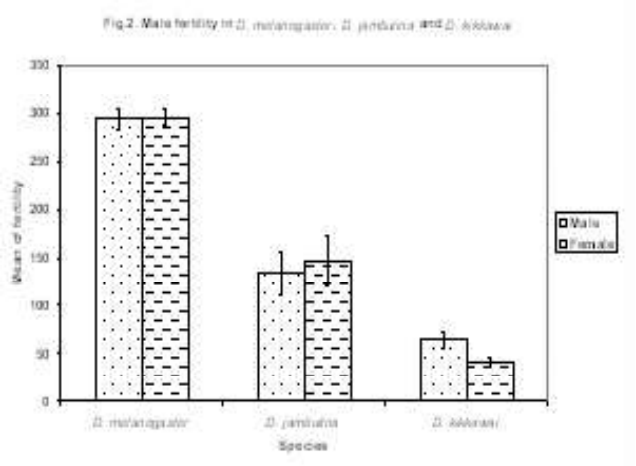
Table.1. Mean±**SE of fecundity, male, female fertility in *D. melanogaster*, *D. jambulina* and *D. kikkawai***

Species	Fecundity	Male fertility	Female fertility
D. melanogaster	584.52±34.2627	589.60±18.15	496.10±40.89
D. jambulina	629.84±53.222	282.90±49.64	355.70±73.57
D. kikkawai	281.44±39.6101	105.40±10.88	112.30±24.58
F-ratio	19.307	61.818	14.713
df	74	29	29

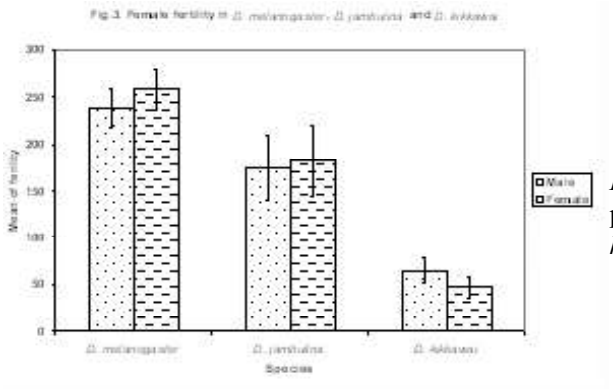
P<0.05-Significant



Fecundity is more in *D. jambulina* when compared to *D. melanogaster* and *D. kikkawai*



Male fertility is more in *D. melanogaster* than other two groups.



Female fertility is also more in *D. melanogaster* when compared to *D. jambulina* and *D. kikkawai*.

C.B.M.Sc:-06

PHOSPHATE SOLUBILIZING BACTERIA IN EARTHWORM BURROW WALL SOIL

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Abstract: Earthworms are recognized important to plant litter decomposition and fertility of soil and their role is complex, which involves the assistance of microorganisms. Earthworm casts contain large amounts of soluble nitrogen, phosphorus and organic carbon and burrow linings may be expected to be enriched by these elements. Earthworm burrow wall hence creates a favorable microhabitat for the soil microflora. One of the major nutrients for plants, phosphorous plays an important role in plant metabolism by supplying energy required for metabolic processes. P. solubilization ability of microorganisms is considered to be one of the most important traits associated with plant nutrition. Phosphate solubilizing bacteria (PSB) posses the ability to solubilize insoluble inorganic phosphate and make it available for plants. These bacteria are involved in a range of processes that affect the transformation of soil P and are thus are an integral part of the soil P cycle. They are effective in releasing inorganic and organic pools of total soil P through solubilization and mineralization. These bacteria convert phosphorous into soluble forms by phosphatase enzyme and produce amino acids, vitamins and growth promoting substances like indole acetic acid (IAA) and gibberellic acid (GA3) which help in soil fertility. The use of PSB as inoculants increases the P uptake by plants.

The present study focuses on isolation and screening of phosphate solubilizing bacteria from burrow wall soil of two species of earthworms, viz., *Lampito mauritii* and *Pontoscolex corethrurus.* Mineral phosphate solubilizing activities of the isolates were tested on tricalcium phosphate medium by determining the hydrolyzing capacity value of the isolates. The phosphatase activity and IAA production of the isolates were also studied. Higher PSB were isolated from *P.corethrurus* with the 30 days upper burrow wall soil showing the maximum number. 89 percent of bacteria isolated from the 45 days upper burrow wall soil of *L.mauritii* were PSBs. Phosphatase activity of these isolates was associated with the release of organic acids and a drop in the pH of the medium. Isolates from the burrow wall soil showed better phosphatase activity at different pH and temperature and also higher IAA production.

INTRODUCTION

Phosphorus is second only to nitrogen in mineral nutrients most commonly limiting in soil and growth of plants. It is an essential element for plant development and growth making up about 0.2 % of plant dry weight. Phosphorous being the major nutrients for plants plays an important role in plant metabolism by supplying energy required for metabolic processes (Lal, 2002). Plants acquire P from soil solution as phosphate anions. However, phosphate anions are extremely reactive and may be immobilized through precipitation with cations such as $Ca^{2+,}$ Mg^{2+}, Fe^{3+} and Al^{3+}, depending on the properties of a soil. In these forms, P is highly insoluble and unavailable to plants. Phosphorous has to be converted into soluble forms by phosphatase enzyme such as acidic and alkaline phosphatases. A great variety of enzymes are produced by soil microorganisms, during their metabolism (Acosta-Martinez, 2000). Several scientists have reported the ability of different bacterial species to solubilize insoluble inorganic phosphate compounds, such as tricalcium phosphate, dicalcium phosphate, hydroxyapatite, and rock phosphate. These bacteria are called has phosphate solubizing bacteria (PSB) which posses the ability to solubilize insoluble inorganic phosphate and make it available for plants. These bacteria are involved in a range of processes that affect the transformation of soil P and are thus are an integral part of the soil P cycle. They are effective in releasing inorganic and organic pools of total soil P through solubilization and mineralization. These bacteria convert phosphorous into soluble forms by phosphatase enzyme and produce amino acids, vitamins and growth promoting substances like indole acetic acid (IAA) and gibberellic acid (GA3) which help in soil fertility. The use of PSB as inoculants increases the P uptake by plants since soil phosphatases hydrolyze phosphate and make it available to plants. Thus, phosphatase activity measurement provides an index of potential availability of phosphatase in soil (Mansell, 1981).

PSB are commonly isolated from soil. An important component of the soil is the earthworms. Earthworms which are recognized as important to plant litter decomposition and fertility of soil play a complex role which involves the assistance of microorganisms. Earthworm casts contain large amounts of soluble nitrogen, phosphorus and organic carbon and burrow linings may be expected to be enriched by these elements. Earthworm burrow wall hence creates a favorable microhabitat for the soil microflora and plants. Among 3000 species of earthworms distributed all over world and about 384 species are reported in India (Julka et. al, 1986). *Lampito mauritii* is the most widely distributed earthworm in India, reported from different agro-ecosystems. *Polypheretima elongata, Perionyx excavatus, Pontoscolex corethrurus* and *Dichogaster bolaui* are the other earthworms having wider distribution in the country next to *Lampito mauritii (Lee*, 1985).

Lampito mauritii has a length of 72-152 mm, diameter of 3.5-5.5 mm and 126-179 segments. Color dorsally is grayish,

brownish or yellowish with purplish tinge at the anterior end. Its ability to withstand a wide range of temperature, soil moisture content , adaptability to coexist with a wide range of other species of earthworms, the wide choice of food niches explain its large distribution (Kale 1997).

Pontoscolex corethrurus another tropical geophagous endogeic earthworm species are medium-sized pale earthworms that colonize the upper mineral soil and ingest organic matter together with large amounts of mineral soil. They are identifiable by their calciferous glands. *P. corethrurus* reproduce only at temperatures between 23 and 27 ºC, being of low activity in soils with low field capacity of water retention (pF 2.5). However, they have great capacity to adapt to soils of different pH values; texture and organic matter content (Bernardes et al., 1997) and have a short reproduction cycle, therefore being able to multiply themselves faster than the other types of earthworms. It is found throughout India and its distribution has been associated with a wide-ranging tolerance to different soil types and environments (Madge, 1965; Lavelle, 1978; Lee, 1983; Dash and Patra, 1979).

The increased amount of inorganic phosphorous released during cast deposition was related to and preceded by increased microbial and phosphatase activity (Sharpely and Syers, 1976). High P_2O_5 content in casts supports phosphatase availability which is required for growth of root, microbial enhancement and in turn, may help drive biological nitrogen fixation (Sharpely and Syers, 1976). Recently, enhanced phosphate content in the soil and press mud casts of *L.mauritti* has been reported. Satchel and Martin (1984) have found direct correlation between microbial population and enzyme activity. Microbes like *Pseudomonas* and *Bacillus* species are reported to mineralize phosphate (Dubey and Maheshwari, 1999).Reports suggest that enhanced phosphatase activity in the casts with more microbial population is of microbial origin rather than by the epithelium of the gut of the earthworm (Vinotha, 2000).

This study involves the isolation of PSB from the burrow wall of *Lampito mauritii* and *Pontescolex corethrurus*.

METHODS AND MATERIALS

Soil samples were collected from burrow wall soil of *L.mauritti* and *P.corethrurus* at an interval of 30 and 45 days and at a depth of 15 cm and 15-30 cms. These soils were air dried and used for isolation of PSB. Pikovskaya medium was used for isolation, enumeration and maintenance of PSB. Aliquots of serial diluted soil samples (10^{-5})were pour plated on the above agar medium containing suspended insoluble phosphate compound (tricalcium phosphate) and bromothymol blue indicator. Bacterial colonies causing clear phosphate solubilizing halo zones by a turbid white background were selected and isolated. The HC value, phosphatase activity at different pH and temperature and the IAA activity was estimated in the isolates. HC value on the Pikovskaya's agar is indexed as the diameter of the colony plus the clear zone around it divided by the diameter of the colony (Hankin and Anagnostakis, 1977; Hendricks *et al.,* 1995).

The phosphorous solubilization potential of PSB strains was tested in vitro by estimating available phosphorous in the Pikovskaya's broth added with known amount of tricalcium phosphate as a substrate. The flasks were inoculated with culture broth of cultures at OD 0.2(A_{600}). Uninoculated flasks were used as control. The flasks were incubated at 30ºC for 3, 5 and 7 days. 5ml of the culture was centrifuged and the supernatant was tested for the phosphatase activity following the procedure of Tatabai and Bremner 1969. The phosphatase activity was calculated by referring to a standard graph prepared with p-nitrophenol. The IAA production ability of isolates was studied by inoculating into modified Pikovskaya's broth containing 1% tryptophan as a substrate. The cultures were incubated at 37ºC on shaker incubator with gentle agitation of 150 rpm for 3 days. After 3 days the culture broth were centrifuged and the supernatant was used for estimation of IAA (Tien *et al*. 1979). Commercial IAA was used for standard graph. Selected isolates from *L.mauritti* and *P.corethrurus* burrow wall and control soil showing high HC value and phosphatase activity were used for further study. Phosphatase activity and titrable acidity at different pH and temperature was estimated for 3, 5 and 7 days. The Pikovskaya's broth with pH range from 4, 5, 6, 7, 8 and 9 and temperature range from 20ºC 30ºC, 37ºC, 45ºC and 55ºC was used for this study.

Result

PSB were isolated from earthworm burrow wall soil and control soil at 2 intervals of 30 and 45 days from 2 earthworm species *viz L.mauritti* and *P. corethrurus*. The burrow wall soil of *L. mauritti* 30 days and 45 days lower burrow wall soil sample showed very less % of PSB compared to control. The lower control soil of 30 days showed 9.17% of PSB and upper control 30 days showed75% PSB where as lower control 45 days showed 77% PSB and upper control 45 days 18.6%. It was significant that the upper burrow wall soil of 45 days showed highest percentage of PSB (88.88) among all sample tested (Graph 1). Among samples from *P.corethrurus* the upper burrow wall soil 30 days showed 100% PSB where as lower sample showed 66.6% PSB. The control soil from both upper and lower showed lesser percentage of PSB compared to burrow wall soil *i.e.* 25% and 50% respectively. Among 45 days burrow wall soil sample the higher % of PSB was isolated from upper sample 45 days (70%) followed by lower sample 45 (50%) both lower and upper control soil sample shower 33.3% of PSB (Graph 1). Fourteen isolates from *L.mauritti* and 10 isolates from *P. corethrurus* were identified by Gram staining. Most of the isolates were Gram + sporulating and non sporulating rods.

In *L.mauritii* the highest HC value was seen among isolate from control soil (2.5). Among the isolates from burrow wall soil of *L.mauritti,* highest activity was seen in LUS-6 (2.14)

followed by LUS-2 (2.07). Among isolates from *P.corethrurus* higher HC value was seen in isolate from burrow wall soil sample. Isolate PUS-10 showed high HC value of 2.66 and PLS-1 showed 2. PUS-10 though showed high HC value, did not show high phosphatase activity and hence was not used for further study (Graph 2).

The phosphate utilizing bacteria isolated from earthworm burrow wall soil was assayed for IAA activity. Isolates LLS-4 from burrow wall soil produced the highest IAA (117.25mg/ml) among both control and sample followed by LUC-5 (116.5mg/ml) which was isolated from control soil. Most other isolates from burrow wall soil produced lesser IAA compared to isolates from control soil. IAA was estimated in 6 isolates from burrow wall soil of *P.corethrurus* and 4 isolates from control soil. Highest IAA production was seen in isolates PUS-9(93.5 mg/ml) followed by PLS-8(87.55 mg/ml) and PLS-2(84.9mg/ml), all burrow wall isolates. Our results show that most isolates from burrow wall soil from *P.corethrurus* produce more IAA than the isolates from burrow wall soil of *L.mauritti* (Graph 3).

Among the 14 isolates from *L.mauritii* and *P.corethrurus*, 4 each from burrow wall soil and 1each from control soil were used to study the effect of pH and temperature on phosphatase activity. A reduction in the pH of the medium and increase in the titrable acidity was noticed in all isolates in Pikovskaya's broth. All isolates showed minimum phosphatase activity at day 3 at all temperature studied (Table 1). Isolate LUS-2 showed higher enzyme activity of 0.20IU at 45°C, day 5 and high activity at 20°C, 30°C and 55°C on day 5 and 7. All isolates showed good enzyme activity almost equal on day 5 and day 7 at 20°C, 30°C and 55°C. Among the burrow wall isolates from *P.corethrurus* the highest activity was seen in PUS-5 day 7, 55°C (0.35IU). All other isolates showed high activity at the temperature 20°C, 30°C, 45°Cand 55°C on day 5 and 7. Isolate PLS-4 showed least activity at all temperature among all isolates. The isolate PLC-4 from control soil showed very less activity at all temperature except 20 and 45°C on day 5 and 7.

Isolate LUS-2 showed maximum activity among all isolates from *L.mauritti* pH 5 day 7 and pH 6 (0.18IU) day 5 (Table 2). On day 3 all isolates from *L.mauritti* produced maximum phosphatase activity at pH 6 and 8. Isolates LUS-3 showed highest phosphatase activity among the isolates tested with 0.04IU at pH 6 followed by 0.03IU at pH 8. Among the four isolates from burrow wall soil 3 isolates *viz.,* LUS-2, 5 and 3 showed higher phosphatase activity compared to control soil isolates. The highest phosphatase activity was observed at pH 9 by PUS-9 (0.06IU). Isolate PLS-2 showed highest activity at pH 9 of 0.07IU at day 7. Isolate LUS-7 also showed maximum activity at pH 8 0.09IU at day 7 though activity was much less compared to isolate LUS-2 showed higher activity at pH 9 and LUS-5 showed high activity at pH 8, the isolate from control soil LCC-6 showed highest at pH 8 day 7 but the amount produced is less than burrow wall isolates. In *P. corethrurus* the highest activity was seen by isolate PLS-8 at pH 6 day 7 and PLS-2 day 7 pH 9(0.07IU). Isolate PUS-9 showed highest activity at pH 9 day 5 and PUS-5 both at pH 6 and pH 8 day 7(0.06IU). Isolate PLC-4 from control soil showed very less activity.

Discussion

The earthworm-microbe interactions in terrestrial ecosystems are known to influence soil fertility and plant growth by changing soil nutrient cycling and the physical environment. The increase of phosphorous in soil that passes through the intestinal tract of earthworm is probably due to several factors (i) a significantly great pH of gut contents along the earthworm intestinal tract (Barois and Lavelle 1986) ; (ii) large amount of mucus secreted in earthworm gut, which releases carboxyl groups from carbohydrates compounds that can block and compete for phosphorous sorbing places, and in turn, increases soluble phosphorous; (iii) an increase in the microbial activity during digestion processes (Lopez-Hernandez *et al* 1993). Reports suggest that the plant phosphorous uptake was upto three times higher in the presence of *P. corethrurus*. The higher concentration of phosphorous found in earth worm casts in the available form, especially $H_2PO_4^-$ and HPO_4^-, are usually beneficial for plant growth (Mackay *et al* 1983).

Our study showed a high percent of bacteria with the ability to produce the enzyme Phosphatase in the burrow wall soil compared to control soil with the upper burrow wall of P. corethrurus showing 100% PSB. A study of PSB from seawater and sediment samples from various sites around the Indian Peninsula showed that 14% of the isolates had the ability to solubilise Phosphate (De Souza et al, 2000). Our results show contrasting percentages of PSB in *L.mauritii* and *P.corethrurus*. In the burrow wall soil of *L.mauritii* the percentage of PSB isolated was less compared to the burrow wall soil of *P. corethrurus*.

There is increasing evidence that PSB improve plant growth due to biosynthesis of plant growth substances than their action to release available phosphorous (Ponmurugan and Gopi, 2006). Our result on the production of growth promoting substances indicated that all isolates were able to produce phytohormones such as IAA. All the strains of phosphobacteria were able to solubilize inorganic phosphate. A reduction in the pH of the medium and increase in the titrable acidity could be due to the secretion of organic acids by PSB. Phosphate solubilizing bacteria are capable of producing physiologically active auxins that may have pronounced effects on plant growth. The cultures release greater quantities of IAA in the presence of a physiological precursor, tryptophan, in a culture medium. Production of IAA varies greatly among different species and is also influenced by culture conditions, growth stage and availability of substrate (Brown, 1972; Vijila, 2000) our results show that isolates from

earthworm burrow wall of *P.corethrurus* produce more IAA compared to the isolates from *L.mauritii*.

PSB strains isolated from burrow wall soil of *L.mauritti* and *P.corethrurus* were able to grow and solubilize phosphates from Pikovskaya's broth. The increased bacterial growth with decrease in pH and production of organic acids resulted in considerable amount of phosphorous solubilized. There was clear relationship established between bacterial growth and phosphorous solubilization. These results are consistent with the report of Rodriguez Fraga (1999), Whitelaw (2000), Jeon *et al* (2003), Maliha *et al*. (2004) and Chen *et al*. (2006), which showed that solubilization of Ca-P complexes were mediated specially by the decreasing pH of the medium. Joseph and Jisha (2008) indicated that phosphate solubilizing organisms are capable of reducing pH of culture medium. Reports suggest that the increased amount of inorganic P released during cast deposition was related to and preceded by increased microbial and phosphatase activity (Vinotha, et al. 2000). A similar activity is also possible in the burrow wall since not all earthworms cast at the soil surface; most species that deposit casts do so in their own burrows. Our results show that the isolates from the burrow wall produce more IAA and show increased phophatase activity than the isolates from the control soil.

We conclude that bacteria in the burrow wall soil have better ability to produce plant growth promoters and Phosphatase activity thereby increasing soil fertility and plant growth.

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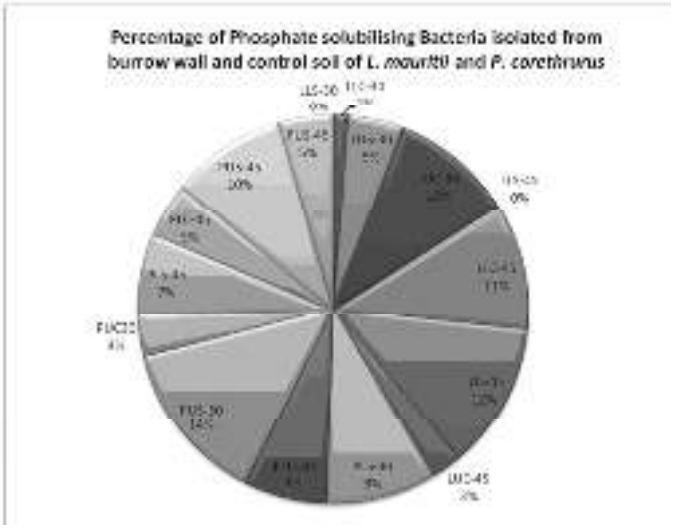
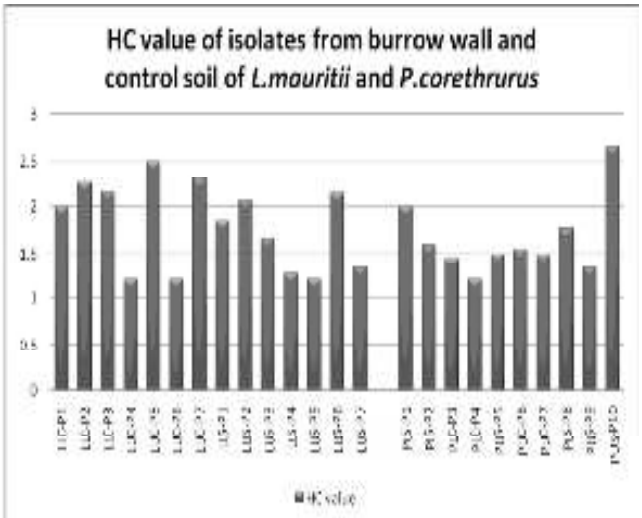
Graph 1: Percentage of Phosphate Solubilising Bacteria isolated from Burrow wall and control soil of *L.mauritii* and *P.corethrurus*



Graph 2: HC value of Phosphate Solubilising Bacteria isolated from Burrow wall and control soil of *L.mauritii* and *P.corethrurus*



Graph 3: IAA value of Phosphate Solubilising Bacteria isolated from Burrow wall and control soil of *L.mauritii* and *P.corethrurus*

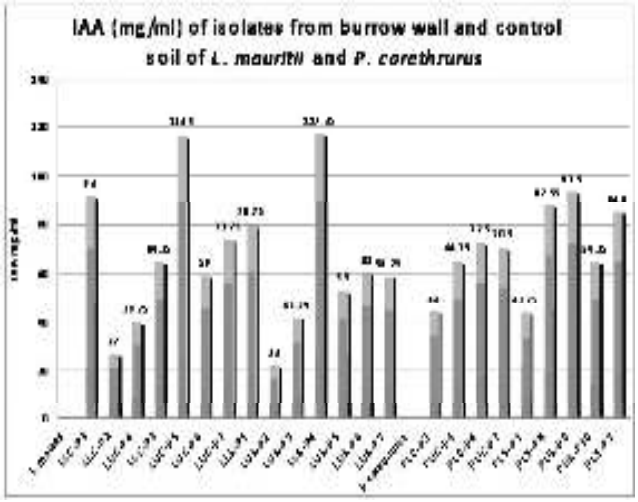


Table 1: Effect of pH on Phosphatase activity of isolates from Burrow wall and control soil of *L.mauritii* and *P.corethrurus*

Phosphatase activity of isolates from Earthworm burrow wall at different pH and days

pH	5			6			7			8			9		
	day 3	day 5	day 7	day 3	day 5	day 7	day 3	day 5	day 7	day 3	day 5	day 7	day 3	day 5	day 7
L.mauritii															
LUS-5	1.12	1.92	2.72	3.09	1.76	1.33	0.21	0.37	10.02	3.52	6.93	7.36	2.29	3.68	9.97
LUS-7	0.00	0.00	1.23	3.09	4.75	6.56	0.43	1.38	1.12	2.08	2.72	12.16	1.12	4.75	5.65
LUS-2	1.38	2.72	25.44	4.00	20.80	3.95	0.53	2.50	1.17	3.20	3.20	8.37	2.29	8.48	4.64
LUS-3	0.00	2.72	1.39	5.38	1.76	1.23	0.37	1.38	1.33	4.42	3.20	3.20	2.29	6.08	7.36
LLC-6	0.00	3.68	0.00	3.09	2.83	2.72	0.37	0.53	1.12	2.08	3.68	5.65	0.00	2.83	1.12
P.corethrurus															
PLS-8	1.12	1.12	3.57	0.00	2.08	9.39	1.01	2.99	1.12	2.18	4.91	3.09	2.56	5.65	5.39
PUS-9	3.57	1.12	0.00	0.00	0.00	6.67	0.80	1.38	1.01	2.29	4.91	5.39	1.28	8.37	6.67
PLS-2	1.12	1.17	1.17	2.29	2.83	4.21	0.85	3.04	0.96	1.12	4.21	5.39	3.36	4.64	9.87
PUS-5	0.00	1.17	5.39	1.12	1.55	7.95	0.37	1.92	1.81	1.06	2.03	7.95	1.22	5.97	5.97
PLC-4	1.01	2.45	4.21	0.00	0.00	3.20	0.32		2.35	0.00	4.43	4.21	0.00	0.00	3.09

Table 2: effect of temperature on Phosphatase activity of isolates from Burrow wall and control soil of *L.mauritii* and *P.corethrurus*

Phosphatase activity of isolates from Earthworm burrow wall at different Temperature and days

Temp	20			30			35			45			55		
	day 3	day 5	day 7	day 3	day 5	day 7	day 3	day 5	day 7	day 3	day 5	day 7	day 3	day 5	day 7
L.mauritii															
LUS-5	0.53	18.2	18.72	0.27	20.8	19.9	0.21	0.37	10.03	2.72	21.5	21.07	3.36	18.5	17.8
LUS-7	4.53	17.7	16.59	1.44	22.93	16.5	0.04	1.38	1.12	2.4	19.4	19.68	4.32	18.3	16.3
LUS-2	2.83	18.2	17.17	1.87	19.15	21.2	0.53	2.5	1.173	3.89	27.3	22.45	1.28	19.7	16.8
LUS-3	2.08	18.6	19.41	3.31	20.11	21.4	0.37	1.38	1.33	1.12	21.1	22.67	1.71	16.5	18.8
LLC-6	1.33	19.4	20.8	1.28	22.35	18.7	0.37	0.53	1.12	3.09	20.1	21.17	0.96	17.1	15
P.corethrurus															
PLS-8	0.48	17.1	10.61	1.07	16.91	21.4	0.48	2.99	1.12	4.43	19.4	21.33	0.8	3.84	12.1
PUS-9	0.96	16.9	20.16	3.09	18.08	14.7	0.8	1.38	1.013	2.93	20.9	15.89	0.21	16.2	12.1
PLS-2	3.89	15.7	17.07	2.93	14.88	16.9	0.85	3.04	0.96	1.33	19.7	19.63	0.43	17.5	14.5
PUS-5	2.56	16.7	16.69	1.92	15.2	13.8	0.37	1.92	1.813	0.8	20.2	19.89	2.13	16.4	48.9
PLC-4	0.21	16.1	19.84	0.96	15.84	8.96	0.32	2.88	2.346	2.24	16.5	11.41	1.71	17.2	12.2

C.B.M.Sc:-07

EVALUATION OF ANTI MICROBIAL ACTIVITY OF SOLANUM SURATTENS AGAINST SOME PLANT PATHOGENS

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Black pepper, the king of all spices, is considered as the oldest and the best-known spice in the world. The name 'pepper' comes from the Sanskrit word 'pipali', which means berry. The pepper plant is a dicot plant, belonging to the family *Piperaceae*. Botanically, black pepper plant is called as Piper *nigrum*. It is commonly used in all dishes as a popular spice and in canned food as flavouring agent.

Pepper is grown in all seasons through out the year. There are different varieties of pepper such as, betel pepper (Piper betel), Indian long pepper (Piper longum), Java long pepper (Piper retrofratum), Rough leaved pepper (Piper umalago) etc. The plant prefers well-drained loamy soils rich in organic matter with a pH of 5.5 to 6.5. The plant requires a partial shade but fairly high temperature and sufficient water.

In India, black pepper cultivation is mainly cultivated to three Southern countries namely, Kerala, Karnataka and Tamil Nadu, contributing to the 95% of the total production in India. It contributes to the export exchanges of 80% of the total spices marketed from India. It is grown mainly as a pure crop on live supports such as *Erythrina indica* or *Garuga pinnata* and also as mixed crop in coconut, areca nut, coffee and cardamom plantations. Major diseases, which affect pepper plant, include Phytophthora foot rot, leaf blight, leaf spot, root rots, stump rot etc. The major pathogens occurring on pepper plant are*, Phytophthora sp, Fusarium sp, Colletotrichum sp*, *Pythium sp*, *Sclerotium sp, Corticium* sp etc. These pathogens bring about severe damage to the crop and considerable yield loss. The productivity of this crop is low in India when compared to other producing countries in the world. Poor genetic stock, non-adoption of scientific management and severe crop losses due to pests and diseases have been identified as the major production constrains. Thus the pest and disease management in this crop receives a greater significance. Hence in present investigation, the following objectives were undertaken.

- To isolate the pathogens of pepper.
- To characterize the isolated pathogens.
- To control the pathogens using biocontrol agents.

Black pepper, Piper nigrum, the king of spices is affected by a number of pathogens in all pepper growing countries. The main reason for the severe crop loss in these countries is the major diseases like, Phytophthora foot rot, anthracnose, leaf spots, blights etc. A viral disease caused by Cucumber Mosaic Virus is also reported recently (Sarma, et. al., 1998).

LEAF SPOT

Leaf spot is another major problem in pepper plants. *Colletltrichum necator, Pestulatia piperis, Nectria bolboohili* are the fungal pathogens causing leaf spots in pepper (Rangaswami, 1996). Alternaria. and Cercospora are also associated with leaf spot disease (http://www.webindia123.com/garden/herb-spi/pepper.htm).

Colletotrichum is found to be associated with the leaf spot disease of pepper in most cases (Rangaswam,1996). Colletotrichum species are world wide in distribution causing anthraenose of leaves and stems, die-back, blossom and fruit rots of agricultural crops (Mordue, 1974 and Muthappa, 1973). This fungus produced white, adpressed, arial mycelium sparse and floccose. Conidiophores are simple, elongated conidia are one-celled, cylindrical and hyaline. (Burnett,1960)

FUSARIUM

Fusarium sp. Is found to be associated with wilt disease of pepper (Rangaswami, 1996). It produces floccose, white colonies on agar plates. Micro conidia may be present or absent, macro conidia are bng, sickle-shaped, produced on mono or polyphialides. (Burnett,1960)

Solanum suvattense

Solanum surattense is a medicinal plant distributed throughout India. Plant is bitter, anti helminthic, and inflammatory, stimulant and Carminative. All the parts of the plant are used for the treatment of helminthiasis, hypertension, fever, asthma, cardiac disorders etc. (Warrier,2004)

Solanum surattense

Class:	Dicotylidanae
Series:	Bicarpellatae
Order:	Polymonales
Family:	Solanaceae
Genus:	Solanum
Species:	Surattense

(Singh et. al., 1994)

MATERIALS AND METHODS

MEDIA USED

POTATO DEXTROSE AGAR MEDIUM (Aneja,2004)

Patato		-	200g
Dextrose	-	20g	
Agar		-	15g
Distilled water	-	1000ml	
pH		-	4.5

SABOURAND'S DEXTROSE AGAR MEDIUM (Kelmani,2001)

Dextrose	-	40g
Peptone	-	10g
Agar	-	15g
Distilled water	-	1000ml
pH	-	4.5

CZEPECK'S AGAR MEDIUM (Aneja, 2004)

Sucrose	- 30g
Sodium nitrate	- 2g
Potassium dihydrogen phosphate	- 1g
Potassium chloride	- 0.5g
Magnesium sulphate	- 0.5g
Ferrous sulphate	- 0.01g
Agar	- 15g
Distilled water	- 1000ml
pH	- 4.5

MINIMAL MEDIUM FOR DINOCOCCUS SP.AND TRICHOCOCCUS SP.

Potassium dihydrogen phosphate	- 1.82g
Dipotassium hydrogen phosphate	- 6.3g
Beef extract	- 5.0g
Sugar	- 20g
Distilled water	- 1000ml

COLLECTION OF SAMPLES

Leaves of the disease plants were collected from two places of Madikeri (Yeladalu house and Mahindra resort. The collected leaves were having the symptoms of wilt (yellowing) and brown centered spot symptoms.

ISOLATION OF PATHOGENS

The diseased portions of the plant leaves were cut into 1sq. cm pieces. It is surface sterilized with 0.05% sodium hypochlorite and washed thoroughly with sterile distilled water.

The cut portions of diseased leaves were placed on PDA medium in petriplates. The plates were kept for incubation at 25°C for 7 days. The plates were observed for the organism.

IDENTIFICATION OF PATHOGENS

The isolated pathogens were taken in a slide, observed for spore and mycelium under the microscope and identification was done). using standard manual (Barnett, 1960).

The plates were kept for 10 days and growth was measured regularly (colony diameter in mm scale).

Preparation of leaf extract:

Leaves of solanum surattense were collected

↓

Washed thoroughly with water

↓

Surface sterilized with 0.5% of sodium hypochlorite

↓

Again washed with sterile distilled water

↓

Dried the leaves under shade

↓

Powdered the leaves using a mixer

↓

10g of powder was added to 40ml of sterile distilled water/ absolutealcohol/phosphate buffer of pH 7.0

↓

Filtered the extract using Whatmann No. 1 filter paper

↓

Stored at 4°C

SPORE GERMINATION ASSAY

Spore germination assay was performed for both the pathogens in aqueous, alcohol and buffer extracts of the *Solanum surattense* leaves. The experiment was conduted as follows.

Potato dextrose broth was prepared

↓

Test tubes (10) were taken and, 10 ml of the broth was taken in each test tube

↓

0.2,0.4,0.6,0.8ml of aqueous/alcohol/buffer extract were added to 8 (duplicates test tubes.

↓

To one of the sets of test tuves, *Colletotrichum* culture was added and to the other *Fusarium* was added

↓

Out of the remaining two test tubes, one was inoculated with Colletotrichum and the other with Fusarium. These tubes were kept as control

↓

The spores germinated in each tube were counted at regular time intervals of 6 hours

↓

The percentage spore germination was calculated

↓

(American Phytopathological Society,1943)

TESTING THE BIO CONTROL EFFICACY OF *SOLANUM SURATTENSE* LEAF EXTRACT:

Disc diffusion method

PDA medium was poured to sterilized petriplates.

↓

Culture suspension of both the pathogens were prepared

↓

The culture was inoculated to the plates by pour plate method

↓

Five discs (four at the periphery and one at the center)were placed on solidified PDA

↓

Medium taken in plate

↓

20ul,40ul,60ul and 80ul of the aqueous/alcohol/buffer extract was loaded to the peripheral discs. To the central disc as control sterile distilled water/absolute alcohol/ phosphate buffer was added.

↓

The plates were incubated at 25°C for 5 days

↓

Plates were observed for inhibition zone and the zone was measured

RESULTS:

1. Colletotrichum sp.:

White colony on PDA plates, adpressed, aerial mycelium is sparse and floccose. Spores are cylindrical to ovoid, hyaline, granular. Spores are found singly at tip of the conidiophores.

2. *Fusarium sp.:*

Bright white colony on PDA plate; produces dark pink colour on the reverse side of the petriplate. Mycelium is branched, septate. Macro conidia are found at the tip of the macro conidiophores. The macro conidia are long, 5 to 7 celled, sickle shaped.

TESTING THE BIOCONTROL EFFICACY OF *SOLANUM SURATTENSE* LEAF EXTRACT

In inhibition assay, aqueous extract did not show any inhibition against *Colletotrichum* and *Fusarium* in botrh the assay methods, well and disc diffusion method. In alcohol extract study, only 80ul showed inhibition zone for *Colletotrichum*. M aximum inhibition zone of 12mm was recorded for *Fusarium sp.* (Table 6 & 7). Buffer extract showed inhibition against Fusarium. No inhibition was observed against *Colletotrichum* (Table 8.)

Inhibition assay of *Colletotrichum* and *Fusarium* by alcohol extract

Conc.of the extract	Diameter of inhibiton none (in mm)	
	Colletotrichum	*Fusarium*
20ul	-	-
40ul	-	-
60ul	-	9
80ul	8	12

SPORE GERMINATION ASSAY

In the spore germination study, *Colletotrichum* showed inhibition for 12 hrs onwards, in case of *Fusarium*, 6 hrs was sufficient for spore germination inhibition

Spore germination assay of *Colletotrichum* and *Fusarium* in Alcohol Extract of *Solanum surattense* leaves.

Time interval Conc. Of extract	Conc. of extract	Percentage of spore germinated	
		Colletotrichum	Fusarium
6hrs	20ul	8.10	17.39
	40ul	3.30	13.46
	60ul	2.81	9.75
	80ul	5.71	0
	Control	9.67	7.14
12hrs	20ul	2.94	11.76
	40ul	4.22	9.67
	60ul	3.03	5.88
	80ul	0	2.38
	Control	19.69	9.83
18hrs	20ul	4.10	11.29
	40ul	2.94	4.54
	60ul	0	0
	80ul	0	1.66
	Control	31.03	18.75
24hrs	20ul	3.17	6.66
	40ul	2.27	6.45
	60ul	2.59	0
	80ul	0	0
	Control	33.80	23.72.

In the present study, *Colletotrichum* and *Fusarium* were isolated from the pepper leaves. *Colletotrichum* was found to be associated with the lef spot of pepper. It is also reported by Rangaswamy (1996). *Fusarium* was isolated from the leaves lhaving yellowing symptom. Fusarium is one of the pathogens causing yellowing and wilting of pepper plants (http://www.webindia 123.com/garden/herbspi/pepper.htm)

Solanum surattense leaf extract was used for biocontrol of the pathogens. *Solanum surattense* has an antihelminthic and antiinflamtory and carminative character (Warrier, 2004). *S. surattense leaves* was found to be effective against both the pathogens as a biocontrol agent.

Colletotrichum and *Fusarium* were found to be the major pathogens in Coorg region. In the present study both the

pathogens were found to be inhibited by alcohol extract of *Solanum surattense* leaves. The leaf extract of *solanum surattense* can be used as biocontrol agent against these pathogens.

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C.B.M.Sc:-08

ASSESSMENT OF BIOAEROSOLS IN SELECTED INDOOR AND OUTDOOR LOCATIONS OF BANGALORE

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INTRODUCTION

Bioaerosols are airborne particles that are extremely small living organisms or fragments of livings suspended in the air. They include dust mites, molds, fungi, spore pollen, bacteria, viruses, amoebae, fragments of plant materials and human and pet dander. The earth atmosphere is teeming with bioaerosols which are thought to be closely related to air pollution that causes human allergic responses (Giorgio *et al.* 1996; Fang *et al.*2007). Most of bacterial aerosols originate from natural and anthropogenic sources, such as plants and vegetables (Linderman and Upper, 1985) soil, (Lighthart and Shaffer, 1944), water bodies (Teltschande and Katzenelson, 1978) and agricultural activities (Lighthart, 1984). Airborne bacteria from urban sources and activities may also contribute substantially to the outdoor air pollution. All around the world the propagules of various microscopic fungi constitute the largest part of the biological particles in the air (D'Amato and Spieksma, 1995). Fungi can travel far and on their way contaminate various substrata of the environment, causing diseases of plants, animals and people. Vehicle movement creates local turbulence which promotes aerosolization of fungal spores from surrounding building, trees and soil, increasing the fungal concentration. Therefore fungal occurrence in the air has been frequently studied (Diaz *et al.* 1998; Mitakakis and Guest, 2001; Klaric and Pepeljnjak, 2006; Das and Gupta-Bhattacharya, 2008). Fungi also play a causative role in the development of asthma.

Bioaerosols contribute to about 5-34% of indoor air pollution. (http://www.pollutionissues.com/Ho-Li/Indoor-Air-pollution.html;http://www,airqualitydirect.com/bioaerosols.htm). Indoor Fungi and bacteria contain immunologically potential material that may have a role in the development of asthma or its symptoms. Outdoor fungi have remarkable diurnal and seasonal variations, the concentrations being highest in summer and spring and lower during winter. Indoor concentrations follow in the seasonal fluctuations of outdoor air (Lee *et al.* 2006). There are also indoor sources for fungi; several everyday activities, handling of

vegetables, fruits, house plants and organic materials act as sources of indoor fungi (Lehtonen *et al.* 1993). Settled dust may contain large amount of fungi and once the settled dust is resuspended fungi become airborne. For bacteria humans are important sources in indoor environments (Fox *et al.*2005). Therefore individual exposure to bioareosols has become a subject of concern over recent years due to the related adverse health effects.

Industrial facilities, such as grain mills, sawmills, farms, barns, waste-recycling facilities, agricultural produce storehouses have high number of airborne fungi along with other microorganisms, solid particles and volatiles. Health outcomes in occupants may manifest as Mucous membrane irritation, Immunotoxic diseases organic dust toxic syndrome (synonyms: ODTS, inhalation fever, grains fever, silo unloader's disease, toxic pneumonitis), mycotoxicosis and Allergic diseases: Allergic alveolitis (synonyms: hyper sensitivity pneumonitis, granulomatous pneumonitis); asthma allergic rhinitis.

Consequently, the last decade has seen a significant increase in the scientific data on the evaluation of bioaerosols from outdoor air (Das Gupta- Bhattacharya. 2008, Fang *et al.* 2007, Lugauskas *et al.*2003, Klaric *et al.* 2006, Kasprzyk *et al.* 2004, Celenk *et al.* 2005, Jo *et al.* 2005) & indoor air: vegetable market, (Abdul Hameed, Awad.2005, Kakde *et al.*2001, Pathak & Verma. 2009. Verma, Pathak. 2008, Skorska *et al.*2005), supermarket, (Srikanth *et al.* 2008, Verma & Pathak. 2008, Law *et al.* 2001, Stanley *et al.* 2008), Flourmills (Hameed & Khoder. 2001, Awad. 2001, Singh *et al.* 2003, Dacarro *et al.* 2005), automobile service station (Amielle *et al* 1995, Sullivan *et al.* 2005 , Zeka *et al.* 2004), shopping mall (Li *et al.* 2001, Nunes *et al.* 2005, Gorny, Dutkiewicz. 2002), library (Zielinska- Jankiewicz *et al.* 2008), Houses (Basilico et al, 2007, Bouilard *et al.* 2006, Cho *et al* .2006, Seo 2005), Gym (Dacarro *et al.* 2003, Douwes *et al.* 2003)

However, for India, there is only a limited amount of information currently available. Hence the objective of this study was the pilot investigation on airborne bacteria and fungi in some selected environments of Bangalore and potential evaluation of possible risk of respiratory diseases in the occupant as a result of exposure to bioaerosols.

MATERIALS AND METHODS

One time air sampling was performed with Reuter's Centrifugal Air sampler (Hi-Media) with agar strips of Tryptone Glucose Yeast extract agar (for total mesophilic bacterial counts), MacConkey agar (for Gram-negative bacilli), Mannitol salt agar (for staphylococci) and Malt Extract agar (for fungi).After sampling, the agar strips were incubated at 37°C for 24 - 48 hours.

$$cfu/m^3 = \frac{Number\ of\ colonies \times 25}{\text{sampling time}}$$

Sampling locations: ***Outdoor***: K.R. Circle, Petrol bunk, Maharani's Junction, Majestic Bus Terminal.
Indoor: Cluster house, Independent House, Gymnasium, Russell market, K.R Market, Supermarkets, Sigma Mall, Hostel kitchen, Flour mill, Automobile Service Station, College Library, Malleshwaram vegetable market.

Sampling time: 5 minutes
Identification of microorganisms: The microscopic identification of bacteria was done using Gram staining technique and identification of fungi was done using lactophenol cotton blue staining technique.

Statistical Analysis: Multivariate analysis was performed using Systat12.

RESULTS

The atmospheric survey carried out in different working environments and outdoor locations of Bangalore revealed microbial contamination. The highest bacterial counts were recorded in hostel kitchen (273×10^2 cfum^{-3}), followed by gymnasium (105.6×10^2 cfum^{-3}), independent house (83.4×10^2 cfum^{-3}), and cluster house (71.25×10^2 cfum^{-3}). (Table1). Among the three vegetable markets sampled, Russel market which is an indoor market showed highest counts of 23.61×10^2 cfum^{-3} whereas Malleshwaram vegetable market which is an open market recorded 2.2×10^2 cfum^{-3}. Similarly the supermarket showed the total microorganism count of 13.34×10^2 cfum^{-3} while shopping mall showed 4.5×10^2 cfum^{-3}. The flour mill recorded 15.08×10^2 cfum^{-3}. The college library recorded 5.45×10^2 cfum^{-3}.

The total mesophilic bacterial counts were also high at the hostel kitchen (90×10^2 cfum^{-3}), followed by Gymnasium (77×10^2 cfum^{-3}), Independent house (66.3×10^2cfum^{-3}) and cluster house (65.0×10^2cfum^{-3}). Staphylococcal counts were high at the gymnasium (10×10^2 cfum^{-3}), followed by Russel market (5.53×10^2 cfum^{-3}) and Independent house (5.1×10^2 cfum^{-3}). However Staphylococci were absent at vegetable market and the automobile Service Station. The Gram-negative bacilli recorded were high at the hostel kitchen (181.25×10^2 cfum^{-3}). The gymnasium recorded 13.75×10^2 cfum^{-3} while independent house recorded 10.2×10^2 cfum^{-3}. The lowest counts were observed at Malleshwaram vegetable market (0.3×10^2 cfum^{-3}) while gram-negative bacilli were absent at the service station.

In contrast to bacterial counts the fungal load were comparatively less in the indoor environments studied (Table 2). The fungal load ranged from 0.2×10^2 cfum^{-3} at the Malleshwaram vegetable market to 5.85×10^2 cfum^{-3} at Russel market. The Gymnasium recorded 4.35×10^2 cfum^{-3} while the supermarket had a fungal load of 4.23×10^2 cfum^{-3} and at the flour mill 4.58×10^2 cfum^{-3} of fungal concentration was observed. The results were statistically significant ($p<0.05$).
Table 2 shows the concentration of microorganisms recorded at four outdoor locations of Bangalore. The busy K.R circle

Junction showed highest total microbial concentration of 62.2×10^2 cfum^{-3} while at the petrol bunk 8.1×102 cfum-3 was recorded. The total mesophilic counts at K.R circle were also high (52.50×10^2 cfum^{-3}). At the Majestic bus terminal and the petrol bunk, the staphylococci were absent. Gram-negative bacilli were observed at all the four locations. At the Maharani's college junction, fungal concentration of 6.9×10^2 cfum^{-3} was recorded. The ANOVA results revealed a p value of 0.284 implying that there is no significant difference in the concentration of different microorganisms with outdoor locations of Bangalore city.

Table 1. Concentrations of microorganisms in the air of outdoor environments.

Sampling locations	× 10^2cfum^{-3}				
	Staphylococci	Total mesophilic count	Gram-negative bacilli	Fungi	Total microorganisms*
K.R Circle	5.45#	52.50	1.85	2.40	62.2
Maharani's college junction	3.34	3.60	2.0	6.90	15.84
Majestic bus terminal	0.0	9.05	0.45	0.60	10.1
Petrol bunk	0.0	7.35	0.3	0.45	8.1

* Sum of concentrations of staphylococci, total mesophilic bacteria, gram-negative bacilli and fungi# Mean, F-ratio=2.923, p-value =0.284

Table 2: Concentrations of microorganisms in indoor environments

Sampling location	×10^2cfum^{-3}				
	Staphylococci	Total mesophilic count	Gram-negative bacilli	Fungi	Total microorganisms*
Independent house	5.1#	66.3	10.2	1.8	83.4
Cluster house	2.5	65.00	3.00	0.75	71.25
Gymnasium	10.0	77.50	13.75	4.35	105.6
Russel Market	5.53	6.4	5.83	5.85	23.61
Malleshwaram Vegetable Market	0.0	1.70	0.30	0.20	2.2
Supermarket	0.95	5.95	2.21	4.23	13.34
Flour mill	4.8	4.8	1.1	4.38	15.08
K.R Market	1.95	1.35	0.53	1.31	4.54
Service station	0.0	1.95	0.0	0.40	2.35
Sigma mall	1.35	1.65	1.20	0.30	4.5
Library	1.5	1.75	1.50	0.70	5.45
Hostel kitchen	1.35	90.0	181.25	0.40	273

Mean, F-ratio=3.509, p-value =0.025

* Sum of concentrations of staphylococci, total mesophilic bacteria, Gram-negative bacilli and fungi

Table 3: Bacterial and Fungal flora in the sampled locations

Location	Bacteria	Fungi
INDOOR Independent house	Endospore forming bacilli. Gram-positive non sporing rods, Staphylococci, gram-negative rods.	*Aspergillus* spp, *Rhizopus* spp, *A.oryzae*
Cluster house	Endospore forming bacilli, Micrococci, Staphylo cocci, gram negative rods	*Aspergillus* spp, *Rhizopus* spp, yeasts, *A.flavus*.
Gymnasium	Gram-negative facultative rods, Staphylococci, Micrococci, Endospore bacilli	*Aspergillus* spp, *Rhizopus* spp, *Penicil lium* spp, yeast
Automobile Service Station	Endospore forming bacilli, Gram-negative faculta tive rods, Gram-positive non sporing rods,	*Aspergillus* spp, *Alternaria* spp
Malleshwaram Vegetable Market	Gram-positive catalase positive cocci, Endospore forming rods, Micrococci,	*Aspergillus* spp, *Rhizopus* spp, *Alterna ria* spp, *Fusarium* spp
Shopping Mall	Endospore forming bacilli, Gram-positive cocci, Staphylococci, Micrococci, Gram-negative bacilli	*Aspergillus* spp, *Rhizopus* spp,
Library	Endospore forming bacilli, Staphylococci, Micro cocci, Gram-negative rods,	*Aspergillus niger*, *Rhizopus* spp,

Hostel kitchen	Gram-negative rods, Endospore forming bacilli, Gram-positive non sporing rods, Staphylococci,	*Aspergillus niger*, *Aspergillus* spp, *Rhizopus* spp, *Curvularia* spp,
Russel market	Gram-positive cocci, Micrococci, Staphylococci, Endospore forming bacilli, Gram-negative rods,	*Cladosporium* spp, *Aspergillus niger, A.terreus, A.fumigatus, Mucor* spp.
K.R Market	Staphylococci, Endospore forming bacilli, Gram-negative rods.	*Alternaria* spp, *Fusarium* spp, *Penicil lium* spp, *Cladosporium* spp, yeasts, *Dreschlera* spp.
Flour mill	Staphylococci, Endospore forming bacilli, Micro cocci.	*Geotrichum* spp, *Monilia* spp, *Cladospo rium* spp, *A.fumigatus*, *Rhizopus* spp, yeasts.
Supermarket	Staphylococci, Endospore forming bacilli, Micro cocci	*Aspergillus niger*, *A.flavus. Rhizopus* spp, *Alternaria* spp, yeasts, *Mucor* spp, *Mycelia sterilia.*
OUTDOOR K.R Circle	Staphylococci, Endospore forming bacilli, Micro cocci, Gram-negative rods.	*Aspergillus niger*, *A.flavus. Rhizopus* spp, yeasts
Majestic Bus Terminal	Gram-positive cocci, Micrococci, Endospore forming bacilli,	*Alternaria* spp, *Rhizopus* spp, *Monilia* spp, *Fusarium* spp, *Dreschlera* spp.
Petrol bunk	Gram-positive cocci, Staphylococci, Endospore forming bacilli, Gram-negative rods	*Penicillium* spp, *Cladosporium* spp
Maharani's College Junction	Micrococci, Endospore forming bacilli, Staphylococci	*Aspergillus* spp, *Monilia* spp, *Fusarium* spp, *Rhizopus* spp.

DISCUSSION

The indoor environment analysis helps to focus attention on the deleterious effects of bioaerosols. In the present study, the quality and quantity of various airborne micro-organisms was systematically surveyed in different locations of Bangalore. Our study on an **independent house** and a **cluster house** revealed the airborne microbes to be of the order of 10^3, with Endospore forming rods, non-sporing rods, gram-negative rods, Micrococci and staphylococci being predominant. Airborne fungi identified were *Aspergillus* spp, *Rhizopus* spp, *A.oryzae, A.flavus and yeasts.* A large study of airborne micro flora in apartments, multifamily houses and offices in Poland, show the presence of *Staphylococcus, Micrococcus* in100% and *Bacillus* species in 90% of the samples (Gorny and Dutkiewicz, 2002). Owing to their ubiquitous presence in nature, bacteria are considered as a pollution source in homes (Kodama *et al.* 1980) moreover bacteria do not generally exist alone in the air, but rather they often adhere to the dust suspended in the air (Che *et al*. 1988), depending on the dust produced in that area.

Table 4. Categories of cfu m^{-3} (mixed population of bacteria and fungi) for non-industrial indoor environments (CEC 1993)

Category	Bacteria	Fungi
Very low	<50	<25
Low	<100	<100
Intermediate	<500	<500
High	<2000	<2000
Very High	>2000	>2000

These categories are based on the range of values obtained in indoor environments and not on a health risk evaluation.

When the counts observed were compared with categories of contamination indicated in the guidelines of the Commission of European Communities (CEC 1993; Table4), the bacterial contamination was very high in independent house and cluster house while the fungal concentrations ranged from Very low to Low. Hence more studies are warranted to determine the biopollution of indoor environments by bacteria.

The bacterial contamination in **Gymnasium** was much more than the limit of 10.0×10^2 cfu m^{-3} is used as a threshold limit for healthy offices (Dacarro *et al.*, 2003; Sessa *et al.*, 2002) and to assess indoor air quality (Brief and Bernath, 1988). The total microorganisms computed in our study includes the contributions of different microorganisms. It is a practical tool for the evaluation of biological risk in indoor and outdoor environments and for the monitoring of potential sources of aerobiological contamination. The total mesophilic bacteria were estimated on Tryptone Glucose Yeast Extract Agar which is frequently used in the determination of airborne concentrations of viable microorganisms. Our study found 10.0×10^3 cfu m^{-3} which was much higher compared to the results obtained by Daccarro *et al.*, 2003 in gyms of high schools and colleges wherein they found that in 71.6% of the gyms examined, the total microorganisms per m^3 were between 10×10^2 and 50×10^2. In our study, although air samples were obtained exclusively during physical exercise periods, air contamination was principally of environmental origin. Gym air contamination may originate not only from respiratory and skin organisms released during the exercises, but

also from infrastructural dirt. Moreover the gym of our study was carpeted which itself could be a source of aerial contamination.

Russel Market recorded a total microorganism count of 23.61 $\times 10^2$ cfu/m^3 while **K R Market** recorded 4.54 $\times 10^2$ cfu/m^3 and **Malleswaram Vegetable Market** recorded 2.2 $\times 10^2$ cfu/m^3. Pathak and Verma (2009) reported as high as 2.9 $\times 10^{-3}$ cfu m^{-3} of airborne bacteria from vegetables market of Jabalpur. Opposed to well documented hazards of bioaerosols containing respiratory-associated microorganisms, the presence of food-associated microorganisms and food-borne pathogens/allergens in bioaerosols requires further in-depth studies, concerning their potential role in food spoilage and food associated allergy/infections. Hence an attempt has to be done to reduce the aerosolization of organic dust particles. Elimination of microbial air contamination, should also take the climate and other environmental characteristics of the market into consideration while addressing the hygiene requirements. A **Super market**, also called as grocery store, is a self service store offering a wide variety of food and merchandise organized into departments. It is larger in size and has a wider selection than a traditional grocery store and it is smaller than a super store. A supermarket typically sells meat, fresh produce, dairy and baked goods, along with canned and packaged goods, house hold cleaners, pharmacy products etc. Compared to the categories of contamination as indicated in the guidelines of the Commission of European Communities (CEC 1993), the results obtained in our study indicated a intermediate-high contamination level for bacteria and fungi. Necessary prevention should be taken to keep fungal concentration to an acceptable level in food section of supermarkets. Prevention techniques include, better isolation between outdoor and indoor air, use of proper filter systems, painting the walls to prevent fungal growth, developing systems that prevent the accumulation of organic materials, and controlling the indoor air humidity. Keeping the indoor air dry is essential to prevent fungal growth.

The results of our study in the **Flour mill** indicated that workers and occupants of flour mills are exposed to various biological hazards that could be a cause of respiratory disorders. Singh *et al.*, (1999) have found that 36-40% of agricultural industry workers in India have definite work-related respiratory symptoms. The occurrence of these symptoms was related to the presence of allergenic and toxin-producing fungi which were found in considerable amounts in the agricultural working environment. The concentrations of total airborne microorganisms were of the order 10^3 cfu m^{-3} resembling those reported for grain mills (Dacarro *et al.*, 2005; Krysinska-Traczyk *et al.*, 2005) and less than those reported for flour mills (Awad, 2007). This study revealed that the microorganisms on the grains could be resuspended into air during the grinding process and contaminate. This also indicates that indoor environment provides more favorable conditions for the survival of microorganisms. Flour mill workers are consistently exposed to elevated levels and types of bioaerosols that may trigger respiratory disorders. Further health evaluations should be carried out and suitable counter measures taken to avoid excess biocontamination. The results of this study also can help apportion and better characterization of the inhalation exposure to bioaerosols.

The finding of the present study in a **Service Station** indicates that Metal Working Fluid (MWF) aerosol contaminated environment could be conducive to microbial growth. The levels of total microorganisms found in the air of the service station were of the order 10^2cfum^{-3}. Our results were similar to the culturable airborne bacteria concentrations (10^1-10^3 cfum^{-3} recorded at a machining plant by Gilbert *et al.* (2010). But Laitinen *et al.* (1999) reported a mean air concentrations of viable bacteria of 10^2-10^4 cfum^{-3} at workplaces where MWF are used. Associations between health-related symptoms and microbial exposures need further study for possible sources of exposure. Many more studies should be undertaken to arrive at occupational exposure limits too.

A **Shopping Mall** is any large shopping center which is usually enclosed with adjacent parking and outbuildings. The entrance to the mall is controlled by a limited number of entrances and most stores are accessible only through interior corridors. In addition, there are entertainment and related retail stores. There is also a food court, a separate area containing fast-food outlets and a common seating area. But, reports on microbiological contamination of shopping malls as an occupational or public health problem have been rather scarce. As the fresh air supplied to the shopping mall comes from outdoors, the Indoor Air Quality of the malls will be closely associated with the outdoor air. In addition, there are several potential indoor sources that can generate air pollutants inside the shopping malls which makes the investigation of IAQ in shopping malls complex. Our study observed 4.5 $\times 10^2$ cfu/m^3 of total microorganisms compared to 600-1800 cfu m^{-3} recorded by Li *et al.* (2001) from nine shopping malls of Hong Kong. The Hong Kong Environmental Protection Department (HKEPD) (1997) reported that the levels of bacterial count were between 38.67 and 48.91 cfu m^{-3} in office and public places, while the mean bacterial counts were 1003 and 2140 cfu m^{-3} at restaurants and shopping malls. It is suggested that the property owners of the malls should monitor the ventilation effectiveness under the condition of occupancy, and fresh air should be provided to achieve sufficient ventilation and also the malls should properly manage any potential air pollutant sources.

The total microorganisms in **Library** were 545 cfu/m^3 while the fungal counts were 70 cfu/m^3. Dhawan and Neet (2005) found that the fungal components inside library not only deteriorate paper material but also significantly affect health of library staff.

In **Outdoor environment**, K.R. circle showed the maximum mesophillic count (52.50$\times 10^2$ cfu/m^3), and staphylococcal

concentration (5.45×10^2 cfum^{-3}) which may be due to excessive vehicle pollution and human population. The highest fungal concentration and Gram negative bacteria (2×10^2 cfu/m^3) were seen in Maharani's junction (6.90×10^2 cfu/m^3). Vehicular movements create local turbulence which promotes aerosolisation of fungal spores from surrounding building trees and soil, increasing fungal concentration. Therefore fungal recurrent in the air has to be studied. Settled dust may contain large count of fungi and once it is resuspended, it becomes airborne.

The presence of Micrococci and staphylococci in the indoor environments and outdoor environments studied may be due to human presence. As observed in other studies (Pastuszka *et al*.2000),the high bacterial count within the building compared to that observed outdoor could be associated with various internal sources, including human activities. Staphylococci and Micrococci are normal skin flora and the yellow or orange pigments in the genera are thought to have resistance against disinfection by UV radiation (Tong and Lighthart, 1997). The presence of environmental organisms like endospore-forming bacilli may be attributed to their ability to form desiccation tolerant spores which enables their survival in a harsh environment (Shaffer and Lighthart, 1997). The presence of Gram-negative bacilli in the indoor environments of our study is significant. Many members of the Enterobacteriaceae are part of the normal human and animal microbiota, but these species are also ubiquitously recovered from environmental samples. In most of the indoor environments Aspergillus, Penicillium and Cladosporium are most commonly encountered. These suspended fungal spores are significant as they not only cause allergic disorders but also damage stored materials. Aeromicrobiological investigations like this study helps to focus attention on allergenic molds and allergen sources.

The study of airborne bacteria and fungi provides substantial evidence that indoor air pollution contains measurable concentrations of microorganisms. Although the concentrations measured in the study were mostly below the Occupational Exposure Limits proposed by various authors, evidence from indoor studies with bioaerosols concentrations suggests that chronic exposure may have negative effects, especially in sensitive populations. In comparison to other studies, our study focused on relatively large and varied indoor environments. Future work could focus on seasonal dynamics and ambient bioaerosols concentrations. It is hoped that studies such as the one presented in this paper may shed light on other avenues of future research.

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THEME:-02

PHYSICAL AND MATHAMATICAL SCIENCES

P.M.Sc:-1

FITTING OF MARKOV CHAIN MODEL FOR DAILY RAINFALL DATA AT BIJAPUR DISTRICT (KARNATAKA)

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The knowledge of climate and weather is being increasingly used in various agricultural activities. The success or failure of crops, particularly under rainfed condition is closely linked with the rainfall pattern. Simple criteria related to sequential phenomenon like dry and wet spells could be used for analyzing rainfall data to obtain specific information needed for crop planning and for carrying out agricultural operations. For planning purpose, it is important to know the sequence or persistence of dry, wet periods. Studies on persistency of dry spells on a regional scale have been carried out by many researchers and a method to evaluate frequencies of continuous days with rainfall above or below any chosen threshold value has been reported. As synoptic system inducing rainfall or dry spells have been found to persist for a few days over a region, it is useful to ascertain the probability of sequential events like wet day following another wet day or a dry day following a wet day or dry day during the crop growing season. Markov Chain Model has been found suitable to describe the long term frequency behaviour of dry or wet weather spells.

In the present paper and attempt has been made to demonstrate the application of two-state Markov Chain Model for studying the pattern of occurrence of dry and wet day during the crop season of Bijapur district. The test of independence indicates overwhelming evidence that sequence of dry and wet days are dependent.

P.M.Sc:-2

TRENDS IN SEASONAL AND ANNUAL DECADAL RAINFALL – A CASE STUDY OF BIJAPUR DISTRICT (KARNATAKA STATE).

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Decadal variations of seasonal and annual rainfall of Bijapur district is studied for the period 1931 to 2000 (station wise as well as district as a whole). Tests of significance applied to decadal seasonal and annual rainfall data indicates that the variations in rainfall are within the statistical limit. A cycle of rise and fall has been observed in two consecutive decades in most of the stations as well district as a whole.

P.M.Sc:-3

RADIO LISTENING AND TELEVIEWING BEHAVIOUR OF RURAL WOMEN

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A study on Radio listening and televiewing behaviour of rural women was undertaken during 2006-07 in Belgum district of Karnataka state. Sample constited of 200 rural women viz., 100 radio listeners and 100 televiewers from Naganur, Tukkanatti, Kalloli and Sanganakeri villages of Gokak taluk. Pre-tested interview schedule was used for collection of information. Radio and Television programmes were classified into four categories namely farm, home, community and anyother programmes. Anyother programme included news, quiz, cinema and its songs, employment, crime, entertainment, astrology, serials, philosophical, educational programmes etc. Amongst all these programmes majority of the respondents had listened and viewed only entertainment programmes. Highest time was spent on listening to any other programmes (84.34 min. out of 374 minutes) followed by home programmes (47.44 min. out of 220 minutes), farm programmes (15.36 min. out of 75 minutes) and community programmes (3.15 min. out of 65 minutes). With respect to television highest time was spent (256.6 min out of 2,400 min.) on entertainment programmes followed by home programmes (8.54 min. out of 120 min.), community programmes (5.45 min out of 120 min.) and farm programmes (3.00 out of 120 min.). Rural women strongly agreed that radio and television programmes are in simple language and helpful for adoption of technologies and give more information. Lack of leisure time for rural women was the important problem for not listening and viewing to all radio and television programmes regularly as mentioned by large majority of rural women. . They preferred simple programmes in local language, programmes to give timely information and they wanted detailed information on income generating activities.

THEME:-03

AGRICULTURAL, HORTICULTURE, FISHERY & VETERINARY SCIENCES

Ag.Ho.F.V.Sc:-01

TOXICITY STUDIES OF CASSIA SPECTABILIS IN RATS

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INTRODUCTION

Cassia Spectabilis is also referred to as "showy crotalaria" or "rattlebox." The genus *Senna* (previously described as *Cassia*) is a pantropical shrub of the family leguminosae comprising of more than 300 species (Randell and Barlow, 1998). In our country, there are reports on the mortality and morbidity due to consumption of hazardous plants but they lack experimental evidence.

The toxic effects vary with the toxin content within the plant, season, the amount ingested, the duration of ingestion and species of animal.

Plants are commonly used for therapeutic purpose in human beings and animals. However their toxic feature has not been studied. It is noticed that the plant, *Cassia spectabilis* had caused death in cattle as well as wild animals like deers. There is no published information on the toxicity of this plants in the literatures perused. In the present study is aimed to study the toxicological effect of the *Cassia spectabilis* extract in a systematic way using rats as models.

MATERIALS AND METHOD

Fresh leaves of *C. spectabilis* were collected and fresh leaves of *Cassia spectabilis* was mixed with methanol and contents were filtered through Buchner's funnel in a conical flask and it was further concentrated by rotary flash evaporator at 39-40^{o}C till the solvent got completely evaporated and extract settled down to bottom. The residual methanol from the extract was evaporated after keeping the extracts in a petri dish in a vacuum oven at 60^{o}C at the pressure of 25 psi.

Phytochemical analysis of the *Cassia spectabilis* leaf extract was carried out using HPTLC technique (Wagner *et al.,* 1984) for the presence of alkaloids, anthracenes, bitter principles, glycosides, flavonoides, saponins and coumarins.

Healthy Wistar albino rats aged 7 to 9 weeks weighing 190 to 210 g adult were selected for the study. Rats were allowed to acclimatize to the laboratory conditions for seven days prior to test before assigning the animals to treatment groups. For acute toxicity the doses were selected based on Acute class method. The dose level to be used as the starting dose is selected from one of four fixed levels, 5, 50, 300 and 2000 mg/kg body weight. For subacute toxicity range finding dose of 50,200,800 and limit dose of 1000mg/kg bodyweight were selected. All the experimental animals were monitored daily for effects on skin and face, eyes, mucous membranes, respiratory and circulatory systems, autonomic change such as salivation, central nervous system effects including tremors and convulsions, and changes in the level of activity, gait, posture, reactivity to handling or sensory stimuli, and altered strength, health conditions and mortality. The blood sample was collected from on Day 0, 7, 14, 21 and 28 for total erythrocyte count (TEC), total leucocyte count (TLC), packed cell volume(PCV) and haemoglobin and the concentrations of serum alanine amino transferase (ALT), aspartate aminotransferase (AST), blood urea nitrogen (BUN) and creatinine estimation.

The data was statistically analyzed by two-way , Bonferroni post-test. Mean values and standard error of mean were calculated and all the values are expressed as Mean±SEM (GraphPad Prism, 2007).

RESULTS AND DISCUSSION

Phytochemical analysis of *Cassia spectabilis* leaf extract was carried out using high performance thin layer chromatography technique (HPTLC) and found positive for presence of alkaloids, anthracenes, flavanoids, bitter principle and coumarins. This finding is in contrast with the findings of Claudio Viegas *et al*. (2004) reported that the flowers of *Cassia spectabilis* had three new piperidine alkaloids Similarly, Ayo and Amupitan (2007) reported *Cassia spectabilis* contained sennosides, rhein emodin, aloe-emodin, 1,3,7-trihydroxy-2-methyl anthraquinone. Nanik *et al*. (2006) reported a dimer flavonoid from the acetone extract of the stem bark of *Cassia spectibilis*.

The *Cassia spectabilis* leaf extract was administered orally by gavaging daily for 28 days to male and female rats separately at 50, 200 and 800 mg/kg and limit dose of 1000 mg/kg, there was no observable clinical signs of toxicity was observed in the rats. The possible non toxic nature of the plant in the present study may be due to the seasonal variation, age of the animals and the dose and duration feeding.

There was no change in the haematological parameters like Hb, TEC, TLC and PCV concentration of all the treated groups compared to control group. This finding is in contrast with the findings of Shridhar and Narayana (2004) reported that there was no changes in hematological parameters in rabbits fed 50 g/kg leaves of *Cassia spectabilis* for 5 days. They also reported that there was no change in hematological parameters in male crossbred cow calves were fed 20, 40 or 60 g/kg leaves of *Cassia spectabilis* for 5 days.

There was no significant ($P>0.05$) change in the biochemical parameters estimated.

The above findings are in accordance with the findings of Shridhar and Narayana (2004) who reported that there were

no significant changes in serum BUN and Crt concentration in rabbits fed 50 g/kg with fresh leaves of *Cassia spectabilis* for 5 days. Further this was supported by the findings of Shridhar and Narayana (2007) who reported that there was no change in serum BUN and Crt concentration in male crossbred cow calves fed 20, 40 or 60 g/kg leaves of *Cassia spectabilis* for 5 days.

This was further strengthened by the histopathological findings of the present study, where in kidney showed normal architecture in all tested groups was evident.

SUMMARY

In Acute oral toxicity study and Repeated dose 28-day oral toxicity study of *C. spectabilis* leaf extract, no clinical signs of toxicity were observed and there was no change in haematobiochemical parameters like TEC, TLC, PCV, Hb, AST, ALT, BUN and creatinine. The present study revealed that *Cassia spectabilis* has anti inflammatory property and did not exhibit any toxic nature in acute and subacute toxicity study in rats for the dose and duration.

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Ag.Ho.F.V.Sc:-02

MOLECULAR CHARACTERIZATION OF BOVINE MASTITIS *Staphylococcus aureus* ISOLATES WITH SPECIAL REFERENCE TO BIOFILM ASSOCIATED PROTEIN GENE.

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Mastitis remains as one of the most important diseases in dairy cattle despite the progress made in improving general udder health in recent years. It continues to be one of the economically most important diseases of dairy cattle, accounting for 38 per cent of the total direct costs of the common production diseases. Losses have been estimated at $2 billion/year, of which 70 per cent was attributed to reduced milk yield from subclinical mastitis. *Staphylococcus aureus* (*S.aureus*) is one of the most frequently isolated contagious mastitis pathogens that causes either clinical or subclinical or chronic bovine mastitis with high economic losses to the farmers. In cows, intramammary infections (IMI) due to *S.aureus*, which account for 25 to 30 per cent of total IMI, are generally subclinical (Leitner *et al*., 2000 and Dego and Tareke, 2003). *Staphylococcus aureus* is a common cause of intramammary infections, which frequently become chronic, associated with the ability of the bacteria to produce biofilm and also recurrent infections are often attributable to biofilm growth of bacteria (Cucarella *et al.,* 2004 and Melchior *et al.,* 2006).

Biofilm formation is accompanied by significant genetic and subsequent physiological changes in the bacteria. A group of surface proteins sharing several structural and functional features is emerging as an important element in the biofilm formation process of diverse bacterial species. The first member of this group of proteins was identified in a *S. aureus* mastitis isolate and was named 'BAP' for biofilm-associated protein. As common structural features, Bap- related proteins: (i) are present on the bacterial surface; (ii) confer upon bacteria the capacity to form a biofilm; (iii) play a relevant role in bacterial infectious processes (Lasa and Penades, 2006 and Latasa *et al*., 2006).

The ability of *S.aureus* to form biofilm *in vivo* is considered to be a major virulence factor influencing its pathogenesis in mastitis. The implication of biofilm in chronic bacterial infection in many species has triggered an increasing interest in the characterization of genes involved in biofilm formation. The *bap* gene is a newly identified gene that encodes the biofilm-associated protein i.e. 'BAP' which is involved in biofilm formation in bovine mastitis causing *S. aureus* (Cucarella *et al*., 2001, Gotz, 2002 and Vautor *et al.,* 2008). The ability of staphylococci to form biofilm affords at least two properties: the adherence of cells to a surface and accu-

mulation to form multilayered cell clusters. A trademark is the production of the slime substance, polysaccharide intercellular adhesion (PIA), an exopolysaccharide composed of beta-1,6-linked N-acetylglucosamines with partly deacetylated residues, in which the cells are embedded and protected against the host's immune defences and antibiotic treatment . Although exopolysaccharides are important and often essential compounds of the biofilm matrix, recent evidences suggest that a biofilm-associated protein in a bovine mastitis causing *S. aureus* isolate plays a leading role during the development of the microbial communities. Later on, other surface proteins homologous to 'Bap' and involved in biofilm development have been described in many Gram-positive and Gram-negative bacteria such as *Esp* of *Enterococcus faecalis* and *BapA* of *Salmonella enterica ssp.enterica* serotype Enteritidis (Cucarella *et al*., 2001, Götz, 2002 and Latasa *et al*., 2006). Polymerase chain reaction based amplification of *bap* gene not only helps us to identify the potential of *S. aureus* to produce biofilms but also its role in establishment of infection in both clinical and sub clinical mastitis.

MATERIALS and METHODS

In the present study, a PCR analysis was carried out using '*bap'* specific primers for 25 bovine mastitis *S. aureus* isolates (*S. aureus* SA1 to SA25) which were isolated from clinical (*S. aureus* SA1 to SA6) and subclinical mastitis (*S. aureus* SA7 to SA25). Genomic DNA was extracted from all the 25 *S. aureus* isolates according to the method described by Hoffman and Winston (1987) and subjected to Polymerase Chain Reaction.

For amplification of *bap* gene, specific primers published by Cucarella *et al.* (2001) were procured from Bio serve Biotechnologies Pvt.Ltd. Hyderabad. They are enlisted with their base sequences in Table1. These primers were reconstituted in TE to a concentration of 20 pmol /µl and stored at -20°C.

Table 1: Nucleotide sequence of *bap* specific primers (Cucarella *et al.*, 2001)

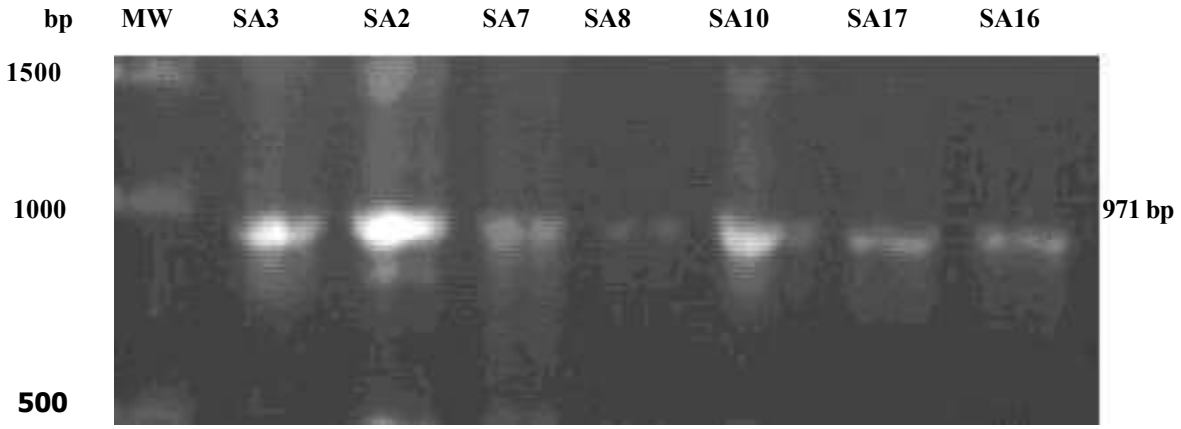
Sl. No.	Primer Code	Nucleotide sequence
1	*sasp-6m(forward)*	5'-CCCTATATCGAAGGT GTAGAATTGCAC-3'
2	*sasp-7c(reverse)*	5'-GCTGTTGAAGTTAAT ACTGTACCTGC-3'

PCR: The amplification reactions were carried out in 0.2 ml microcentrifuge tubes using a programmable thermal cycler (Palm Cycler, Corbett Research, Australia) following the method described by Cucarella *et al.* (2001). A 25µl of the PCR mixture comprised of 250 ng (3 µl) of *S.aureus* DNA, 2 µl (40 pmol) of each forward and reverse primers and 1 µl (100 µM) of each dNTPs, 2.5µl of 10X PCR assay buffer and 0.66µl of *Taq*.DNA polymerase which were procured from Bangalore Genei, Bangalore. Water was added to make a final volume of 25µl. The contents were mixed gently using a micropipette and centrifuged for 5 sec. at 5000 rpm.A drop of mineral oil was overlaid in all the tubes to avoid evaporation at high temperature during PCR. The PCR amplification was carried out by initial denaturation of DNA at 94°C for 2 min. followed by 40 cycles of denaturation at 94°C for 20 sec, annealing at 42°C for 20 sec and extension at 72°C for 50 sec. Final extension step of 72°C for 5 min was included to complete the synthesis of unfinished products. After completion of PCR reaction, amplified products were subjected to electrophoresis in 0.8 per cent agarose gel with 6X gel loading dye. As molecular weight marker, 500 bp DNA ladder procured from Bangalore Genei, Bangalore was used.

RESULTS and DISCUSSION

Out of the 25 *S.aureus* isolates (SA1 to SA25), 10 (40 per cent) isolates were '*bap'* positive that showed an amplicon of 971 bp. Among 10 '*bap'* positive isolates, three isolates (SA2, SA3 and SA4) were from clinical mastitis and seven isolates (SA7, SA8, SA10, SA15, SA16, SA17 and SA23) were from sub clinical mastitis cases (Fig.1 and Table 2). In the previous study conducted by Rajeev (2006) who had subjected these 25 isolates of *S.aureus* for *ica*A specific PCR and found that 23 (92 per cent) isolates were positive for *ica*A gene. It was found that all the *bap* positive isolates were also *ica*A positive in this study (Table.2). These findings are in agreement with Cucarella *et al.* (2004) who analyzed 195 bovine subclinical mastitis *S.aureus* isolates by PCR using *ica*ADBC and *bap* specific primers. Results revealed that 94.36 per cent were *ica*ADBC positive and 25.6 per cent were *bap* positive isolates. They also reported that all the *bap* positive isolates were also *ica* positive. They also studied the relationship between the ability to produce chronic bovine mastitis and biofilm formation and found that *bap*-positive isolates were significantly more able to colonize and persist in the bovine mammary gland *in vivo* and were less susceptible to antibiotic treatments when forming biofilms *in vitro*. In addition, analysis of the structural *Bap* gene revealed the existence of alternate forms of expression of the Bap protein in *S. aureus* isolates obtained under field conditions throughout the animal's life. The presence of anti-Bap antibodies in serum samples taken from animals with confirmed *S. aureus* infections indicated the production of Bap during infection. Furthermore, disruption of the *ica* operon in a *bap*-positive strain had no effect on *in vitro* biofilm formation, a finding which strongly suggested that biofilm associated protein could compensate for the deficiency of the polysaccharide intercellular adhesin / PIA product (a biofilm matrix polysaccharide).

Fig. 1: PCR profile with '*bap*' gene specific primers for *S. aureus* isolates



Lane 1: MW: 500 bp DNA ladder
Lane 2, 3, 4, 5, 6, 7 and 8: *S. aureus* SA3, SA2, SA7, SA8, SA10, SA17 and SA16

Table 2: '*bap*' positive and *ica*A positive *S.aureus* isolates

Sl.No.		***S.aureus* isolates**	***'bap'* gene**	***ica*A gene**
1	Clinical mastitis	SA1	-	+
2		**SA2**	**+**	**+**
3		SA3	+	+
4		SA4	+	+
5		SA5	-	-
6		SA6	-	+
7	Sub clinical mastitis	SA7	+	+
8		SA8	+	+
9		SA9	-	+
10		SA10	+	+
11		SA11	-	+
12		SA12	-	+
13		SA13	-	+
14		SA14	-	+
15		SA15	+	+
16		**SA16**	**+**	+
17		SA17	+	+
18		SA18	-	-
19		SA19	-	+
20		SA20	-	+
21		SA21	-	+
22		SA22	-	+
23		SA23	+	+
24		SA24	-	+
25		SA25	-	+

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Ag.Ho.F.V.Sc:-03

STORAGE STUDIES ON CASHEW APPLE PRODUCTS.

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Processed storage products to reach the consumers take long time, therefore even though cashew apples have been processed into various products to extend fresh Cashew Apple keeping quality from less than two days to a range of extended shelf life by the investigators. This requires collection of some useful and important primary data attest on how long these processed cashew apple products could be stored without affecting its quality characteristic such as physico-chemical and sensory characteristics. Therefore this study had the objective of determining the optimum keeping quality without any adverse changes in selected processed products on storage. Keeping quality studies were conducted as described below on the prepared products of cashew apples

Storage of cashew apple products

Storage studies of the cashew products prepared were studied for a period of three months. Each month products were given to sensory evaluation and juice analyzed for changes in TSS, acidity and ascorbic acid (Table-1)

Storage of cashew apple Juice

The mean scores of acceptability during three-month storage period are presented in Table-2. Juice had maximum score for appearance, aroma, consistency, taste and over all acceptability soon after preparation and scores decreased with increase in period. But after 3rd month, scores though lower were in acceptable range of 3.38 for appearance, Aroma 2.85; consistency 3.19; taste, 3.24 and over all acceptability 3.22. There was significant difference ($P<0.01$) among the scores with respect to period of storage for all characteristics. Thus juice had acceptable scores for all characteristics after three months indicating that it can be stored for three months. Changes in TSS (Brix) of bottle stored juice is represented in Table-1.

Results revealed that there was fall in the TSS content of juice with increase in storage duration. After three months highest TSS was found in watermelon juice (38.2) and lowest TSS was found in cashew juice (36.0). Acceptability of any drink is highly influenced by the presence of sugar in it and this was estimated in terms of percent total soluble solids Table-1 furnishes the details of the keeping quality characteristics studied on the cashew and watermelon juice and cashew apple blended there in.

Table-1 Storage effect on TSS (Brix) and Titrable Acidity (%) of Bottled Cashew-Watermelon Juice

Cashew:Watermelon Juice	Initial		1st month		2nd month		3rd month	
	TSS	Acidity	TSS	Acidity	TSS	Acidity	TSS	Acidity
100:0	40	0.30	39.40	0.28	38.00	0.26	36.00	0.24
50:50	40	0.23	39.20	0.22	38.20	0.17	38.00	0.14
75:25	40	0.25	39.70	0.22	36.40	0.16	36.40	0.15
25:75	40	0.18	39.80	0.14	37.20	0.11	36.00	0.06
0:100	40	0.12	39.00	0.13	38.60	0.09	38.20	0.04

Table-2 Storage effect on acceptability of cashew apple-watermelon juice

Variation	Appearance	Aroma	Consistence	Taste	Overall Acceptability
Initial	4.01	3.23	3.53	3.63	3.52
1st Month	3.73	3.00	3.37	3.46	3.36
2nd Month	3.50	2.92	3.19	3.38	3.28
3rd Month	3.38	2.85	3.19	3.24	3.22
F-Ratio	9.71**	39.9**	7.99**	9.4**	14.08**
CD	0.20	5.50	0.25	2.68	0.20
CV	3.24	0.25	3.83	0.17	2.66

Scale with 1(low) to 5(high).** Significant at 1% level.

Changes in acidity (percentage) of bottle stored juice is presented in Table-1. Proper sugar/acid blend is very essential to obtain beverage of high quality. Changes in total titrable acidity in terms of citric acid was determined from juice immediately after preparation and during storage. Data indicates decline in the acidity of juice with increase in storage duration. However there was not much reduction in acidity (%). Cashew juice had highest (0.24) and watermelon juice had least (0.04) acidity after the end of third month.

Changes in ascorbic acid content of Cashew apple blended juice on storage represented is shown in Table-3. Cashew apple juice is valued for its ascorbic acid content where as watermelon juice which is not a good source for it. Juice was analyzed in fresh and stored conditions. Results revealed that there was decrease in ascorbic acid content during entire storage period. The rate of reduction was found to be less during initial stages compared with the end. Maximum ascorbic acid was found in pure cashew juice (86 mg) followed by blend 75:25 (64.20 mg) and minimum ascorbic acid was found in watermelon juice (3.92 mg) among the blended blend 25:75 had least ascorbic acid (20 mg).

Table-3 Storage changes in ascorbic acid (mg) content in bottled juice in 100g Sample

Cashew: Watermelon	Initial	1st month	2nd month	3rd month
100:0	99.9	96.4(3.5)	93.1(6.8)	86.0(13.9)
50:50	54.8	52.6(4.0)	50.0(8.8)	46.4(15.3)
75:25	75.6	71.8(5.0)	69.6(7.9)	64.2(15.0)
25:75	29.9	28.5(4.7)	27.4(9.7)	25.0(16.4)
0:100	5.2	4.8(7.6)	4.5(13.4)	3.9(24.7)

Figures in parenthesis indicate the percentage loss of ascorbic acid

Toffee:

Mean scores of acceptability during three months period are represented in Table-4. Results showed that toffee too scored maximum points for appearance, aroma, texture, taste and overall acceptability soon after preparation and scores decreased with period. There was significant difference ($P<0.01$) among scores with respect to all characteristics. But yet after three months scores were in acceptable range. Toffee for appearance had score of 3.33; for aroma had score of 3.28 and 2.94 for texture, 3.32 for taste and 3.09 for overall acceptability. This indicates that toffee could be stored for a period of three months and further if proper packaging is used unlike in the present candies. but day to-day uses the containers and method used could be highlyrecomendable.

Nutrimix

Sensory scores of Nutrimix are represented in Table-5 Results indicated that Nutrimix had maximum score for appearance, aroma, texture, taste and overall acceptability soon after preparation. Scores declined along with the period. There was significant difference ($P<0.01$) among the period with all characteristics. After three months the mix had scores that lie in acceptable range viz., 3.45 for appearance; 3.17 for aroma; 3.27 for texture; 3.47 for taste and 3.33 for overall acceptability. The tested mix can be stored for a period of three months and further studies with better packaging is suggested for commercial feasibility.

Sweet and Spicy bread spread

Mean scores of acceptability for bread spreads are represented in Table-6. Data indicated that both the type of spreads have maximum scores for all characters soon after preparation and scores declined with increase in duration. There was significant difference in scores between the periods. Even after 3 months the scores were in acceptable range.

Table-4 Mean scores for acceptability of stored toffee

Variation	Appearance	Aroma	Texture	Taste	Overall Acceptability
Initial	3.81	3.86	3.58	3.88	3.92
1st Month	3.61	3.71	3.43	3.75	3.73
2nd Month	3.53	3.63	3.35	3.59	3.31
3rd Month	3.33	3.28	2.94	3.32	3.09
F-Ratio	39.7**	17.17**	18.2**	6.89**	9.40**
CD	0.17	3.42	0.24	3.49	0.38
CV	3.95	0.81	3.77	0.05	6.14

** Significant at 1% level.

Table-5 Mean scores for Nutrimix before and after storage (n=12)

Variation	Appearance	Aroma	Consistency	Taste	Overall Acceptability
Initial	3.78	3.65	3.66	3.86	3.79
1st Month	3.68	3.55	3.54	3.67	3.62
2nd Month	3.56	3.43	3.51	3.54	3.48
3rd Month	3.45	3.17	3.27	3.47	3.33
F-Ratio	11.60**	5.25**	4.71**	12.13**	16.30**
CD	0.26	3.13	0.27	0.92	0.22
CV	2.72	0.11	2.11	0.019	2.57

** Significant at 1% level. Score index – 1-4 in ascending acceptability scale.

Table-6 Keeping quality of sweet and spicy bread spread (N=12)

Period	Appearance		Aroma		Texture		Taste		Overall acceptability	
	Sweet	Hot	Sweet	Hot	Sweet	Hot	Sweet	Hot	Sweet	Hot
Initial	4.29	4.09	3.76	3.46	3.78	3.64	3.75	3.74	3.99	3.57
1st Month	9.03	3.96	3.46	3.45	3.76	3.62	3.43	3.64	3.64	3.43
2nd Month	3.83	3.91	3.41	3.35	3.55	3.51	3.41	3.54	3.57	3.33
3rd Month	3.60	3.71	3.24	3.33	3.35	3.41	3.31	3.45	3.31	3.28
F-Ratio	3.62**	30.30**	8.21**	12.19**	21.01**	21.80**	12.93**	23.20**	23.70**	23.70**
CD	0.60	5.26	0.16	1.82	0.26	3.26	0.11	1.54	0.19	2.39
CV	0.09	1.16	0.29	3.79	0.12	1.55	0.25	3.05	0.11	1.42

** Significant at 1% level

Table-7 Mean Score of variance for Cashew Apple Powder (N=12)

Period	Appearance		Aroma		Texture		Taste		Overall acceptability	
	RF	RM	RF	RM	RF	RM	RF	RM	RF	RM
Initial	3.87	3.87	3.83	3.83	4.46	4.48	3.80	3.80	3.75	3.75
2nd month	3.83	3.75	3.67	3.59	4.45	4.39	3.74	3.64	3.67	3.59
4th month	3.75	3.72	3.52	3.46	4.43	4.33	3.65	3.50	3.56	3.50
6th month	3.70	3.60	3.96	3.28	4.37	4.24	3.54	3.41	3.49	3.39
F-Ratio	1.81^{NS}	2.10^{NS}	16.30**	14.93**	2.12^{NS}	9.84**	29.50**	12.19**	17.86**	15.00**
CD	0.06	1.39	0.06	1.38	0.14	2.90	0.12	2.43	0.07	1.13
CV	0.07	1.13	0.12	2.60	0.13	2.36	0.11	2.24	0.10	2.20

RF: Refrigerated temperature RM: Room Temperature
** Significant at 1% level ^{NS}: Non-significant

Keeping Quality of Cashew apple powder

Mean scores for acceptability of cashew powder on storage are presentated in Table-7. The powder was kept at two different temperatures and the results revealed that the scores for appearance, aroma, texture, taste and overall acceptability were maximum soon after preparation and the scores decreased with increase in period. There was no significant difference ($P<0.01$) among scores obtained for the period with respect to appearance and aroma. But scores obtained for appearence reduced from 3.87 to 3.70 for refrigerated and 3.87 to 3.60 for room temperature. Similarly for all the characteristics scores at refrigerated temperature were higher than room temperature. There was no significant difference ($P<0.01$) among the varieties with respect to texture. Even after three months, the scores procured were in acceptable range indicating that Bulk powder can be stored. The powder had better scores at refrigerated conditions.

Pickles of Salt and Sweet Type

Pickles of salt And Sweet Type were in invariably acceptable on storage.

Table-8 Statistical analysis of Cashew apple pickles after storage in months for assorted Pickles acceptability difference

Cashew apple pickles								
Months storage→	A		B		C		D	
	3	6	3	6	3	6	3	6
Total	82	90	86	76	84	78	84	85
Mean	6.8	7.4	7.2	6.3	7	6.5	7	7.08
F-test	NS	NS	NS	NS	NS	NS	NS	NS

NS – Non significant
A - Cashew apple pickle (FPO standard)
9 pt scale. Pleasant (9) to Repulsive (1)
B - Sweet oil cashew pickle
C - Cashew pickle with mustard
D - Spiced vinegar cashew pickle

Results of acceptability of Cashew apple pickles stored for 3 and 6 months are represented in Table-8 it is evident from the data that there was no significant decrease in acceptability of pickles even after 6 month storage. Pickles had not developed undesirable colour, odour and taste. Pickles prepared from vinegar showed a slight brown discolouration only after 6 months, but had no residual after taste. After 6 months of storage, "A" was the best accepted with a mean score of 7.41, followed by "D", "B" and "C", which had the mean scores of 7.08, 6.3 and 6.5 respectively. Scores and remarks of panelists indicated that Cashew apples can be used for making pickles successfully, but needs popularization extensively.

Table-9 Changes in ascorbic acid (mg) content of pickles stored in bottles

Period	Salt pickle	Sweet oil Pickle
Initial	68.70	64.30
1st month	59.80(13)	58.80(10)
2nd month	46.24 (33)	49.20(24)
3rd month	34.26(50)	38.80(40)

Figures in parenthesis indicate per cent loss of ascorbic acid.

Conclusion

To conclude all products had maximum scores for acceptability immediately after preparation. As the period increased the scores obtained got decreased. Soon after preparation of sweet bread spread had maximum score and juice had minimum score as fresh juice, but after storage and clarification, the score got improved as an exception for pickles.

Ag.Ho.F.V.Sc:-04

SCREENING OF SELECTED VEGETABLE SOYBEAN GENOTYPES FOR NUTRIENT AND ANTINUTRIENT FACTORS.

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Introduction

Vegetable soybean (*Glycine max* [L.]Merrill) is a member of the leguminous family. The vegetable soybean is considered to be a special kind of soybean, because unlike the typical harvest of field soybean, vegetable soybean is harvested when the seeds are at the immature (R6) stage and have expanded to fill 80 to 90% of the pod width (Lumpkin *et al*., 1993). The botany of vegetable soybean is similar to field soybeans except minor morphological and physiological differences. In Himalayan and North- East Region of India, farmers are growing soybean in the vicinity of their dwelling for culinary purpose. India has a good potential and scope for vegetable soybean to about one million tons (Nawab, 2001). Compared to the green seeds of other legumes, green seeds of vegetable soybean rich in vitamins (B1, B2 and C), minerals (iron, calcium and phosphorus), and protein content. Vegetable soybean seeds are superior in flavour, texture and require shorter cooking time. Vegetable soybean contains protein (13g/100 g), fat (5.7 g/100 g), phosphorus (158 mg/100g), calcium (78 mg/100 g) ,vitamin B1 (0.4 mg/100 g), vitamin B2 (0.17 mg/100 g) (Shanmugasundaram and Yan, 2004), and also contains ant nutritional factors such as phytates, tannins, which reduce bioavailability of the minerals such as Calcium, Magnesium, Iron and Zinc. Little is known about the nutritional quality of vegetable soybean. No systematic study has been done to find out the variability of antinutrient components of vegetable soybean. Hence the present study was conducted to evaluate the nutritional quality and antinutrient contents of the selected vegetable soybean genotypes.

Material and Methods

Ten different vegetable soybean genotypes were obtained from Soybean Scheme, GKVK, UAS, Bengaluru. Released cultivar GC-00209-4-1-1 was used as control. Three replications of each genotype were planted in four row plots in a randomized complete block design during the Kharif season, 2009 at the soybean scheme research field at GKVK, UAS, Bengaluru. Different vegetable soybean genotypes used in this study were; AGS- 434, AGS-435, AGS-436, AGS- 437, AGS-438, AGS-439, AGS-440, GC- 99010-35-1-2-2, GC- 98017-7-196-1-2 and GC-00209-4-1-1(released variety as control). Each entry was harvested at the physiological maturity (65-70 days after sowing) were used for determination of nutritional quality and antinutrient components.

Proximate composition of vegetable soybean genotypes

The vegetable soybean seeds were dried in a hot air oven at 60^0 C for 12 hours and finely powdered and subjected for nutrient analysis. The nutrient such as protein, fat, crude fibre, ash, calcium, iron, phosphorus dietary fiber and antinutrient such as phytates, tannins (AOAC, 1980) and trypsin inhibitors (Ray and Rao, 1971) were estimated on dried sample. Moisture and vitamin C were analysed on fresh sample. Carbohydrate and energy were computed using differential method. Three replicates were used for each analysis. The results were analyzed using a completely randomized design (CRD) to compare the variance (Fisher and Yates, 1963).

Results and discussion:.

Table 1 : Macronutrient composition (based on fresh sample) of vegetable soybean genotypes (Per 100 g)

Genotypes	Moisture (%)	Protein (g)	Fat (g)	Ash (g)	Crude fiber (g)	Carbo hydrate (g)	Energy (Kcal)
AGS-434	69.40	14.09	5.08	1.74	2.32	7.35	127
AGS-435	68.90	14.96	6.12	1.71	2.27	5.88	139
AGS-436	69.70	13.65	5.74	1.53	2.62	6.74	131
AGS-437	70.05	13.23	5.71	1.63	2.06	7.18	131
AGS-438	70.15	13.58	5.44	1.64	2.21	6.97	131
AGS-439	71.80	13.43	4.46	1.61	2.44	6.16	119
AGS-440	70.60	14.05	4.64	1.63	2.55	6.51	124
GC- 99010-35-1-2-2	72.10	12.32	4.24	1.49	1.89	7.93	119
GC- 98017-7-196-1-2	71.50	12.59	4.50	1.49	2.27	7.63	119
GC-00209-4-1-1 (control)	71.70	13.37	5.31	1.61	2.35	6.00	123
F value	NS	*	*	*	*	*	*
S.Em±	-	0.29	0.18	0.08	0.05	0.25	1.95
CD (p=0.05)	-	0.90	0.58	0.25	0.16	0.80	6.13

* Significant at 5% level; NS- Non- significant

The highest moisture content was found in GC- 99010-35-1-2-2 (72.10 per cent) and lowest was observed in AGS-435 (68.90 per cent). Seed moisture content is a critical factor that affects organoleptic value. Kumar *et al*. (2006) reported the moisture content of vegetable soybean Japanese cultivar and Indian JS335 at R6 stage ranged from 67.5- 76.1 per cent. Protein and fat reported highest in AGS-435 (Table 1). The value of protein observed in the present study is similar to that of Obatolu and Osho (2006) on five Nigerian varieties of vegetable soybean genotypes (TGX) that contained 11.6- 15.3 g. Protein content of vegetable soybean are highest among vegetable legumes such as pigonpea with 6.9 g/100 g(), cowpea 2.5-5.94 g/100 g (Aghora *et al.* 1994) and green peas 7.2 g/100 g (Gopalan *et al.* 2007).

Ash content which reflects mineral content ranged from 1.49-1.74 g. Crude fiber content of the genotypes ranged from 1.89 to 2.62 g/100g. High values of fiber suggest that it can be good source crude fiber and has many health benefits. In the present study carbohydrate content ranged from 5.88 to 7.93 g. Genotype GC- 99010-35-1-2-2 had the highest (7.93 g) carbohydrate content and highest energy was recorded in AGS-435. Mebrahtu (2008) reported the carbohydrate content of 31 vegetable-type soybean genotypes ranged from 15.84-22.18 g (based on dry matter).

Table 2 : Micronutrient composition (based on fresh sample) of vegetable soybean genotypes (Per 100 g)

Genotypes	Calcium (mg)	Phosphorus (mg)	Iron (mg)	Vitamin C (mg)
AGS-434	62.74	222.4	3.70	20.85
AGS-435	61.57	231.5	3.14	19.39
AGS-436	67.71	189.0	3.31	19.69
AGS-437	55.10	173.2	3.28	17.57
AGS-438	54.92	181.2	3.43	16.91
AGS-439	60.93	215.6	3.15	19.84
AGS-440	54.24	186.5	3.03	15.90
GC- 99010-35-1-2-2	58.91	213.6	3.16	17.72
GC- 98017-7-196-1-2	59.61	223.8	3.14	18.03
GC-00209-4-1-1 (control)	55.79	201.7	2.68	20.80
F value	*	*	*	*
S.Em±	1.22	4.08	0.07	0.51
CD (p=0.05)	3.84	12.86	0.21	1.61

* Significant at 5% level

Calcium content of vegetable soybean genotypes ranged from 54.24- 67.71 mg (Table 2). The highest calcium was found in genotype AGS-436 and the highest phosphorous content reported in AGS-435. Mohmmad *et al*. (1991) observed calcium and phosphorous content of 17 selected vegetable soybean genotypes ranged from 1326.9 - 3262.9 µg/g meal and 12.77-28.33 mg/g meal respectively, which are much higher than values reported in the present study. The differences may due to genotypic variation or environmental condition. Iron content in genotypes ranged from 2.68- 3.70 mg. The highest iron content was observed in genotype AGS-434. Calcium, phosphorous and iron content of vegetable soybean was reported higher than most vegetable legumes such as green peas, cowpea and pigeonpeas. Calcium, phosphorous and iron content in green peas are 20, 139 and 1.5 mg/100 g (Gopalan *et al.* 2007). Phosphorous and iron content of vegetable cowpea were reported by Awasthi *et al. (*1989) in the rage of 54-80 mg/100 g, and 1.5-2.5 mg/100 respectively. Rashmi, 2008 reported calcium, phosphorous and iron content of nine vegetable pigeonpea in the range of 20.9-32.2 mg/100g, 127.3-169.5 mg/100g, 0.53-1.31 mg/100g respectively.

Vitamin C is an essential nutrient for man as he lacks the capacity to synthesise it like many other animal species. It also helps absorption of dietary iron by keeping it in the reduced form, that is, in ferrous form. Vitamin C content of vegetable soybean genotypes ranged from 15.90 to 20.85 mg (Table 2). The highest vitamin C content was found in AGS-434. Awasthi *et al.* (1989) in similar study on ten fresh cowpea genotypes reported the vitamin C content ranged from 14-22 mg/100 g. Genotype L- 1552 exhibited its highest vitamin C content. These values are similar to values mentioned in present study.

Table 3: Soluble (SDF), insoluble (IDF) and total dietary

Genotypes	IDF	SDF	TDF
AGS-434	21.58	1.60	23.18
AGS-435	19.97	2.73	22.70
AGS-436	25.93	2.71	28.61
AGS-437	18.19	2.15	20.34
AGS-438	21.14	2.30	23.44
AGS-439	20.03	1.57	21.60
AGS-440	19.74	1.85	21.59
GC- 99010-35-1-2-2	19.82	2.04	21.85
GC- 98017-7-196-1-2	22.38	1.72	24.10
GC-00209-4-1-1 (control)	24.88	2.31	27.19
F value	*	*	*
S.Em±	0.20	0.09	0.26
CD (p=0.05)	0.59	0.27	0.76

* Significant at 5% level

The dietary fiber (DF) is the sum of the polysaccharides and lignins which are not digested by the endogenous secretions of the human gastrointestinal tract. In recent years, it is suggested that some amount of DF must be present in diet. Depending on the solubility in water, DF is further divided into insoluble (IDF) and soluble dietary fiber (SDF). The sum of these two fractions is known as total dietary fiber (TDF). The SDF is effective in reducing incidence of coronary heart disease (CHD), type II diabetes and obesity. In present study IDF, SDF and TDF ranged from 18.19- 25.93 g, 1.57- 2.73 g, 20.34- 28.61 g respectively (Table 3). AGS-436 had highest value of IDF and TDF. SDF was observed highest in AGS-435. Vegetable soybean is superior to other vegetable legume in dietary fiber such as green peas (TDF 8.6 g/100 g) (Gopalan *et al*. 2007).

Many plant origin foods contain a wide range of anti-nutrients which interfere with the assimilation of nutrients by binding to form chelates. The important anti nutrients are trypsin inhibitors, phytates, phenols, tannins etc.

Table 4 : Phytate, tannin and trypsin inhibitor content of vegetable soybean genotypes

Genotypes	Phytate (mg/g)	Tannin (mg/100g)	Trypsin inhibitor (units/mg)
AGS-434	9.29	123.1	23.05
AGS-435	10.06	108.8	23.28
AGS-436	8.79	157.4	25.02
AGS-437	13.94	189.9	25.53
AGS-438	15.06	196.2	25.41
AGS-439	12.11	100.6	26.44
AGS-440	21.49	152.2	25.08
GC-99010-35-1-2-2	20.14	164.2	28.42
GC-98017-7-196-1-2	15.33	206.6	28.89
GC-00209-4-1-1 (control)	16.44	184.9	23.85
F value	*	*	*
S.Em±	0.22	2.66	0.61
CD (p=0.05)	0.69	8.37	1.933

* Significant at 5% level

Phytate content of vegetable soybean genotypes ranged from 8.79 to 21.49 mg/g. The highest phytate content was observed in AGS-440, followed by GC- 99010-35-1-2-2 (27.11 mg/g). Genotype AGS-436 (8.79 mg/g) showed the lowest phytate content (Table 4). Tannins are polyphenolic compounds, occurring widely and influence the protein quality of legumes. In present investigation, tannin content ranged from 100.6-206.6 mg/100g. The highest tannin content was found in GC-98017-7-196-1-2. The least value was reported in genotype AGS-439 (Table 4). The values observed in the present study is similar to that found for five Nigerian varieties of immature soybean by Obatolu and Osho (2006). The tannin content ranged from 1.0- 2.7 mg/g. Values were significantly higher in TGX1448-2 (2.7 mg/g) and TGX 923-2 (2.6 mg/g). Trypsin inhibitors are proteins distributed widely in plant foods like

legumes. They generally inhibit the activity of trypsin in the gut and interfere with the digestibility of dietary proteins and reduce their utilization. Trypsin inhibitor content of vegetable soybean genotypes ranged from 23.05 to 28.89 unit/mg protein. The highest content was observed in GC- 98017-7-196-1-2 and the lowest in AGS-434 (Table 4). Mohammad *et al.* (1991) in similar study reported trypsin inhibitor content of 17 genotypes of vegetable soybean ranged from 18.80 units/mg meal for PI 416771 to 40.67 units/mg meal for PI 417052.

Conclusion

The green seeds shelled from the immature pods of soybeans bear great potential for human consumption in India like the green pods of other legumes. The green seeds can be added to stews and soups, and also boiled in salt water. Furthermore, no other vegetable crop can match the nutritional value of the vegetable pods of soybeans. Fresh vegetable legumes namely pea, cowpea, pigeonpea and fresh beans (*phaseolus vulgaris*) are an integral part of the Indian diet. Thus there is a huge potential for vegetable soybean to be added in to the diet as a good and economical source of nutrition.

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PHYSICO-CHEMICAL CHARACTERS, SENSORY QUALITY AND STORAGE BEHAVIOUR OF JACKFRUIT NECTAR BLENDED WITH AVOCADO AND KOKUM.

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Introduction : Majority of the fruit crops produced are season bound and hence, there is need for post harvest processing of the fruit and its products in the off season. Jackfruit (*Artocarpus heterophyllus* L.) is an important minor fruit crop of the tropical region. It belongs to family Moraceae. The ripe jackfruit bulbs are rich in sugars with a calorific value of about 90 calories per 100 g fresh weight. Jackfruit is nutritious, rich in vitamins (A and B), minerals (Ca, K and Fe) and contains considerable amount of carotene and vitamin-C. It is an important source of pectin and protein (Anon., 2000). Fruit is highly fibrous and nutritious, containing 18.90 g carbohydrates, 0.8 g minerals, 30 IU vitamin-A and 0.25 mg thiamine for every 100 grams of fruit (Sammaddar, 1985).

In this perspective a study was taken up in an effort to-

1. To standardize the recipes for preparation of product of jackfruit nectar blended with avocado and kokum
2. To study the keeping quality of prepared products in ambient conditions
3. To study physico-chemical characteristics and organoleptic evaluation of prepared products for quality and acceptability.

Material and methods

The experiment was carried out at the Department of Horticulture, Gandhi Krishi Vigyan Kendra, University of Agriculture Sciences, Bangalore for extraction of jackfruit juice. Outer rind was removed using stainless steel knife and bulbs were cut into small pieces. Fresh pulp was separated and known quantity of bulb was blended with equal amount of water (1:1 w/v) and filtered with the help of muslin cloth.

Juice from avocado was obtained by blending pulp with water in the ratio of 1:2 (w/v). Kokum fruits were, first, thawed using plain water and then, the fleshy pulp was separated from the rind. A known quantity of rind was blended with equal amount of water to obtain the kokum juice.

The Fruit Product Order (FPO) minimum specification for nectar minimum 10 per cent of fruit juice/pulp, minimum percentage TSS 15° Brix and acidity 0.25 per cent. Recipes were prepared with 20 and 23 per cent TSS 15 and 18° Brix and 0.3 per cent acidity.

Preparation of products for chemical analysis

Jackfruit nectar blended with avocado and kokum

The nectar was prepared by blends like jackfruit (65%), avocado (15%) and kokum (20%). Sugar syrups of desired strength 15^0B and 18^0B were prepared by dissolving sucrose in warm water. A known amount of blended juice was added to it. As the TSS value dropped due to addition of the juice, it was adjusted by adding required amount of sucrose while making up the total volume with water for each treatment. Acidity was checked and adjusted to the desired level by using citric acid.

Sodium benzoate (120ppm) was dissolved in a spoonful of warm water and added to the product as a preservative. The prepared product was filtered with the help of muslin cloth and was filled into pre-sterilized bottles of 200 ml. capacity each and sealed with crown caps using leg operated crown corking machine. The sealed bottles were, then, kept in boiling water for half an hour for pasteurization and, were stored at room temperature.

The TSS was analyzed by using Erma-hand refractometer, Titrable acidity, sugars and vitamin-C were estimated by using Ranganna, (1977) and Somogyi (1945) methods respectively. Organoleptic evaluation of the product was done by a panel of 20 judges by numerical scoring method (Amerine *et al*, 1965).

Treatments

N_1T_1: 20(%) pulp, 15^OB and 0.3(%) acidity
N_1T_2: 20(%) pulp, 18^OB and 0.3(%) acidity
N_2T_1: 23(%) pulp, 15^OB and 0.3(%) acidity
N_2T_2: 23(%) pulp, 18^OB and 0.3(%) acidity

The results were analysed using factorial CRD (Completely Randomize Design)

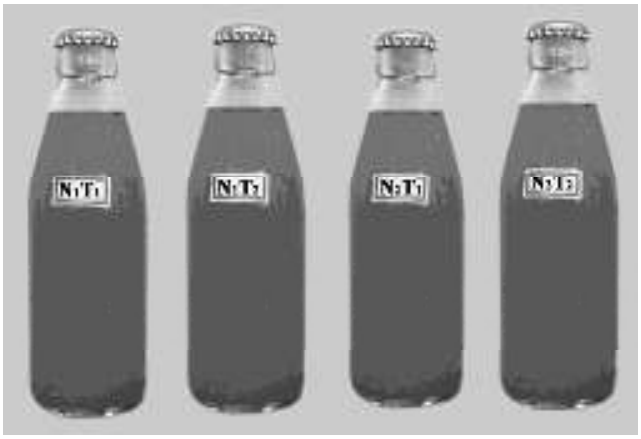

Plate 1: Jackfruit nectar blended with avocado and kokum with 20 (%) and 23 (%) pulp (Jackfruit, Avocado and Kokum in the ratio of 65:15:20) and TSS 15^0 and 18^0 B

Results and discussion

The total soluble solids of jackfruit was 28-29^{0}Brix, while acidity recorded 0.170 per cent. Fruit pulp contains 27.65 per cent of total sugars of which 20.10 per cent of reducing sugars and 7.55 per cent of non-reducing sugars (Table1).

The results of the changes in chemical composition of jackfruit nectar blended with avocado and kokum revealed maximum increase in total soluble solids levels during the storage period of 120 days in N_2T_2 as shown in Table 2, This might be due to increase in total sugars by inversion in the presence of organic acids of polysaccharides like starch and cellulose substances into simpler soluble molecules and also inversion of added sucrose into simpler soluble substances in the course of time. Similar results were obtained by Vijay jain *et al*, (2006) in Aonla squash

The pH of nectar increased during storage period of 120 days (Table 2). Maximum initial pH of 4.90 was recorded in N_1T_2 whereas it increased to 4.95 at 120 days of storage, A corresponding decrease in acidity of products during storage could be responsible for change in pH (Madan Lal choudhary *et al*. (2006) in guava RTS).
Acidity of nectar decreased after a storage period of 120 days and reduction in acidity was found in N_1T_2 ranging from 0.30 to 0.23 per cent during storage period. This could be due to chemical interaction between the organic constituents of the juice induced by temperature and action of enzymes.

A declining trend in the ascorbic acid content of nectar was noticed during storage period. However, the interaction effects of N_2T_2 recorded maximum ascorbic acid content of 26.40 mg/100 g initially, which was 15.10 mg/

100 g after 120 days of storage (Table 3) The decline in ascorbic acid concentration could be due to thermal degradation during processing and subsequent oxidation in storage as it is very sensitive to heat and pressure treatment, Similar results were obtained by Teotia *et al*. (1997) in muskmelon nectar from enzyme clarified juice and Doodanth and Badriel (2000) in water melon nectar.

There was a considerable increase in reducing sugars content of nectar during storage. It was found maximum (5.77 per cent) in N_2T_2 which increased to 11.99 per cent at 120 days of storage, There was a continuous reduction in non-reducing sugar content of nectar throughout storage period at fresh and maximum non-reducing sugar content was noticed in N_2T_2, which to decreased to 4.38 per cent at 120 days of storage. This could be due to inversion of non-reducing sugars to reducing ones caused by acids present in products.

Slight increase in total sugar content of nectar was observed during storage period. The Total sugar content in N_2T_2 was 16.25 per cent initially that increased to 16.36 per cent after 120 days storage Table 4. The increased levels of total sugars were probably due to conversion of starch into simple sugars. Similar results were reported by Gajanana (2002) in Aonla juice and Krishnaveni *et al*, (2001).

During processing with aseptic methods followed for handling the products, bottles used for storing products were pre-sterilised and dried properly before filling the products. Ergo there was no visible spoilage of products during storage. The findings were in agreement with findings of Giridharlal *et al* (1986).

Organoleptic qualities of content of jackfruit nectar blended with avocado and kokum

Nectar prepared with different recipes was subjected to organoleptic evaluation at 120 days of storage to assess the quality attributes like appearance, aroma and flavour, taste and overall acceptability. The scores obtained for these parameters are presented in Table 5.

Appearance

The interaction effect with respect to pulp and TSS levels had significant effect on the appearance of nectar. Nectar prepared with 23 per cent pulp and TSS levels of 18^0B (N_2T_2) recorded highest score of 4.15. Lowest score of 3.50 was recorded in treatment N_1T_1.

Aroma and flavour

The data shows significant difference in the interaction effect of pulp and TSS levels in relation to aroma and flavour of nectar. Highest score of 4.10 was recorded in treatment with 23 per cent pulp and 18^0B (N_2T_2) and Treatment N_1T_1 registered lowest score of 3.22.

Taste

There was significant difference in the interaction of pulp and TSS levels in relation to taste of the nectar and highest score of 3.95 was recorded in treatments with 23 per cent pulp and TSS level of 18^0B (N_2T_2) and Treatment N_2T_1 registered lowest score of 3.20.

Overall acceptability

The difference between the scores obtained was significant for interaction effects. A highest score of 3.96 was recorded in treatment N_2T_2 whereas, the lowest score of 3.70 was recorded in treatment N_1T_2.

Table 1: composition of jackfruit pulp

Sl. No.	Parameters	Observation
1.	Total soluble solids (^{0}B)	28-29
2.	Titrable acidity (%)	0.17
3.	Total sugars (%)	27.65
4.	Reducing sugars (%)	20.10
5.	Non-reducing sugars (%)	7.55

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Table 2: Changes in pH and TSS content of jackfruit nectar blended with avocado and kokum during storage

Factors	pH					TSS (^{0}Brix)				
	Fresh	30 days	60 days	90 days	120 days	Fresh	30 days	60 days	90 days	120 days
Pulp (%)										
20 (N_1)	4.86	4.87	4.89	4.90	4.91	16.50	16.81	17.10	17.40	17.70
23 (N_2)	4.83	4.84	4.86	4.88	4.90	16.50	16.97	17.40	17.55	17.87
F-test	*	*	*	*	*	NS	*	*	NS	*
SEm±	0.002	0.002	0.002	0.002	0.002	0.381	0.014	0.014	0.204	0.020
CD (5%)	0.008	0.008	0.008	0.008	0.008	-	0.045	0.044	-	0.060
TSS (^{0}B)										
15^{0}B (T1)	4.81	4.82	4.83	4.85	4.88	15.0	15.32	15.70	15.95	16.17
18^{0}B (T2)	4.88	4.89	4.91	4.93	4.94	18.0	18.46	18.80	19.0	19.40
F-test	*	*	*	*	*	*	*	*	*	*
SEm±	0.002	0.002	0.002	0.002	0.002	0.381	0.014	0.014	0.204	0.020
CD (5%)	0.008	0.008	0.008	0.008	0.008	1.176	0.045	0.044	0.629	0.060
Interaction										
N_1T_1	4.83	4.84	4.85	4.87	4.88	15	15.30	15.50	15.80	16.1
N_1T_2	4.90	4.91	4.93	4.94	4.95	18	18.30	18.70	19.00	19.30
N_2T_1	4.80	4.81	4.82	4.84	4.88	15	15.35	15.90	16.10	16.25
N_2T_2	4.86	4.87	4.90	4.92	4.93	18	18.60	18.90	19.00	19.50
F-test	NS	NS	NS	NS	*	NS	*	*	NS	*
Em±	0.004	0.004	0.002	0.003	0.004	0.540	0.020	0.020	0.288	0.030
CD (5%)	-	-	-	-	0.012	-	0.063	0.063	-	0.060

* Significant at 5%; NS = Non-significant

Table 3: Changes in acidity and ascorbic acid content of jackfruit nectar blended with avocado and kokum during storage

Factors	Acidity (%)					Ascorbic acid (mg/100g)				
	Fresh	30 days	60 days	90 days	120 days	Fresh	30 days	60 days	90 days	120 days
Pulp (%)										
20 (N_1)	0.30	0.28	0.25	0.24	0.24	23.70	18.80	16.50	14.42	12.72
23 (N_2)	0.30	0.27	0.25	0.24	0.24	25.80	23.25	19.55	16.95	14.80
F-test	NS	*	NS	NS	NS	*	*	*	*	*
SEm±	0.002	0.002	0.004	0.004	0.002	0.100	0.144	0.25	0.002	0.002
CD (5%)	-	0.008	-	-	-	0.309	0.444	0.77	0.008	0.007
TSS (^{0}B)										
15^{0}B (T1)	0.30	0.27	0.26	0.25	0.25	24.27	19.75	17.00	15.02	13.30
18^{0}B (T2)	0.30	0.27	0.25	0.24	0.23	25.25	22.30	19.05	16.35	14.22
F-test	NS	NS	NS	NS	*	*	*	*	*	*
SEm±	0.002	0.002	0.004	0.002	0.002	0.100	0.144	0.25	0.002	0.002
CD (5%)	-	-	-	-	0.008	0.309	0.448	0.77	0.008	0.007
Interaction										
N_1T_1	0.30	0.28	0.26	0.25	0.25	23.30	17.50	15.00	13.75	12.10
N_1T_2	0.30	0.28	0.25	0.24	0.23	24.10	20.10	18.00	15.10	13.35
N_2T_1	0.30	0.27	0.26	0.25	0.25	25.25	22.00	19.00	16.30	14.50
N_2T_2	0.30	0.27	0.25	0.25	0.24	26.40	24.50	20.10	17.60	15.10
F-test	NS	NS	NS	NS	NS	NS	NS	*	*	*
SEm±	0.004	0.004	0.005	0.004	0.004	0.142	0.204	0.350	0.002	0.003
CD (5%)	-		-	-	-	-	-	1.08	0.008	0.011

* Significant at 5%; NS = Non-significant

Table 4: Changes in total sugars, reducing sugars and non-reducing sugars content of jackfruit nectar blended with avocado and kokum during storage

Factors	Total sugars (%)					Reducing sugars (%)					Non-Reducing sugars (%)				
	Fresh	30 days	60 days	90 days	120 days	Fresh	30 days	60 days	90 days	120 days	Fresh	30 days	60 days	90 days	120 days
Pulp (%)															
20 (N_1)	15.10	15.12	15.16	15.18	15.22	5.11	6.74	8.09	9.35	10.85	10.00	8.40	7.07	5.84	4.36
23 (N_2)	15.32	15.38	15.42	15.42	15.48	5.24	6.84	8.47	9.56	11.07	10.12	8.55	7.06	5.87	4.28
F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
SEm±	0.003	0.002	0.012	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.002	0.002	0.001	0.001	0.001
CD (5%)	0.010	0.006	0.038	0.006	0.006	0.010	0.013	0.014	0.013	0.014	0.006	0.007	0.003	0.003	0.003
TSS (^oB)															
15^oB (T1)	14.30	14.32	14.37	14.38	14.44	4.64	5.74	6.73	7.86	10.09	9.67	8.60	7.76	6.52	4.22
18^oB (T2)	16.15	16.18	16.12	16.23	16.26	5.72	7.84	9.84	11.05	11.84	10.45	8.35	6.37	5.18	4.42
F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
SEm±	0.003	0.002	0.012	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.002	0.002	0.001	0.001	0.001
CD (5%)	0.010	0.006	0.038	0.006	0.006	0.010	0.013	0.014	0.013	0.014	0.006	0.007	0.003	0.003	0.003
Interaction															
N_1T_1	14.15	14.17	14.21	14.23	14.28	4.56	5.71	6.63	7.85	10.02	9.60	8.47	7.59	6.39	4.27
N_1T_2	16.05	16.08	16.10	16.13	16.15	5.66	7.76	9.55	10.85	11.68	10.40	8.33	6.56	5.29	4.18
N_2T_1	14.45	14.48	14.52	14.53	14.60	4.71	5.76	6.82	7.87	10.15	9.72	8.72	7.94	6.66	4.46
N_2T_2	16.25	16.28	16.32	16.32	16.36	5.77	7.91	10.12	11.25	11.99	10.50	8.38	6.19	5.08	4.38
F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
SEm±	0.004	0.003	0.017	0.003	0.003	0.006	0.006	0.006	0.006	0.006	0.003	0.003	0.001	0.001	0.001
CD (5%)	0.014	0.009	0.054	0.009	0.009	0.019	0.019	0.019	0.018	0.020	0.009	0.010	0.004	0.003	0.003

Table 5: Organoleptic scores of jackfruit nectar blended with avocado and kokum during storage

Factors	Appearance	Aroma and flavour	Taste	Over all acceptability
Interaction				
N_1T_1	3.50	3.22	3.62	3.75
N_1T_2	3.85	3.75	3.80	3.70
N_2T_1	4.05	4.02	3.20	3.82
N_2T_2	4.15	4.10	3.95	3.96
F-test	*	*	*	*
SEm±	0.004	0.004	0.082	0.004
CD (5%)	0.013	0.012	0.252	0.012

* Significant at 5%; NS = Non-significant

N_1T_1 : 20(%) pulp, 15^oB N_1T_2 : 20(%) pulp, 18^oB

N_2T_1 : 23(%) pulp, 15^oB N_2T_2 : 23(%) pulp, 18^oB

Ag.Ho.F.V.Sc:-06

UTILIZATION OF FRUIT WASTE

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Introduction

Fruits are more prone to spoilage than cereals due to their nature and composition and about 20-40% of these are lost due to non availability of proper infrastructure during post harvest operations. Efficient, disposal and recycling of these wastes can help in minimizing pollution hazard, supply of vital nutritional components in foods and feeds and bringing down the cost of production.

Waste utilization is both a necessity and a challenge. In food industry the recovery and modification of wastes are becoming increasingly important. During processing large quantities of wastes accumulate but these wastes are really the by products of industrial processing of materials and have greater economic significance. The effective utilization of some of these wastes in developing countries has resulted in the production of very valuable by-products, resulting in the economy in the cost of production of the main product.

Hence proper and economic utilization of wastes of food processing industries is not only necessity for proper development of food industries, but also essential to make these units economically viable in our country. Besides, with the increase in world population and the existing shortage of high quality low-cost foods recovery of the nutrients from presently wasted sources and their utilization as food and feed will help to fill up the gap between world population and world food supplies.

Present production of fruits and vegetables

In the last 3-4 decades, India has made great strides in fruit and vegetable production .according to FAO production Year Book, 2006.it is now ranked as the largest producer of fruits and second largest producer of vegetables after China with a total production of 31 million tonnes of fruits and about 72 million tonnes of vegetables. our share in world production is about 8.56% of total fruits and 13.50% of total vegetables.

Estimation of wastes

Due to lack of post-harvest management infrastructure, developing countries lose a big chunk of their total production (Table 2). Conditions in India are not much better.

Estimated loss of fruit and vegetables developing countries

Commodity	Estimated loss (%)
Fruits	
Banana	20-80
Papaya	40-90
Avocado	43
Apricot	28
Citrus	20-95
Grapes	27
Mango	40-60
Apples	14

Fruit processing wastes available India annually

Fruit	Nature of waste	Production (0000 tones)	Approximate waste conent(%)	Potential quantities of wastes (0000 tones)
Mango	Peel and stone	6987.7	45.00	3144.4
Banana	Peel	2378.0	35.00	832.3
Citrus	Peel, rag and seed	1211.9	50.00	606.0
Grapes	Stem, skin and seed	20.00	20.00	——
Guava	Peel and core with seed	656.4	10.00	——
Tomato	Skin, core and seed	664.4	20.00	90.3
Potato	Peel	2769.0	15.00	415.3
Apple	Peel, pomace and seed	1376.0	——	412.0

Nutrient composition of different fruit wastes

Waste	Moisture (g)	Protein (g)	Fat (g)
Apple pomace	——-	2.09	1.71
Mango seed kernel	8.2	8.50	8.85
Jack fruit seeds	64.5	6.00	0.40
Jack seed flour	77.0	2.64	0.28
Passion fruit peel	81.9	2.56	0.12
Banana peel	79.2	0.83	0.78
Sweet orange seeds	4.00	15.80	36.90
Watermelon seeds	4.3	34.10	52.60
Muskmelon seeds	6.8	21.00	33.00
Pumpkin seeds	6.0	29.50	35.40

Need to utilize fruit and vegetable wastes

* Left unattended fruit wastes can be source of atmospheric pollution and contamination
* Efficient disposal and recycling of these wastes can help in minimizing the pollution hazards
* Bring down the cost of production of processed foods
* Provide valuable raw material for gas reactors, organic manures and extraction of some useful by-products
* Effective handling of produce and conversion of solid waste into wealth are the basis of appropriate technology for ending poverty and insanitation and malnutrition prevailing in our country

Potential by-products of fruit wastes

Fermented Edible products

A number of beverages such as cider, beer, wine and brandy, and vinegar can be obtained from the fermentation of fruit wastes.Apple pomace has been utilized for the production of cider. Best quality of cider can be made by carbonating it. Good quality apple cider and brandy can also be produced by fermenting milled apple pulp. The possibility of making brandy from dried culled and surplus apples, grapes, oranges and other fruits have also been explored. Vinegar can also be prepared from fruit wastes. The fruit waste is initially subjected to alcoholic fermentation by acetic acid fermentation by Acedobacter bacteria, which produce acetic acid. Vinegar production by fermenting waste from pineapple juice has been reported. Vinegar production by fermenting orange peel juice has also been attempted successfully. Apple pomace extract can also be mixed with molasses in the ratio of 2:1 for producing vinegar.

Single Cell Proteins

Single cell proteins can be produced from dried and pectin extracted apple pomace by using Trichoderma viride and Aspergillus niger. The grape waste and pressed apple pulp have also been employed as a substrate for Aspergillus niger to generate crude protein and cellulose. Pineapple waste for single cell protein production has also been utilized. Using Fusarium has also used citrus peel juice to generate single cell protein. The waste from brewery and distilleries can also be used for the production of single cell proteins. Potato peels supplemented with ammonium chloride have also been used for the production of protein by using a non-toxic fungi pleurotus ostreatus. Similarly, waste from orange, sugarcane and grape processing industry have also been utilized for the production of single cell protein.

Animal Feed

The waste obtained from processing of fruits and vegetables is rich in fibre, which includes cellulose, hemi-cellulose, lignin and silica with poor quality of protein. Fermented potato waste has been successfully tried as animal feed. Apple pomace after fermentation with different species yeast, followed by drying, makes the feed enriched with proteins, vitamins, minerals and fats and which can be used for feeding animals. Waste from wineries, breweries and distilleries can be used for feeding livestock. Animal feed can also be obtained from grape pomace after fermentation. Dry brewer's grains after addition of molasses become a very good cattle feed.

Ethanol

The waste from fruits and vegetable processing industries being polyaaccharides (cellulose, hemi-cellulose and lignin) can be subjected to solid state fermentation for the production of ethanol, which has several uses. It can be used as a liquid fuel supplement and as a solvent in many industries. Process for production of ethanol from apple has been developed. Pear and cherry waste have also been utilized for production of ethanol. Orange peel after enzymatic hydrolysis was found suitable for the production of ethanol by use of Saccharomyces cerevisiae.

Biogas Production

Bio-mass consisting of agricultural, forest, crop residues, solid and liquid wastes from industries, sewage and sludge can be utilized for production of biogas through microbial technology. Similarly, the waste from fruit and vegetable processing industries has been used for production of biogas. Biogas is produced by anaerobic digestion of fruit and vegetable wastes. Methanotropic bacteria like Methanobacterium and Methanococus spp. can utilize CO2 from waste materials to produce methane. During this process, the complex polymers are first hydrolyzed into simple substances by acid forming bacteria and finally these are digested anaerobically by methanotropic bacteria and methane gas is liberated.

As source of Nutrients

1. Source of fat

- Mango seeds
- Tomato seeds
- Muskmelon, watermelon, cucumber seed kernels

2. Production of starch
- Banana pseudo-stem
- Mango seed kernel
- Jack fruit seed flour
- Ungraded Potato flour

4. Protein
- Seeds of all fruits

3. Extracting Dietary fiber
- Carrot peel
- Banana peel

Production of Food additives

1.Essential oil
- Citrus fruits peels (*D-limonine*)

2. Extraction of pectin
- Citrus peels
- Mango peels
- Guava peels

3. Pigment extraction
- Mango peels
- Carrots peels
- Grapes skin

4. Flavours and gums
- Cabbage waste (xanthan gum-*Xanthomonas compestris*)
- Citrus waste

5. Organic compounds: Citric acid, Acetic acid, Lactic acid
- Citrus peel juice and citrus waste (*Aspergillus niger*)
- Apple pomace
- Sweet potato residues
- Mandarine orange waste
- Apple pomace
- Grape pomace

6. Antioxidants:
- Tomato seed oil
- Apple peel

Industrially important products

1.Enzymes
- Sauerkraut waste (Invertase- *Candida utilis*)
- Baked bean waste (Amylase)
- Dried apple pomace (cellulase,xylanase-*Trichoderma viridae*)
- Papaya waste (Papain)
- Pineapple (Bromelin)

2. Vinegar
- Pineapple waste
- Orange peel

3.Essential oils
- Citrus waste

4. Alcohalic beverages
- Cider (apple waste)
- Wine (grapes waste)

5. Natural colours
- Blue grape skin
- Kokum waste(Garcinol ,*Garcinia indica*)
- Jamun peel (*Syzygium cumini*)
- Tomato peel (lycopene)
- Papaya peel (chlorophyll)
- Beet root peel

6.Cosmetics
- Orange peel –facepacks
- Nail paints-water melon rind

Value added products

1. Citrus peel – Candy
2. Water melon rind –Pickle, Candy, Tutti-frutti, Jam
3. Jack fruit seed –Incorporation into chapati, jamun mix...
4. Carrot waste – Candy
5. Low grade Potato – Halwa powder, Tikki powder
6. Water melon, Pumpkin, Muskmelon, Cucumber Seed kernel –Sweets, Bakery items, Ice-creams

Animal feed

* Molasses -Orange peels, seeds
* Poultry feed –ripe banana peel powder, dehydrated citrus peel, tomato seed oil and cake
* Fodder pellets -peel orange
* Single cell protein- Apple pomace- *Candida utilis, Saccharomyces cerevasiae*

Orange peel and grape stalks-*Aspergillus niger*

Bio-fuel production

- Biogas, Biofuel and Biodiesel -mango and banana peels, mango seeds, vegetable processing wastes
- Ethanol-pineapple, papaya waste

Thus, the waste from fruit and vegetable processing in real sense is not a waste as every thing can be profitably recycled, bio converted and utililzed in one or the other form as food, feed or fodder. However, most of the technologies for the waste utilization are developed at the laboratory scale, so these technologies needed to be standardized for commercial exploitation by the industry. Since the waste is a source of pollution, it has to be treated before discharging into the environment. The regulatory agencies can act as catalyst in developing different processes for the utilization and management of waste arising out of processing industries and industries engaged in food processing should invest a

part of their investment on research and development for waste utilization and standardization of the various processes which are commercially viable. Furthermore, the wastage in fruit and vegetable can be effectively managed by the use of bio-technology, by maintaining efficient food distribution system and by promoting domestic and international trade. Thus, proper waste utilization will add to the wealth of the nation and will benefit all involved in the process.

Ag.Ho.F.V.Sc:-07

VALUE ADDED PRODUCTS FROM POMEGRANATE

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Introduction:

Pomegranate fruit is very popular for its delicious and Nutraceutical properties. The Pomegranate (Punica granatum) belongs to Punicaceae family and is one of the oldest known edible fruits. Pomegranate is native to the region of Persia and the Himalayan ranges of India and in some districts like Bagalkot, Bijapur, Koppal of North Karnataka. In the Northern Hemisphere, the fruit is typically in season from September to February.[3] In the Southern Hemisphere, it is in season from March to May.

"Pomegranate" derives from Latin pomum ("apple") and granatus ("seeded"). This has influenced the common name for pomegranate in many languages (e.g., German Granatapfel, "Granat" meaning "garnet" and "Apfel" meaning "apple", thus "garnet apple"). Perhaps stemming from the French word for the fruit, "pomme-grenade", the pomegranate was known in early English as "apple of Grenada" — a term which today survives only in heraldic blazons. This was probably a folk etymology, confusing Latin granatus with the Spanish city of Granada. The genus name Punica is named for the Phoenicians, who were active in broadening its cultivation, partly for religious reasons. In classical Latin, where "malum" was broadly applied to many apple-like fruits, the pomegranate's name was malum punicum or malum granatum, the latter giving rise to the Italian name melograno, or less commonly melagrana.

Cultivation:

The pomegranate is native to the region of Persia and the Himalayan ranges of India,[6] and has been cultivated in Iran, Afghanistan, Pakistan, North India, Armenia, Azerbaijan, Georgia, and the Mediterranean region for several millennia.

Scientific Classification of Pomegranate

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Subclass:	Rosidae
Order:	Myrtales
Family:	Lythraceae
Genus:	*Punica*
Species:	***P. granatum***
Binomial Name: *Punica granatum, (L)*	

Nutritive value of Pomegranate arils

Nutritional value per 100 g (3.5 oz)	
Energy	346 kJ (83 kcal)
Carbohydrates	18.7 g
Sugars	13.7 g
Dietary fiber	4.0 g
Fat	1.2 g
Protein	1.7 g
Thiamine (Vit. B_1)	0.07 mg (5%)
Riboflavin (Vit. B_2)	0.05 mg (3%)
Niacin (Vit. B_3)	0.29 mg (2%)
Pantothenic acid (B_5)	0.38 mg (8%)
Vitamin B_6	0.08 mg (6%)
Folate (Vit. B_9)	38 µg (10%)
Vitamin C	10 mg (17%)
Calcium	10 mg (1%)
Iron	0.30 mg (2%)
Magnesium	12 mg (3%)
Phosphorus	36 mg (5%)
Potassium	236 mg (5%)
Zinc	0.35 mg (3%)
Percentages are relative to US recommendations for adults. Source: USDA Nutrient database	

Post Harvest Technology of Pomegranate

Pomegranate's commercial life means the time that this fruit can keep a certain quality level under specific storage conditions.

The physiological status and development of the fruit play an important role in the refrigerated storage and handling processes, aiming to minimise the quality loss. As a non-climatic fruit, pomegranate does not ripen after harvest, and for this reason it has to be harvested when it is fully ripened, when it shows the optimal organoleptic characteristics.

In pomegranates, the more intense the respiration, the faster is the decay. Temperature, relative humidity and atmosphere composition, are the environmental factors that depending on the desired storage period, can be used to reduce the respiration and minimise the physiological and fungal decay losses.

It is evident that one of the main ways to extend the post-harvest life of pomegranates is reducing as much as possible the mechanical damage (bruises, scrapes, cuts, compression etc) with a careful handling. Another essential way to prolong the commercial life of pomegranates is optimising the environmental conditions that will maintain the quality specifications of microbial pathogens. A fast pre-refrigeration using forced air is one of the simplest ways to extend pomegranate is commercial life. This temperature has to be around 5^0C to prevent the production of physiological disorders, during 2-3months storage.

The relative humidity is the second factor in importance. The key concept is the deficit in vapour pressure of difference between relative humidity of the environment. Temperature and relative humidity are closely related and the objective is minimising the weight loss without increasing the microbial development and decay. As pomegranates are commercialised without post-harvest treatments (washing, waxing, fungicides) the fruits must be gently brushed, and kept with a relative humidity around 90-95%, if the fruits are healthy and clean.

The Health Benefits of Pomegranate:

- Rich in Antioxidants (3 times greater than red wine and green tea)
- Reduces the Effects of Ageing
- Drinking daily 250 ml of pomegranate juice can significantly slow the progress of prostate cancer
- Slowers the breast cancer
- Lowers the risk of Type 2 diabetes
- Reduces blood pressure
- Polyphenols present in pomegranate helps to combat, obstructive pulmonary disease
- Effective in reducing macular degeneration and vision loss
- Fights against Arthritis and cystic fibrosis
- Pomegranate plays vital role in development natural drugs

Objectives of the Research:

Aim: To prepare the pomegranate value added products and analysis of nutrients.

Objectives:

- Analysis of raw materials used for the preparation of value added products
- To analyse the final product prepared to check the level of various nutrients like protein, total sugar, energy, fat and the antioxidant content in the final product.
- To prepare the pomegranate value added products. As this is filled with lots of anti-oxidants, this can be a major subject for the self-employment of the women.
- This contains a lot of medicinal properties; it helps in the curing of the diseases related to free radical damage.

Methods for the Preparation of Value Added Products:Pomegranate Beverage

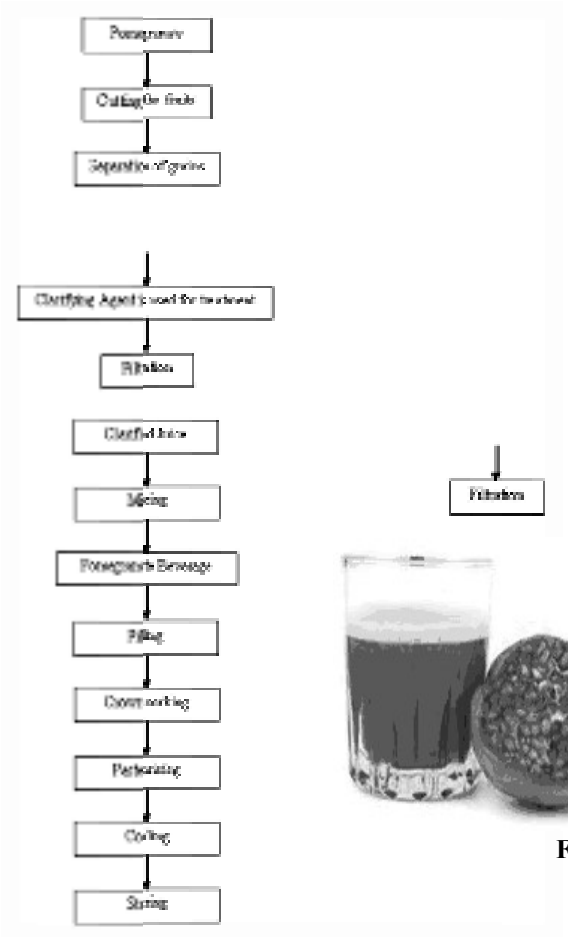

Figure 1: Pomegranate Beverage

Pomegranate Jelly

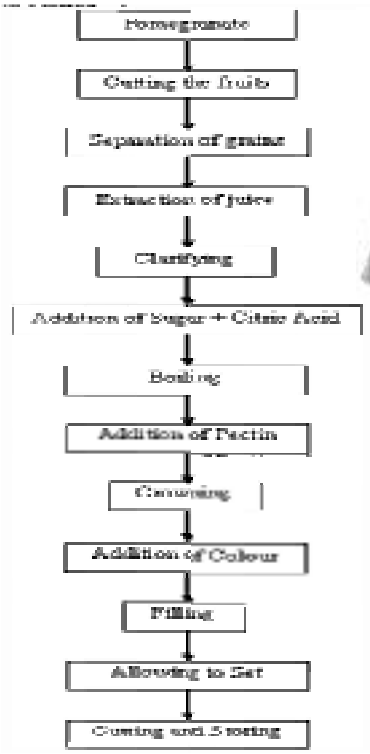

Figure 2 : Pomegranate Jelly

Pomegranate Squash

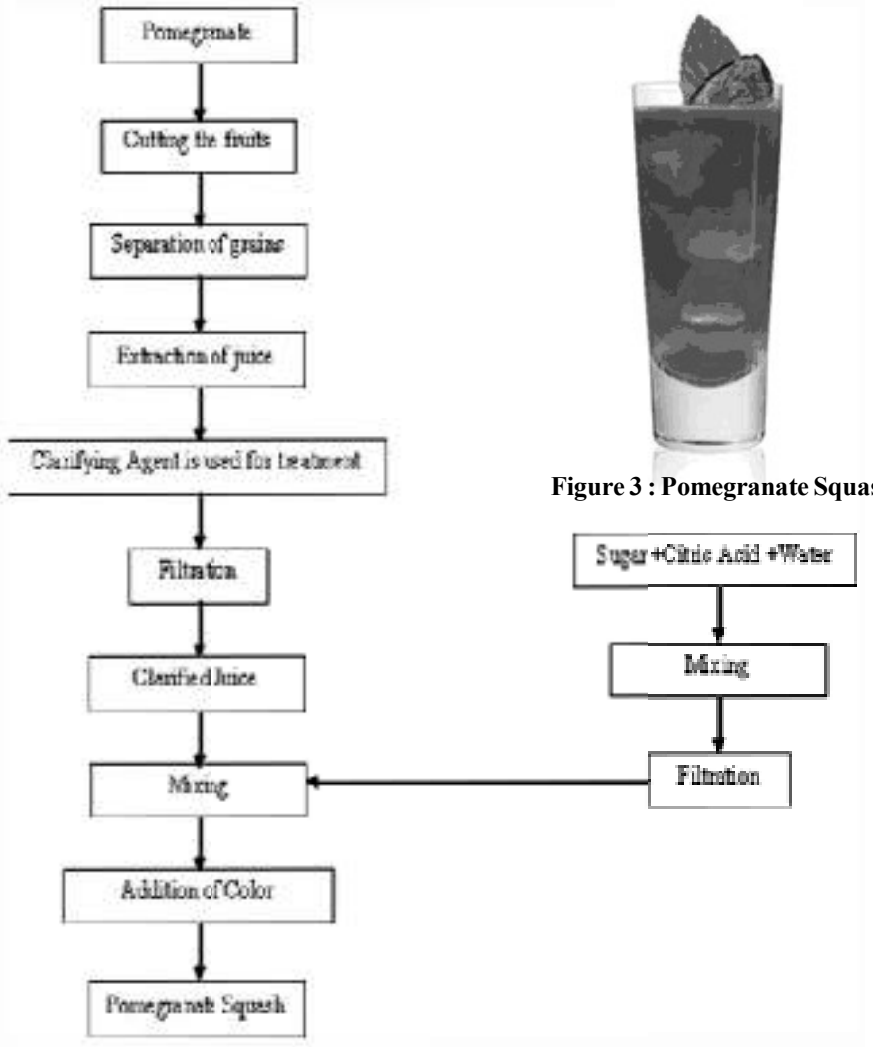

Figure 3 : Pomegranate Squash

Material and Methods:

List of Raw materials and Tools:

- Pomegranate Fruits
- Sugar/ Artificial Sweetners
- Water
- Weighing Balance
- Knives
- Aril Separator
- Juice Extractor
- Vessels
- Gas Stove / Cylinders for Lab
- Refractometer
- Glass bottles/ jars
- Fillers
- Stirrer
- Crowning Machine

Screw Type Juice Extractor

Refractometer

Chemicals Used:

- Sodium Benzoate (120ppm)
- Citric Acid (0.3%)
- Carmosine colour.

Crowning Machine

Analysis of Pomegranate Value Added Products:

1. Estimation of Hardness of water by EDTA Method
2. Determination of Brix using Hand Refractometer.
3. Estimation of Energy in Pomegranate Value Added Prod ucts.
4. Estimation of Protein by Folin- Lowry method.
5. Estimation of Total sugar by Phenol- sulphuric Acid Method.
6. Estimation of Total Anthocyanin in Fruits.

All these were the analyses of raw materials and the final product was done and the results were obtained as below:

Resluts :

Sl. No	Description	Result
01	Hardness of water	365µg/lit of $CaCO_3$
02	Estimation of Brix	15^0B
03	Energy	67.00Kcal/100ml of sample
04	Protein	0.82gm/100ml
05	Total sugar	12.4gm/100ml
06	Anthocyanin	3mg/100ml

Conclusion:

Pomegranate Beverage, Jelly, Squash contain all the nutrients in almost same level as that in the fresh fruit and these nutrients and antioxidants present in pomegranate are very much required by the humans to maintain good health.

Pomegranate products contain 3.0mg Anthocyanin /100ml of sample which is a major antioxidant that acs against and scavenge the free radicals and prevents their action on other cellular constituents in the body which otherwise initiate various disorders. Pomegranate product's consumption significantly reduces cellular peroxides (71%) and increases glutathione levels in diabetic patients. Pomegranate product's consumption significantly decreases the extent of Ox-LDL cellular uptake (39%). Thus pomegranate product's consumption by diabetic patients will not worsen the diabetic parameters, but rather results in anti-oxidative effects on serum and macrophages, which could contribute to attenuation of atherosclerosis development in the diabetic patients. Ergo, Pomegranate products have very much health benefits and these can be good marketability products for the self-employment of women and others.

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Ag.Ho.F.V.Sc:-08

JAMUN – A DIABETES FIGHTER

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Introduction

Jamun (*Syzygium cumini*) is an important indigenous minor fruit rich in neutraceutical and antioxidant properties with commercial value. The jamun fruit possesses considerable nutritional and medicinal value; hence the fruit has received more recognition in folk medicine. It is native to India, Pakistan, Bangladesh and Indonesia. Jamun is also commonly called by different names such as Eugenia, Nerale hannu, Njaval, Jambolan, Black plum, Malabar plum, Damson plum, Duhat plum, Jambolan plum, Portuguese plum, Indian black berry. Since ancient times it is known for its unusual taste, flavour and colour. It is popularly consumed and available only in summer season. The fruit has sweet, mildly sour and astringent flavour. Children enjoy fruit mainly due to purple colouring of tongue when eaten. The berry has an unusual taste but it is power house of health with medicinal properties. The bark, fruit, leaves and seeds are used in treatment of various disorders.

India is becoming diabetic capital in the world. WHO has stated that India will have the highest number of diabetic people by 2020, combating this problem through food offers a natural and safe way to prevent onset of diabetes. Hence jamun fruit is boon to the diabetics. Daily consumption of jamun fruit or extracts gives positive results. Jamun is officially named as a diabetes fighter by the studies conducted by Indian Journal of Pharmacology and Baba Atomic Research Centre and Central Drug Research Institute for its hypoglycemic (lowering blood sugar) properties.

Nutritional value

The jamun fruits are oblong, ovoid, pink at maturity and crimson black when ripe. The fruit has 70% edible portion. The fruit pulp carries incredible amounts of nutrients. Glucose and fructose are the principle sugars present in ripe fruit with no traces of sucrose. The sugar present in the form of glucose and fructose helps in providing hydration on consumption. The fruit contains large number of vitamins and minerals with fewer calories as compared to other fruits. It is fairly good source of vitamin A, vitamin C, and folic acid. The fruits are also fairly rich in mineral such as zinc, calcium, potassium, magnesium, phosphorus, sodium and iron. The astringency of fruit is due to presence of tannins and gallic acid. The fruit also consist of antioxidants like tannic acid, gallic acid and oxalic acids and some alkaloids which give little bitter flavour. The seed of fruit is rich in protein, carbohydrates and traces of calcium.

Medicinal value

The whole tree of jamun is known for its medicinal properties. Jamun is a healthy fruit with medicinal properties not only in

fruits but also in the seed, leaves and bark of the tree. Leaves, stem, flower buds, open blossoms and bark have antibiotic properties. White variety has more medicinal properties particularly for diabetes.

Jamun Fruits

These fruits purify blood and strengthen liver. Fruit juice has good soothing and cooling effect enhance the proper functioning of the digestive system. Acidic, sour, sweet and soothing fruit is used to treat diabetes, diarrhea and ring worm. Acidity is generally aggravated in summer which generally leads to stress and frustration. This fruit helps in reducing acidity. Jamun powder also reduces skin blemishes. Juice of ripe fruit or a decoction is administered in spleen enlargement, chronic diarrhea and urine retention.

Jamun Seeds

Seeds have gastro protective properties by mucosal defensive factors and antioxidant properties and decreasing lipid peroxidation. It also has anticancer and antiviral potential. Many scientific studies have proved that dried alcoholic extract of the seeds of the fruit given to diabetic patients regularly showed a reduction in the blood sugar level and glycosurea (sugar in urine). Seeds contain a glucoside that prevents conversion of starch to sugar thereby controlling sugar level. Seeds are used in Ayurvedic, Unani and Chinese medicine for digestive ailments. It is used to treat diarrohea and ring worm.

Jamun tree leaves

Leaves have antibacterial properties and are used for making medicines for the strengthening of the teeth and gums. It is used to cure soar throat, bronchitis, asthma, thirst, dysentery, blood impurities and ulcers. The paste prepared from jamun leaves is good to recover the infected wounds. The leaves are also useful in controlling blood pressure and gingivitis. Ash from burnt leaves is good for gums and teeth.

Jamun tree bark

Bark of jamun tree has astringent properties and therefore useful for gargles and mouth wash. The bark has got carminative, diuretic, digestive and constipating properties. It has also got antithelmintic properties and used to formulate many herbal medicines.

Research studies have revealed that oral administration of jamun extracts from bark and seeds boost insulin levels in diabetics. Consumption of a quarter teaspoon of the powdered seeds with one tea spoon of honey for fifty days showed significant changes in sugar levels. .

Uses of jamun

- Fresh fruits are yummy and relished after shaking in salt which enhance taste.
- Ripe fruit is fermented to prepare excellent quality wine.
- Fruit juice is used to prepare vinegar
- Jamun is processed to prepare a distinct flavored jam, jellies, preserves and squash.
- The rejected fruit / low quality fruits are crushed and syrup is prepared. This jamun syrup is beneficial in treating diarrhea.
- Smaller fruits are used in beverage industries for being rich in acidity, tannins and anthocyanins.
- Seed can be used as a concentrate for animals as it is rich in protein, carbohydrates and calcium.

The jamun fruit is a potential fruit with nutritional and medicinal value. It is boon for diabetic people. The whole tree, leaves, bark, fruits and seeds are useful.

Ag.Ho.F.V.Sc:-09

DEVELOPMENT OF READY – TO – RECONSTITUTE MIXES FROM QUALITY PROTEIN MAIZE

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Introduction:

Maize (*Zea mays* L) is the third most important cereal in India, after Rice and Wheat. Being potential crop in India , Maize occupies an important place as a source of Human food (25 *per cent*), animal feed (12 *per cent*), poultry feed (49*per cent*), starch (12 *per cent*)and 1 *per cent* each in brewery and seed (Kaul *etal* 2009).In the recent past Quality protein maize (QPM) has got special distinction among the cereals due to presence of high amount of essential amino acids viz, Lysine (4.92), Tryptophan (1.20).Quality protein maize can be utilized for diversified purposes in food and nutritional security as Infant food, Health food, Convenience food, specialty food and emergency rations.(Jat *etal* 2009).Cereals along with pulse combinations constitute an important part of human diet in many parts of the world because of easy availability, low cost, long shelf life and nutritional balance.

Today's women finding it difficult to cook many of our traditional recipes due to shortage of time. Hence Convenience foods such as Ready-to-reconstitute, normally in dry form need to be mix with water before consumption, and require only few minutes of cooking in boiling water or steaming or frying, can suitably serve the purpose. Hence an attempt has been made in this regard to know the feasibility of using maize suji or semolina for the preparation of Ready—to - reconstitute products such as Idli mix and Vada mix using maize semolina with a prime objective to spread the aware-

ness about nutritional qualities of maize and to popularize the recipes that can be easily prepared among rural and urban populations at low cost.

MATERIALS AND METHODS

The maize grains of Quality protein maize hybrid (Shaktiman-4) were procured from AICRP Maize centre, Dholi, Bihar and were treated with 1 *per cent* lime solution (Usha Singh, 2001), drained, washed, and sun dried until the moisture percentage reaches to 11.5 *per cent*. Grains were dry milled passed through sieve no 36 to get the semolina of 425 microns size.

Development of Rava Idli mix: Different levels of maize semolina *viz*., 50, 60, 70 *per cent* levels were tried along with other ingredients like Rice semolina, Soya protein Isolate, Black gram flour, Bengal gram dhal, Salt, mustard and Sodium bi carbonate were purchased from local market, and dry roasted at a temperature of 74.5^{o}C for15 minutes. Water blanched curry leaves, carrot, and chilies were dehydrated at a temperature of 50^{0}C for 18 hours, in a hot air oven and powdered as described by Singh and Kulshrestha, (2006) with a slight modification. Developed mix was reconstituted by doing slight modifications (Premavalli. K. S.2000) to know the best level of semolina incorporation. For sensory evaluation, 100 grams of idli mix was reconstituted with 4 teaspoon of curd, 150 ml of water, 30 grams of fresh grated onion, 2 grams of coriander leaves, condition for 15 minutes, then steam cook for 6 minutes and idlies were served with coconut chutney.

Development of Rava vada mix: Three levels of Maize semolina (50, 60, 70*per cent*) were mixed with Wheat semolina, Soya flour, Wheat flour and Salt were purchased from the local market. Dehydrated red chilli, onion, curry leaves, carrot powder was used and the process of dehydration was alike for both the products.100 grams of vada mix in three different levels was reconstituted with 10 grams of warm oil or ghee, along with 60 ml of water to get a hard dough. Condition the dough for 5 minutes; make small balls, pressed on a papad presser to get round shaped vadas. Deep fry these in cooking oil on a medium flame, till they turn to golden brown colour.

Sensory Evaluation was carried out in both the products to know the best level of incorporation, on a 5 point Hedonic scale which rates 5-excellent and 1-as poor (Ranganna,1986) for appearance, colour, texture, flavour ,taste, and overall acceptability by 15 semi trained judges of ZARS, V.C. Farm.

Analysis of Nutritional Composition: Developed mixes were analyzed for Moisture, crude protein (Gerhardt, vapodust, Germany**),** fat and ash contents (AOAC, 1995). Carbohydrate content was determined by difference (Livesey, 1995). Gross energy was determined by calculation from fat, carbohydrate and protein contents using the Atwater's conversion factor; 1 g of fat = 9 k cal, 1 g of Protein = 4 k cal, 1 g of Carbohydrate = 4 k cal (Passmore and Eastwood, 1986). For mineral estimation, the samples were prepared by dissolving the ash obtained after ashing the samples in a Muffle furnace in dilute hydrochloric acid (1:1 v/v). Calcium, phosphorus, were estimated according to standard procedure of AOAC (1995), Iron by Wong's method (Wong, 1928), while magnesium by versanate titration method and potassium content by the procedure of Ranganna (1986).

Storage studies: Samples were packed in two types packaging materials viz LDPE covers (300 gauge) and Alluminium covers (alluminium cover + one tensil polyester 3 layer film), for a period of 3 months. Immediately after dehydration, the samples were analyzed for initial moisture, peroxide value, and free fatty acids. (AACC, 2000) subsequently every month the packed samples were tested for the same. Microbial quality of the stored samples was analyzed by the method of Collins and Lyne (1970), all the isolations were carried out following serial dilution technique. Plates were incubated at 32±1^{o}C for 96 hours, and every month colony counts were recorded for bacteria, fungi, and moulds.

Statistical Analysis: One way and two way anova are applied to test the significant differences between the packaging material and between the months of storage.

RESULTS AND DISCUSSION

From the Table I indicates that the overall acceptability scores of Idli and vada, prepared by incorporating Maize semolina at 50 *per cent* scored between good to very good i.e. 3.60 and 3.80 respectively. Texture (3.70, 3.80) and Taste (3.60, 4.20) of the products indicated a significant difference among the variations tested. The standardized recipe of ready–to- reconstitute mixes is depicted in Table II.

Nutritional composition of the Ready-to-reconstitute Mixes: The perusal of Table III indicates the moisture content at the time of analysis was 3.69 and 4.79 *per cent* respectively, for Idli and vada mix. However, the initial moisture content of the mixes was 0.963 and 0.831 respectively, but subsequent storage of the products and exposure before analysis must have increased the moisture content. The protein contents were comparatively good in both the mixes (15.08 and 13.87 *per cent*).Addition of Black gram has increased the calcium content of the Idli mix which basically contains 154 mg of calcium. Phosphorous content of the mixes were 320 and 300 mg respectively, it obviously because of maize is a good source of Phosphorus (348 mg/100 g) as quated by Gopalan *etal* (2000).Potassium and Iron contents were comparatively more in Vada mix (320, 4.55mg), may be due to the high ash content of the mix (4.52 *per cent*) and the kind of ingredients like wheat semolina, whole wheat flour must have contributed to the more ash content and in turn to more minerals.

Storage Studies: The storage of any product determines its Wholesomeness during the definite period of time .Therefore the quality of the mixes was evaluated during storage for a period of 90 days, on the basis of biochemical, and microbial changes. From the Fig. 1 it can be revealed that there was an increase in the moisture content of the samples irrespec-

tive of the packaging material. However there is a significant increase in the moisture content over a period of 90 days. (0.96 to 3.45, and 0.831 to 2.72 in LDPE pouches, 0.96 to 2.35 and 0.831 to 2.62 in Alluminium packs). Similar studies conducted by Afoawa etal (2004) and Midna and Mogra (2007) indicate an increase in the moisture content of vermicelli during storage from 6.9 to 8 *per cent* for a period of 2 months. The peroxide value was significantly increased from 1.32 to 3.84 and 2.98 and 2.33 to 4.97 and 4.15 respectively for Idli and Vada mix in polyethylene and Alluminium packs over 3 months (Fig. 2). Perusal of the Fig. 3 indicates an increase in FFA content over a period of time, and was significant between the months, which increased from 0.187 to 0.768 (PC), 0.485(AF) for Idli mix and 0.197 to 0.912 (PC), 0.815(AF) for Vada mix respectively. The peroxide value of 1.64±0.38 and free fatty acid of 0.11±0.005 for Cowpea and groundnut based miso like product was reported by Kwaku etal (2004). Saha and Dunkwal (2009) also reported a free fatty acid value of 0.3 to 2.2 mg for Spread Instant mix, for a period of 90 days. Values reported in this study are within the limit reported by Kirk and Sawyer (1991), where in for a noticeable rancidity of an oil product the FFA level should exceed 1.5 *per cent* and they also quoted a PV of 20-40 meq / kg as the range at which rancidity begins to be noticeable in oils.

The microbial quality of the samples (Table IV) reveals that, there was no mould and fungal colonies throughout the storage period of 3 months, except a mould appeared in polyethylene packs during 3 month. Bacterial colonies which may be present inherently in the food were with in the limit ($3x10^{-6}$, $2x10^{-7}$) in polythene and ($5x10^{-6}$, $2x10^{-7}$) alluminium covers and subsequently reduced during storage. Low moisture content must have played a beneficial role in keeping the product safe for longer period. Similar study conducted by Midha and Mogra (2007) reveals that the load of total viable counts yeast and mould were very less in value added Vermicelli which may be due to low moisture content and low water activity combined with hygienic handling of the product. Packaging had an effect on the keeping quality of the products, however ready-to-reconstitute mixes can be safely kept for 3 months under room temperature (25-30^{0}C) without affecting the organoleptic, biochemical and microbial qualities. From this study it can be concluded that maize semolina can be substituted with rice or wheat semolina to prepare nutritionally rich vada or idlis at low cost along with other pulses and cereals.

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TABLE I

Sensory Evaluation of Rava Idli and Vada

Characteristics of Rava Idli	Ingredient variations			Statistical analysis		
	50*per cent*	60*per cent*	70*per cent*	F-Value	SEm±	CD at 5*per cent*
Appearance	3.40	3.30	3.00	1.11	NS	NS
Colour	3.60	3.20	2.60	8.14	0.25	0.51
Texture	3.70	3.10	2.50	10.23	0.27	0.54
Flavour	3.50	3.20	3.10	1.67	NS	NS
Taste	3.60	2.60	2.50	13.68	0.23	0.48
OAA	3.60	2.50	2.30	18.90	0.23	0.47

Characteristics of Vada	Ingredient variations			Statistical analysis		
	50*per cent*	60*per cent*	70*per cent*	F-Value	SEm±	CD at 5*per cent*
Appearance	4.40	2.70	2.30	50.86	0.22	0.45
Colour	4.50	2.80	2.70	27.09	0.27	0.56
Texture	3.80	3.20	2.70	7.25	0.29	0.59
Flavour	4.20	2.90	3.20	12.39	0.27	0.56
Taste	4.20	3.30	2.80	12.03	0.29	0.59
OAA	3.80	2.70	2.50	12.97	0.27	0.56

TABLE II

Standardized recipe of Rava idli mix and Vada mix

Ingredients of Rava Idli	Quantity
Maize semolina (sieve no.36)	50g
Rice semolina	25g
Soya protein	5g
Black gram flour	20g
Dehydrated curry leaves	2g
Dehydrated carrot powder	5g
Bengal gram dhal	5g
Salt	2.5g
Dehydrated chilli	1.5g
Mustard	1g
Sodium bicarbonate	0.5g

Ingredients of Vada	Quantity
Maize semolina	50g
Wheat semolina	30g
Soya flour	10g
Wheat flour	10g
Onion	10g
Red chilli	3g
Salt	2g
Coriander	1g
Curry leaves	1g
Carrot powder	2.5g

TABLE III

Nutrition composition of Rava idli mix and Rava vada mix per 100g

Nutritional composition	Rava Idli mix	Rava vada mix
Protien(*per cent*)	15.08	13.87
Fat (*per cent*)	2.85	4.25
Carbohydrate (*per cent*)	70.65	73.60
Energy (K cal)	368.57	388.13
Fibre (*per cent*)	3.00	3.21
Ash (*per cent*)	3.49	4.52
Moisture (*per cent*)	3.69	4.79
Calcium (mg)	154.0	36.0
Phosphorus (mg)	300 .0	320.0
Magnesium (mg)	152.5	150.0
Potassium (mg)	270.0	320.0
Iron (mg)	2.37	4.55

TABLE IV

Microbial load of Rava idli mix and Vada mix

Months of Microbial studies	Samples	PDA		NA		RBC	
		Cfu/ml of sample		Cfu/ml of sample		Cfu/ml of sample	
		10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-4}	10^{-5}
1st month	Vada mix	0	0	3	2	0	0
	Rava idli mix	0	0	5	2	0	0
2nd month	Vada mix	0	0	2	1	0	0
	Rava idli mix	0	0	2	0	0	0
3rd month	Vada mix	0	0	2	1	1	0
	Rava idli mix	0	0	2	1	0	0

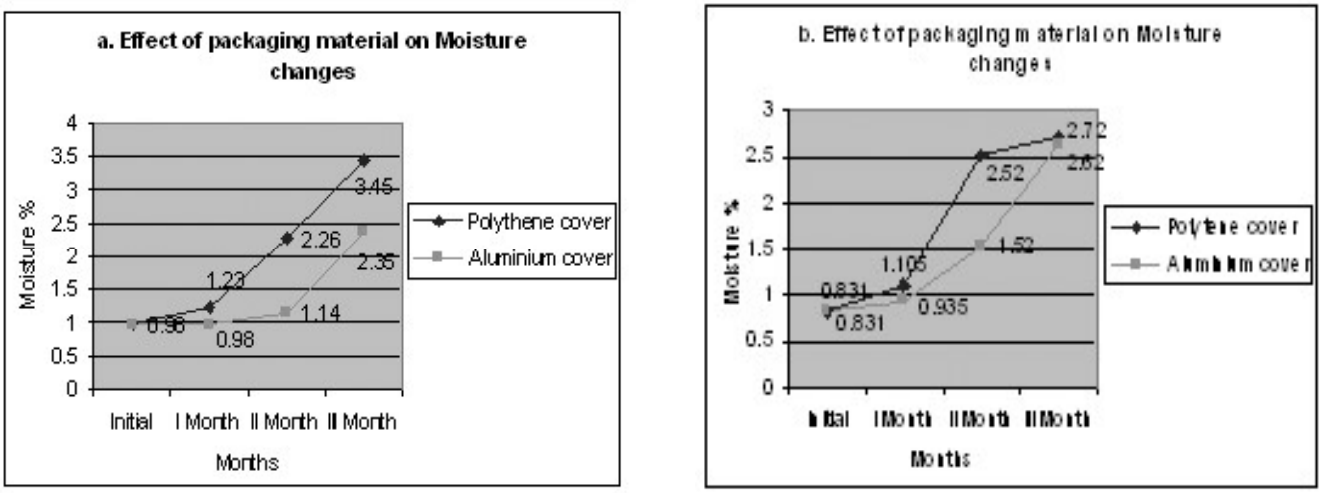

Figure 1: Moisture changes of Rava idli mix and Vada mix during storage

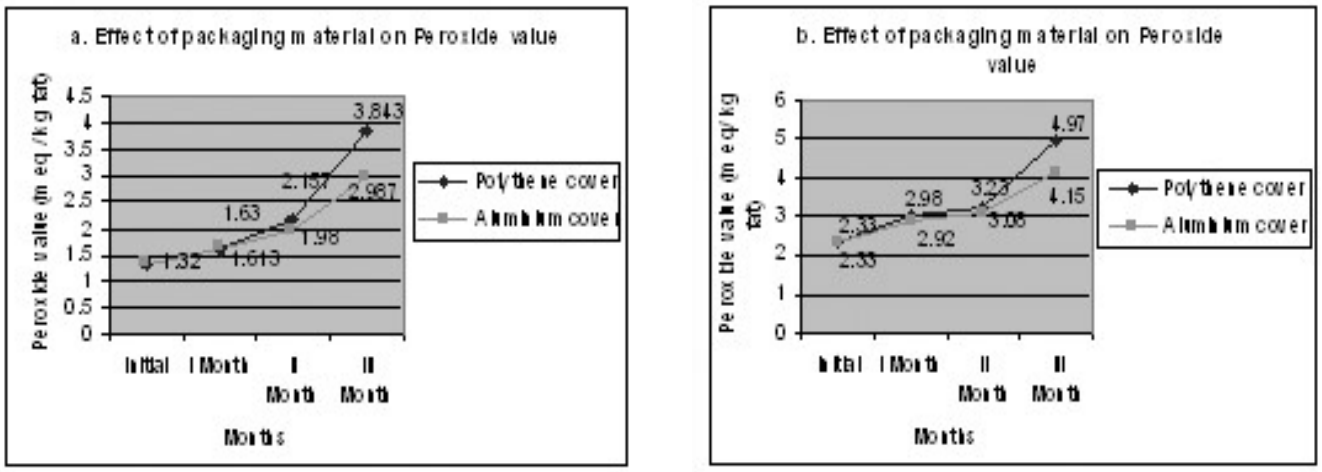

Figure 2: Peroxide value changes of Rava Idli mix and Vada mix during storage

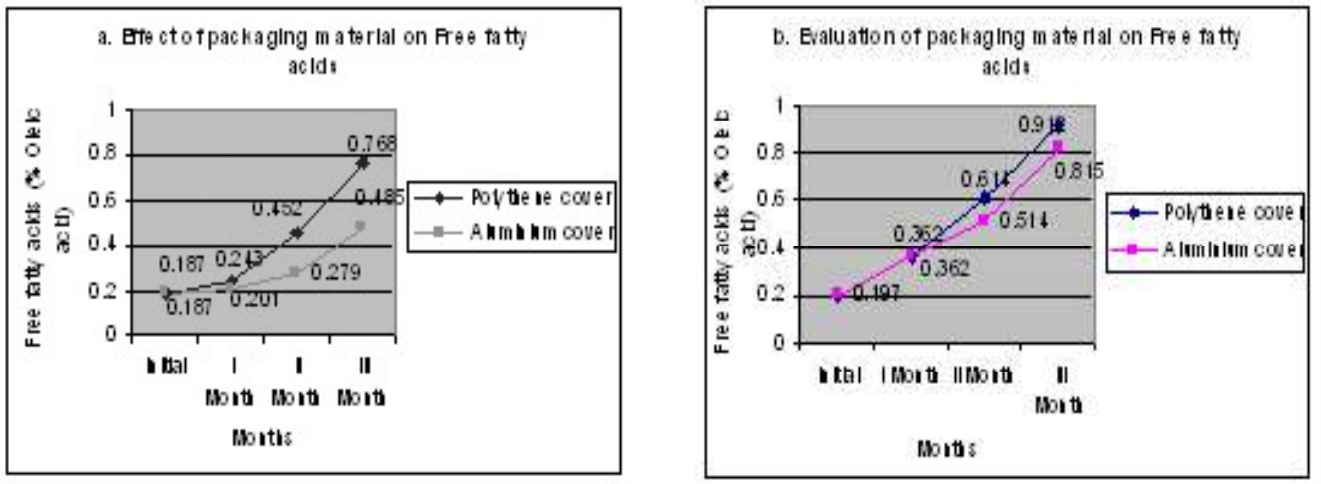

Figure 3: Free fatty acid changes of Rava Idli mix and Vada mix during storage

Ag.Ho.F.V.Sc:-10

DIAGNOSIS OF CRYPTOSPORIDIOSIS IN BOVINES BY CONVENTIONAL DIAGNOSTIC TECHNIQUES

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Introduction

Cryptosporidiosis is an emerging zoonotic disease of global importance caused by a tiny apicomplexan, ubiquitous protozoan parasite of the genus *Cryptosporidium* that infects gastrointestinal tract which manifests as gastroenteritis in man and animals. It causes self-limited watery diarrhoea in immunocompetent individuals but has far more devastating effects on immunocompromised individuals and in some cases can be life-threatening due to dehydration caused by chronic diarrhoea (Caccio, 2005 and Chen *et al*., 2005). The present paper deals with conventional diagnostic techniques *viz*., Sheather's sucrose floatation (Anderson 1981) and MZN (Anderson 1991) used for identification of *Cryptosporidium* oocysts.

Materials and methods

A total of 201 faecal samples were collected from calves and cattle of different age groups and divided as, 0-2 months age, 2-6 months age, 6 months to 1 year and adults and were examined for *Cryptosporidium* oocysts by using conventional diagnostic techniques *viz.*, Sheather's sucrose floatation and modified Ziehl-Neelsen staining technique.

Sheather's sucrose floatation: In Sheather's sucrose floatation, the faecal suspension was transferred to a centrifuge tube for centrifugation at 500 × g for 10 minutes. The separated supernatent was discarded and then to the sediment, Sheather's sugar solution (1.16 specific gravity) was added upto the brim of the tube and mixed thoroughly and centrifuged at 500 × g for 10 minutes, a drop of the floated fluid on the top was placed on a glass slide and examined for *Cryptosporidium* oocysts under low power (10X), high power (40X) and oil immersion (100X) for comparision of the size of the oocysts.

Modified Ziehl Neelsen staining technique (MZN): Thin smears prepared from the faecal samples were stained with modified Ziehl-Neelsen stain. The smears were stained with strong carbol fuchsin solution for 5 minutes. After staining, the smears were washed in running tap water for 1-2 minutes. Then the slides were subsequently decolorized in 5 per cent sulphuric acid for 30 seconds. The smears were then washed in tap water for 1-2 minutes and, the smears were counterstained with 3 per cent methylene blue for 1 minute. The smears were finally washed under running tap water and dried with a dryer. The smears were then examined microscopically under oil immersion (100X) for *Cryptosporidium* oocysts. Both hot and cold Ziehl-Neelsen techniques were used. Identification of oocysts was done by morphological characterization and micrometry was done as per Upton and Current (1985).

Results and Discussion

Out of 201 faecal samples of calves and cattle collected from 12 different farms, animal shelters, abbatoirs and Veterinary hospitals in and around Bangalore, 26 (12.94 per cent) faecal samples were positive for *Cryptosporidium* oocysts by Sheather's sucrose floatation method. The modified Ziehl-Neelsen staining technique revealed 18 samples (8.96 per cent) to be positive for *Cryptosporidium* oocysts. The detection of *Cryptosporidium* oocysts was higher by Sheather's sucrose floatation method when compared to modified Ziehl-Neelsen staining technique (Table I).

Table 1

Of these two techniques Sheather's sucrose floatation method was found to be more specific and sensitive method for the diagnosis of Cryptosporidiosis. It gave significantly higher percentage of recovery even when the concentration of oocysts was low and morphologic changes in oocysts did not occur during the floatation procedure. In the Sheather's sucrose floatation method, the oocysts appeared as round or oval, refractile bodies with a thin cytoplasmic membrane, finely granular cytoplasm, and a prominent black dot (residuum) and there was a longitudinal suture running along one pole. The oocyst wall had a pinkish hue due to chromosomal aberration that helped in better identification (Fig 1). These observations were in accordance with the observations made by Rekha (2007) who conducted a prevalence study on Cryptosporidiosis in cattle in and around Bangalore. Similar observations were also made by Anderson (1981), Kuzynska and Shelton (1999) and Kvac *et al*., (2003).

In Modified Zeihl-Neelsen staining technique, the oocysts appeared as densely stained red bodies against a blue background with a clear hallow around the oocyst and a varying number of dark blue or brownish internal bodies. In modified Ziehl-Neelsen staining technique both hot and cold methods gave similar results (Fig 2). In the hot method artifactual shrinking and distortion of oocysts were observed. Similar observations were made by Rekha (2007), Casemore *et al*., (1985) and Baxby *et al*., (1984).

Fig 1

Fig 2

In the present study two species of *Cryptosporidium* were identified namely *C. parvum* in young calves and *C. andersoni* in older calves based on morphology and micrometry. The identification of oocysts were in accordance with Rekha (2007) and Shobamani *et al.,* (2009) who carried out different conventional diagnostic tests for the detection of *Cryptosporidium* infection in calves.

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Table

Table 1: Cryptosporidial infection detected by two different conventional diagnostic tests

Faecal samples	Sheather's sucrose floatation method	Modified Ziehl-Neelsen staining technique
No. of samples tested	201	201
No. positive	26	18
Percent positive	12.94	8.96
No. negative	175	183
Percent negative	87.06	91.04

Figures

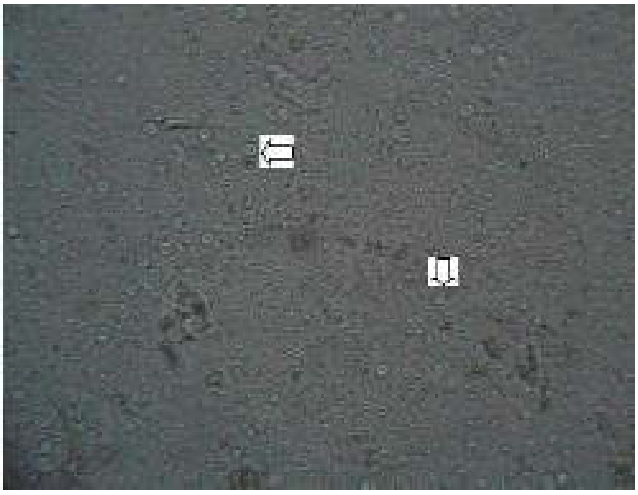

Fig 1: *C. parvum* and *C. andersoni* under Sheather's sucrose floatation (Under 40X)

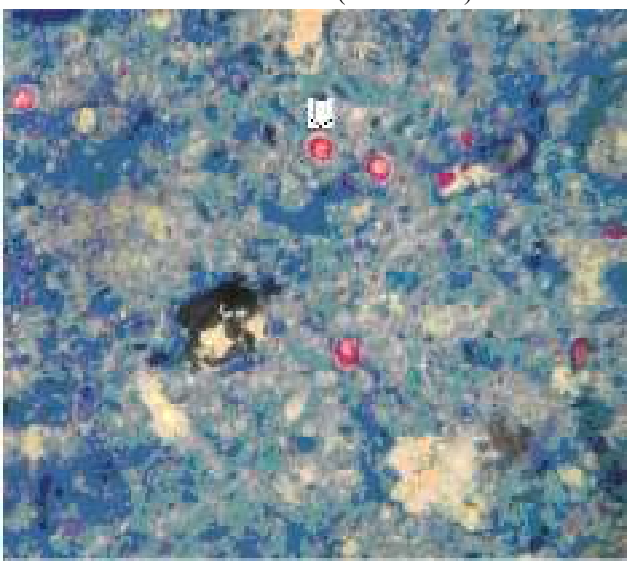

Fig 2: *Cryptosporidium* oocysts under MZN staining technique (Under 100X)

Ag.Ho.F.V.Sc:-11

IMMUNOLOGICAL DIAGNOSIS OF CRYPTOSPORIDIOSIS IN BOVINES

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Introduction

The protozoan parasites belonging to the genus *Cryptosporidium* infect a wide range of vertebrates including rodents, bovines, lambs, goats, pigs, birds as well as humans. Cryptosporidiosis is a disease of neonates characterized by acute gastrointestinal disturbances associated with mucoid or haemorrhagic diarrhoea, fever, lethargy, anorexia leading to loss of condition (Navin and Juranek, 1984). A plethora of immunodiagnostic assays have been used for the detection of Cryptosporidiosis like antigen capture ELISA, monoclonal antibody based immunofluorescence test, EITB etc. Enzyme Linked Immunosorbent Assay is one of the fast and reliable technique which could be used for the detection of *Cryptosporidium* oocysts (Robert *et al.,* 1990). Enzyme Linked Immunosorbent Assay has a high sample handling capacity as multiple samples can be processed simultaneously and is very sensitive (Lindergard *et al.,* 2001).

Therefore the present study was carried out by Sandwich ELISA to observe the prevalence of *C. parvum* infection in cattle.

Materials and Methods

A total of 72 faecal samples were collected from calves and cattle from different farms, animal shelters, abattoirs and Veterinary hospitals in and around Bangalore. The faecal samples were collected directly from the rectum of the calves separately in zip lock covers and brought to the laboratory and preserved at 4°C. The samples were screened by the Sheather's sucrose floatation technique and were later preserved in 2.5% potassium dichromate solution.

Sandwich ELISA protocol: Sandwich ELISA was undertaken with *Cryptosporidium parvum* kit procured from M/s R. Biopharm, AG., Darmstadt, Germany. The protocol specified by the manufacturer was employed for testing the faecal samples. The faecal samples were diluted with the sample dilution buffer (1:11). The diluted faecal sample was allowed to settle for some time and two drops (100 µl) of positive control and two drops of negative control (sample dilution buffer) and 100 µl of clarified supernatent was added directly to the required number of wells and the wells were incubated at 37°C for one hour. The wells were then washed with washing buffer three times. Two drops of conjugate was added and incubated at 37°C for one hour. The wells were washed again with washing buffer for five times. Two drops of substrate was added and it was incubated for 15 minutes. Finally one drop (50µl) of stop solution was added and the absorbance values were read in the ELISA reader (M/s Biorad Labsystems) at 450 nm.

Results and Discussion

Out of 72 faecal samples evaluated by Sandwich ELISA, 16 samples were found to be positive for *C.parvum* infection (Table 1). All negative faecal controls were negative in the assay. The positive and negative results were read based on OD values using 450 nm filter (Figure 1).

Table 1

Fig 1

In the present study, *Cryptosporidium* antigen detection ELISA kit for diagnosis in humans was found to detect *C. parvum* in cattle. The kit detected only *C. parvum* and it did not indicate *C. andersoni* infection. No cross reactions were observed. One sample was positive in ELISA which did not show any oocysts on microscopic examination, which may be due to low number of oocysts which could not be detected on faecal examination. The samples which were positive for *C. andersoni* screened by ELISA did not give a positive reaction. Similar observations were made by Nagamani *et al*. (2007), Shobamani *et al*. (2009) regarding the detection of *C. parvum* infection in bovines. They reported that the degree of sensitivity of ELISA and floatation test was comparable. A high prevalence of *C. parvum* infection was reported in the present study when compared to the prevalence study conducted by Rekha (2007) from cattle in and around Bangalore.

The results of the present study indicated that coproantigen detection by Sandwich ELISA was found to be a simple, accurate and reliable test for the diagnosis of Cryptosporidiosis in cattle.

Acknowledgement

The authors thankfully acknowledge Indian Council of Agricultural Research, New Delhi through the Centre of Advanced Faculty Training in Veterinary Parasitology for providing the necessary facilities

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Table

Table 1: Coproantigen detection of *C. parvum* infection in cattle by Sandwich ELISA

Microscopy results (Floatation)	Samples tested by ELISA	No. of samples positive	% positive
Samples positive for *C.parvum*	15	15	100
Samples positive for *C.andersoni*	7	0	0
Samples without *Cryptosporidium* oocysts	25	1	4.16
Samples with Eimeria oocysts	25	0	0
Total	72	16	22.22

Figure

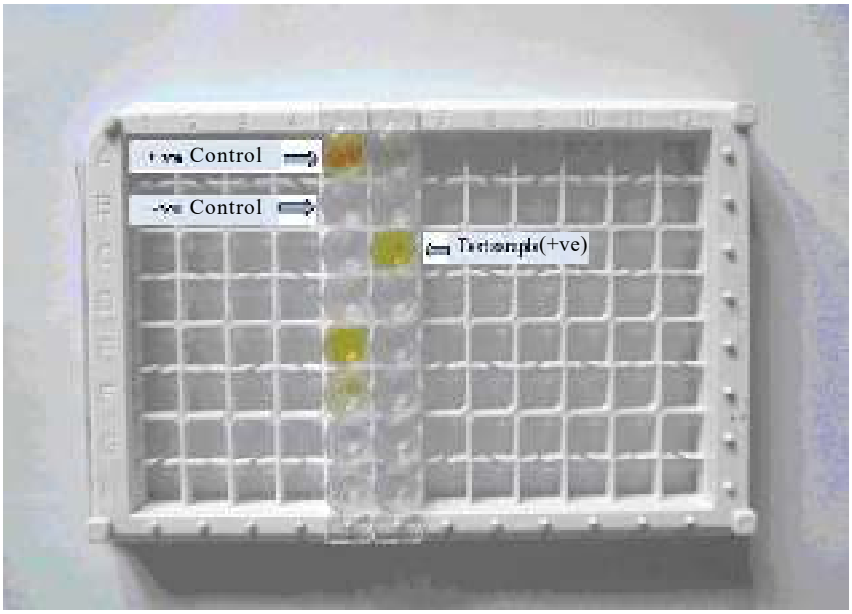

Fig 1: *C.parvum* infection in faecal samples of calves detected by Sandwich ELISA

THEME:-04

HEALTH AND MEDICAL SCIENCES INCLUDING AYURVEDA

H.M.Sc.A:-01

CONTRIBUTION OF FPAI IN IMPROVING REPRODUCTIVE HEALTH OF WOMEN IN INDIA

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Millions of women in India die each year during child birth. With the availabilities of modern medicine and health services, such deaths should not occur. Yet they do, because women, particularly in developing countries like India are caught in a cycle of poverty, disempowerment and lack f access to health services.

The Family Planning Association of India was established in 1949. It is a premier national voluntary organization that pioneered the family planning movement in India. It was in 1951 that Mrs.Avabai Wadia along with the then president of FPA India, Mrs.Dhanavanti Rama Rau, was instrumental in the inclusion of family planning in India's First Five Year Plan. Over the years it has expanded its work to include, programmes covering maternal and child survival, male involvement, adolescents and young people, sexual and reproductive health, including family planning, HIV/AIDS, gender inequities and basic rights of men and women.

FPA India works closely with the government, other non-governmental organizations, UN agencies and national and international partners. Through its volunteers and staff, FPAI India is represented on a number of policy-making bodies including the National Population Commission headed by the Prime Minister of India. It works through its 39 branches spread across the country. FPA India is also a founder member of the International Planned Parenthood Federation (IPPF) and has been accredited as a member association. It also is an ISO 9001-2000 certified organization.

FPA India has played a key role in supporting the government in designing and implementing the Reproductive and Child Health Programme (RCH-II) adopted in 2002 as part of the National Population Policy. The organization believes that in a country facing serious problems of poverty, disease, illiteracy and high maternal and child mortality, a balanced mix of contraception and development would break the vicious cycle of overpopulation and poverty.

Some of FPA India's important initiatives are:

- Family Planning in the 1950s
- Population Education in the 1960s
- Sexuality Education in the 1970s
- Women's Empowerment and community participation in the 1980s
- Prevention of sexually transmitted infections (STIs) and HIV in the 1990s
- Integration of HIV and Sexual and Reproductive Health (SRH) in the new millennium.

Access to Health Services as a Right:

Health is a fundamental human right indispensable for the exercise of other human rights. Every human being is entitled to the enjoyment of health conductive to living a life with dignity.

"Human Rights" means the rights relating to life, liberty, equality and dignity of the individual guaranteed by the Constitution or embodied in the International Covenants and enforceable by courts in India. Under sexual and reproductive health rights all humans are entitled to be free from torture and ill-treatment, right of all people to protection from rape, sexual abuse and harassment.

FPA India believes that sexual and reproductive rights are internationally recognized human rights that should be guaranteed for and exercised by every one. FPA India has played a key role in supporting the government in designing and implementing the Reproductive and Child-Health (RCH-II) programme adopted in 2002 as part of the National Population Policy.

Reproductive Rights:

Reproductive rights rest on the recognition of the basic right of all couples and individuals to decide freely and responsibly the number, spacing and timing of their children and to have the information and means to do so. It includes the right to attain the highest standard of sexual and reproductive health, the right of all to make decisions concerning reproduction free of discrimination, coercion, and violence.

The charter of the International Planned Parenthood Federation (London) is intended to promote and protect sexual and reproductive rights and freedom in all political, economic and cultural systems.

IPPF recognizes the following rights:

1) The right to life - no woman's life should be put at risk or endangered by reason of pregnancy.

2) The right to liberty and security of the person – Which recognizes that all persons must be free to enjoy and control their reproductive and sexual life and that no person should be subject to forced pregnancy, sterilization or abortion.

3) The right to equality and to be free from all forms of discrimination

4) The right to privacy – meaning that all sexual and reproductive health care services, should be confidential and all women have the right to autonomous reproductive choices.

5) The right to freedom of thought - Which includes freedom from the restrictive interpretation of religious texts, beliefs,

philosophies and customs as tools to curtail freedom of thought on sexual and reproductive health care.

6) The right to information and education.

7) The right to choose whether or not to marry and to found and plan a family.

8) The right to decide whether or when to have children.

9) The right to health care and health protection.

10) The right to the benefits of scientific progress.

11) The right to freedom of assembly and political participation – meaning that all persons have the right to seek to influence governments to place a priority on sexual and reproductive health and rights.

12) The right to be free from torture and ill-treatment – including the rights of children to be protected from sexual exploitation and abuse, and the right of all people to protection from rape, sexual assault, abuse and harassment.

Several women's groups campaigning for women's reproductive health and rights argued that population policies must be centered on women's health and their reproductive rights and should be broadened to include sexual health and rights of men and adolescents.

They argued that:

- The inability of women to assert their right about when and how many children to have had directly affected their health and their status.
- Lack of health facilities and poor nutrition endangered the lives of millions of women who delivered babies without trained help.
- The limiting of contraceptive use led to millions of unwanted pregnancies. It was followed by induced abortions by untrained help resulting in deaths.
- Early marriage and lack of information amongst adolescents increased their vulnerability to STI and other diseases.

These women's groups urged the United Nations to embrace the concept of sexual and reproductive health and rights. At the International Conference on population and development (ICPD) in Cairo, Egypt, in 1994 179 countries signed on to a 20 year programme of Action that linked fertility regulation and development goals in the context of human rights.

FPAI,s Specific Areas of work:

- FPA India believes that Development is key to empower people to exericese their sexual and reproductive rights.
- Poverty is the root cause of under development.
- There are close linkages between sexual and reproductive health and poverty and between demographic change and development.

In keeping with its broader objective, FPA India's strategic Plan aims at increasing access to sexual and reproductive health services with a focus on poor, marginalized and unserved communities.

The plan has five major goals that are related to the Millennium Development Goals (MDSs) given by the UN.
These are :

- Adolescents
- Abortion
- HIV/AIDS
- Advocacy
- Access

Adolescents:

FPA India has been building partnerships with schools in its operational areas to provide gender-sensitive, adolescent-friendly sexual and reproductive health education and service to school- going adolescents in the 10-16 year age-group. Young people are involved through peer educators approach.

Abortion:

Every year, unsafe abortions contribute to 12 percent of maternal deaths in India. The vicious cycles of unmet need for contraception, resulting in unwanted pregnancies perpetuates morbidity and mortality, a direct consequence of unsafe procedures done by untrained/unqualified providers. Around 68,000 women die every year from unsafe abortions and many more suffer permanent impairment.

FPA India advocates women's rights to safe abortion, forging partnerships with the government and upgrading facilities in its service delivery points to prevent unsafe as well as sex-selective abortions.

HIV/AIDS:

FPA India has integrated gender sensitive programmes for SIT/HIV and AIDS prevention and management with ongoing sexual and reproductive health programmes, including family planning services in all its braches. This has been done to reduce the incidence of STI and HIV and ensure full protection of the rights of people infected and affected by HIV and AIDS.

Advocacy:

The strategy for advocacy, which is an overarching tool for intervention strategy, associates communities and policy makers with the promotion of sexual and reproductive health and rights. Through its various activities, FPA India generates strong public, political and financial commitments and support for sexual and reproductive health and rights at national and international levels.

Access:

Increasing access to reproductive health services also means removing hurdles such as socio-cultural barriers. FPA India strategy includes collaborating with religious leaders, urban family welfare centers, self help groups, partnership with other NGOs and government agencies.

FPA India through its service outlets provide family planning and reproductive health services that are affordable and accessible to the poorer section of the society.

FPA India provides the following services:

- Contraception
- Safe abortions
- Safe motherhood
- Child survival
- Male reproductive health
- Adolescent sexual and reproductive health
- Infertility Counseling
- HIV/AIDS Prevention and Counseling

Other Issues:

In addition to these five specific areas, all FPA India projects address issues to improve women's health and status, eliminate gender inequity and enable women's empowerment.

Specific Programmes Include:

- Providing vocational training so that women can become ec onomically independent.
- Raising awareness to remove bias against women and about the PNDT (Pre-Natal Diagnostic Test) Act and campaigning against sex selection.
- National campaigns to reduce violence against women.
- Girl Child and Prevention of Sex Selection project in six northern states.
- Increasing female literacy rate and increasing girls' average age at marriage.
- Small Family by Choice project, which helped in promoting gender equity and women's empowerment.
- Sexual and reproductive health services for adolescent girls and young women.

H.M.Sc.A:-02

NUTRITIONAL STATUS OF RURAL ADOLESCENT GIRLS

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Adolescent girls are very important section of our society as they are our potential mother and future homemakers. Adolescent aged between 10-19years account for more than one fifth of the world population .In India this age group forms 21.4 per cent of total population (Saroja Prabhakaran, 2003).

Unfortunately adolescent girls are neglected sector of the population of our country. They are poorly fed members of family under our present economic conditions. As a social custom and cultural practice, an adolescent girl enters married life and motherhood when she neither is neither matured enough to understand the meaning of motherhood nor is in good health to cope up with the triple needs of growth, pregnancy and lactation. Several factors such as socio-economic status, environment, attitude towards girl babies and adolescent girls, ignorance with regard to nutritional requirement, hygiene and illness are responsible for present nutritional status of adolescent girls. Hence, this study has been undertaken based on the objective to assess the nutritional status of rural adolescent girls.

Materials and Methods:

A sample of 300 school going adolescent girls were selected in the age group of 13-16 years from the transitional and dry zone. From each zone two villages were selected at random. Seventy five girls were selected from each village .General information such as name of the respondent, address, age, education. Type of family, family size, occupation and family income were collected by structured pre-tested questionnaire through personal interview method. Nutritional status of the adolescent girls was assessed as fallows,

Nutritional Anthropometry

The anthropometric measurements viz., height, weight, and waist and waist to hip ratio were measured as per the guidelines suggested by ICMR standards.

The height was measured by using height scale nearest to 0.1 cm. A portable personal weighing scale was used to measure the weight in kilograms nearest to 0.5kg,with ordinary casual clothing and without shoes. Waist and hip circumference were measured by using a fibre glass measuring tape in centimetres.

Body Mass Index

The anthropometric measurements of the adolescent girls were used for calculating the body mass index which was expressed as ratio of weight (kg) to weight in metre square.

$$BMI = \frac{\text{Weight (Kg)}}{(\text{Height})^2\ (\text{m})}$$

Further, the individuals were classified into different classes based on Anon.,(2003)

BMI classification for adolescent girls

BMI classes	Presumptive diagnosis
<18.5	Under weight
18.5-22.9	Ideal BMI
>23.0	Over weight
>25.0	Obese grade I
>30	Obese grade II

Waist to hip ratio:

Waist to hip ratio was computed using the waist and hip circumference, The abdominal obesity was judged by using the reference ratio given by Lean et al., (1995) for female.

At risk	No risk
>0.85	<0.80

Dietary survey:

The information on daily intake of food was collected by 24 hour recall method. To assist the subject to recall better, a set of standardized vessels were displayed to quantify identification and asked to indicate the vessel number. Further, information on, frequent consumption of green leafy vegetables, methods of preparation of green leafy vegetable and storage of green leafy vegetables were also collected.

Dietary adequacy of blood forming nutrients:

To assess the adequacy of energy and blood forming nutrients, the cooked food was converted into raw ingredients. The commonly used recipes were prepared in the laboratory to computed the raw equivalents using Annapurna VAR 3,a software developed by M.R. Chandrasekhar of Bangalore. The percent adequacy of energy and blood forming nutrients like protein,iron,folic acid, vitamin A, Vitamin C ,copper and vitamin B 12was assessed by using recommended dietary allowances (RDA) given by ICMR (19890 with the help of formula

$$\text{Percent nutrient adequacy} = \frac{\text{Nutrient intake of subjects}}{\text{RDA of nutrients}} \times 100$$

The student't' test was used to test the significance of mean difference between nutritional status of dry and transitional zone respondents.

Result and Discussion:

Demographic profile of selected adolescent girls:

Particulars	Dry zone (n = 150)	Transitional zone (n = 150)	Total
Age			
12 years	9 (6.00)	-	9 (3.00)
13-14 years	99 (66.00)	113 (75.33)	212 (70.67)
15-16 years	42 (28.00)	37 (24.66)	79 (26.33)
Education			
8th standard	76 (50.66)	67 (44.66)	143 (47.66)
9th standard	74 (49.33)	70 (46.66)	144 (48.00)
10th standard	-	13 (8.66)	13 (4.33)
Type of family			
Nuclear	124 (82.66)	130 (86.66)	254 (84.66)
Joint	16 (10.66)	9 (6.00)	25 (8.33)
Extended	10 (6.66)	11 (7.33)	21 (7.00)
Family size (members)			
2-4	35 (23.33)	28 (18.66)	63 (21.00)
5-10	106 (70.66)	114 (76.00)	220 (73.33)
>10	9 (6.00)	8 (5.33)	17 (5.66)
Occupation			
Farming labour	72 (48.00)	98 (65.33)	170 (56.66)
Skilled	18 (12.00)	16 (10.66)	34 (11.33)
Employed	29 (19.33)	15 (16.00)	44 (14.66)
Business	31 (20.66)	21 (14.00)	52 (17.33)
Family income			
< 1057.63/month	74 (49.33)	-	
1057.63-3073.03 /month	52 (34.66)	-	162 (54.00)
>3073.03 /month	24 (16.00)	-	99 (33.00)
<1175.32/month	-	88 (58.66)	39 (13.00)
1175.32-2521.74 /month	-	47 (31.33)	
>2521.74/month	-	15 (10.00)	

Distribution of study subjects based on the demographic profile is presented in Table1. Majority of the subjects (82.66 per cent and 86.66 per cent in dry and transitional zone respectively) were belonging to nuclear family, 7.33 per cent of the subjects were from extended family and only 6 per cent of subjects were from joint family and only 6.66 per cent of subjects were in extended family system.

Most of the subjects were in the family size of 5 to 10 members (70.66 and 76.00%in dry and transitional zone, respectively) and above 10 members group was 6.00 per cent in dry zone and 5.33 per cent in transitional zone.

Major of the subjects expressed their family occupation as farming labour in both dry(48.00%) and transitional zone(65.33%) followed by business (20.66 and 14.00%,respectively).Nineteen and 16 per cent of the subjects were from employed and rest of them(12.00 and 10.00%) were from skilled occupation group in dry and transitional zone respectively.

When adolescent girls were distributed on family income, majority of the dry zone families (49.33%) had family income between Rs.1175.32 per month fallowed by 34.66 per cent with a family income above 2521.74 per month and only 16 percent of them had family income above 2521.74 per month. Similarly, in transitional zone, 58.66 per cent of the families had income between Rs.1057.63 per month followed by 31.33 per month of the subjects had family income between Rs. 1057.63 to 3073.03 per month and only 10 per cent of the subjects had family income of above Rs.3073.03 per month.

Nutritional status of the adolescent girls:

Anthropometric measurements:

Table 2. Mean anthropometric measurements of adolescent girls (N = 300)

Parameters	Dry zone (n = 150)	Transitional zone (n= 150)	'Z' value
Height (cm)	146.73 ± 7.88	147.01 ± 6.06	0.1^{NS}
Weight (kg)	35.69 ± 6.41	35.66 ± 6.27	0.2^{NS}

The mean height of adolescent girls was 146.73cm and 147.01 cm and transitional zone, respectively. The mean weight of adolescent girls was found to be almost same in dry and transitional zone (35.69 and 35.66kg, respectively).Thus it was apparent that all the anthropometric measurements between

the subjects of dry and transitional zone were statistically not significant (Table 2).All the anthropometric measurements of both dry and transitional zone girls were similar, but significantly lower than NCHS standards. The results of the present study were on par with that reported by Hangi (2001).

Body Mass Index

Table 3. Distribution of adolescent girls based on BMI classification

BMI	Dry zone (n = 150)	Transitional zone (n= 150)	Total
<18.5 (under weight)	125(83.33)	128(85.33)	253 (84.33)
18.5 – 22.9 (ideal BMI)	20 (13.33)	22 (14.66)	42 (14.00)
>23-24.9 (over weight)	3 (2.00)	-	3 (1.00)
> 25 (obese grade I)	2 (1.33)	-	2(0.66)
Total	150	150	300

The distribution of girls based on body mass index is presented in Table 3.In the present investigation only 14 per cent of the population were found to be normal. It was alarming to note that majority of the adolescent girls (84.33%) were belonging to underweight category, while only 1 per cent of them were in over weight and only 0.66 per cent were obese grade I category. When dry zone sample was considered, only 13.33 per cent underweight, while 2 per cent were overweight and only1.33 per cent were in obese grade I category. in transitional zone, only 14.66 per cent were in normal category and 85.33per cent belonged to underweight category .It indicates that majority of the adolescent girls were underweight in both the zones.

Waist to Hip Ratio

Table 4. Classification of adolescent girls into different groups based on WHR

WHR	Dryzone (n = 150)	Transitional zone (n = 150)	Total
> 0.80 (at risk)	38 (25.33)	46 (30.66)	84 (28.00)
<0.80 (no risk)	112 (74.66)	104 (69.33)	216 (72.00)
Total	150 (100.00)	150 (100.00)	300(100.00)

Categorization of adolescent girls based on waist to hip ratio is presented in table 4. Hundred and twelve girls (74.66%) were not having any risk and 38 girls (25.33%) were at risk of abdominal obesity with waist to hip ratio more than 0.80 in dry zone. Similarly in transitional zone, 69.33 per cent not having any risk and 30.66 per cent were at risk. Thus indicating 25-30 per cent of adolescent girls were in abdominally obese through majority of them are underweight.

Majority of adolescent girls (84.33%) were in underweight group (Table3).But it is alarming to note that about 25-30 per cent adolescent girls were having abdominal obesity, through they were underweight. Similar result were noticed in the study conducted by Jayashree (2002)

Dietary Survey

The result pertaining to food intake and adequacy by the dry and transitional zone adolescent subjects are presented in Table 5.

Table 5. Mean food intake of adolescent girls (N = 300)

Food intake (g/day)	SDA	Dry zone (n = 150)	Transitional zone (n = 150)	'Z' value
Cereals	350	150.96 (43.13)	165.58 (47.30)	2.52**
Pulses	50	122.21 (244.42)	139.95(279.9)	2.10*
Green leafy vegetables	150	4.99 (3.32)	5.10 (3.40)	0.20^{NS}
Other vegetables	75	27.85 (37.13)	28.02 (37.36)	0.01^{NS}
Roots and tubers	75	33.41 (44.54)	36.24 (48.32)	0.70^{NS}
Fruits	30	139.89 (466.30)	191.33 (637.76)	2.3*
Oils and fats	40	43.43 (108.57)	38.58 (96.45)	2.1*
Fleshy foods	30	3.00 (10.00)	8.45 (28.16)	1.3^{NS}
Milk and milk products	150	54.76 (36.50)	68.45 (45.63)	4.2**
Sugar and jaggery	30	37.14 (123.80)	50.21 (167.36)	3.3**

* Significant at 5% level, ** Significant 1% level,
NS – Not significant.
Values in parentheses indicate per cent adequacy
SDA – Suggested dietary allowance (Zanvar et al., 2007).

The mean cereal intake of dry and transitional zone adolescent girls was 150.96 and 165.58 g, respectively, which met only 45 percent of the suggested Dietary Allowances. Irrespective of locality, the consumption of pulses was 122.21 and 139.95 g in dry and transitional zone respectively. Which was two times (262%) higher than the recommendations? Pulse intake among dry and transitional zone was statistically significant over SDA for the target group.

The per cent adequacy of green leafy vegetables (3.32 and3.40g), other vegetables (37.36g) and roots and tubers (4.45 and 4.32 g) was less in the both dry and transitional zone respectively. Surprisingly, consumption of fruits irrespective of locality was higher and could supply 100 percent and in transitional zone it was 637.76 per cent. The average daily intake of oils and fats was higher in dry zone (43.43 g) over transitional zone (38.58g) and these differences in consumption with SDA was less with an adequacy of 108.57 per cent and 96.45 per cent respectively. The daily consumption

of fleshy foods, irrespective of locality was 10.00 and 28.11 per cent in dry and transitional zone respectively. The daily intake of milk and milk products could not meet the recommendation in both dry and transitional zone. It was higher I transitional zone (68.45) than dry zone (54.76) which could meet 45.63 and 36.50 per cent of adequacy in transitional and dry zone respectively. Irrespective of locality, sugar and jaggary intake per day was more than the recommendation in both dry and transitional zone (123.8 and 167.36 % respectively).

The student't' test indicated that mean intake of food groups except for green leafy vegetables and milk was significantly different between the zone.

Table6.Intake of energy and blood groups forming nutrients:

Nutrients	Dry zone (n = 150)	Transitional zone (n= 150)	'Z' value
Energy (kcal)	1463 ± 448	1647± 219	2.01*
Protein (g/day)	40.39 ± 14.03	45.03 ± 11.30	1.98*
Ascorbic acid (mg/ day)	13.22 ± 15.34	14.48 ± 29.08	0.40 NS
Vitamin B12 (µg/ day)	0.15 ± 10.13	0.13 ± 0.81	1.20 NS
Folic acid (µg/day)	93.48 ± 37.80	125.35 ± 46.68	1.98*
Iron (mg/ day)	12.64 ± 7.14	14.04 ± 8.64	1.50 NS

The mean intake of energy, protein and folic acid was significantly higher in transitional zone (1647±219,45.03±11.30 and 125.35±46.68 respectively) compared to dry zone(1463±448,40.03 and 93.48±37.70 respectively).Other blood forming nutrients like ascorbic acid (14.48±29.08) and iron intake(14.04±8.67) were found higher in dry zone (0.15±0.81) was not statistically (Table 6)

Analysis of the diet survey from the present study revealed that, except for energy, protein and folic acid, significant differences did not exist in the intake of nutrients between dry and transitional zone. But the intake was significantly low in both the zones compared ICMR recommendations for all the nutrients except for folic acid in transitional. This was due to the poor intake of green leafy vegetables, other vegetables, roots and tubers, cereals, fleshy foods and milk and milk products in both the zones. Intake of pulses, sugar, jaggery, oils , fats and fruits was higher in consumption but these food groups mainly provides energy and protein and do not contribute to blood forming nutrients.

Table 7. Mean intake of energy and blood forming nutrients

Nutrients	Dry zone (n = 150)	Transitional zone(n = 150)	'Z' value
Energy	71	75	1.98*
Protein	77.32	95.20	2.10*
Ascorbic acid	33.07	37.68	0.96 NS
Vitamin B12	47.53	44.83	0.43 NS
Folic acid	93.49	125.35	1.98*
Iron	45.15	47.16	1.92 NS

* Significant at 5% level, NS – Not significant

The mean per cent adequacy of energy and blood forming nutrients by dry and transitional adolescent girls are depicted in fig1. The mean per cent adequacy of energy, protein and folic acid was significantly higher in transitional zone (75,95.20 and 125.35%, respectively) compared to dry zone (71,77.32 and 93.495%, respectively).Other blood forming nutrients like ascorbic acid (37.68%) and iron (47.16%), were higher in transitional zone, but were significantly different from the dry zone. The adequately of vitamin B_{12} was higher in dry zone (47.53%) compared to transitional zone (44.53) compared to transitional zone (44.53%), but significant difference was not there between the zones. The per cent adequacy of energy was less than 75 percent compared to recommended dietary allowance in all the selected adolescent girls which may be due to inadequate consumption of food itself. Since 80 per cent of adolescent were from low and middle socio-economic group.

Clinical symptoms

Table 8. Prevalence of clinical symptoms of anaemia in adolescent girls (N = 300)

Symptoms	Dry zone (n = 150)	Transitional zone (n = 150)	Total
Fatigue	42 (28.00)	35 (23.33)	77 (25.66)
Breathlessness	5 (3.33)	7 (4.66)	12 (4.00)
Paleness	42 (28.00)	10 (6.66)	52 (17.33)
Giddiness	10 (6.66)	12 (8.00)	22 (7.33)
None	51 (34.00)	86 (57.33)	137 (45.66)
Total	150 (100.00)	150 (100.00)	300 (100.00)

(Values in parentheses indicate percentage)

When dry zone was considered majority of the subject had fatigue and paleness (12% each), followed by giddiness and breathlessness (6.66 and 3.33% respectively), while 34 per cent of the girls were free of symptoms. About 23 per cent of subjects in transitional zone had fatigue followed by giddiness (8.00%), paleness (6.66%) and 4.66 per cent of the subjects had breathlessness, 57.33 per cent of the subjects had no clinical symptoms (Table6).From the clinical examination conducted it was of the found that majority of the adolescent girls did not show any clinical symptoms. Only few of the subjects exhibited clinical symptoms like fatigue, paleness, giddiness and breathlessness. Similarly Kumar et.al (2006),

also reported symptoms of anaemia like breathlessness, tiredness and pale nails in 80 adolescent girls.

Haemoglobin assessment:

Table 9. Hemoglobin status of selected adolescent girls (N = 300)

Hemoglobin level	Dry zone (n = 150)	Transitional zone (n = 150)	Total
Mild anaemic (10-12 g/dl)	38 (25.33)	46 (30.66)	84 (28.00)
Moderate anaemic (7-10 g/dl)	112 (74.66)	104 (69.33)	216 (72.00)
Total	150 (100.00)	150 (100.00)	300 (100.00)
Mean Haemoglobin level (g/dl)	9.54	10.19	9.86
't' Value	13.50**		

Values in parentheses indicate percentage. ** Significant at 1% level

The mean haemoglobin content of the total subjects was found to be 9.86g/dl. The mean haemoglobin content of dry zone girls was 9.54g/dl, while that of transitional zone girls was 10.19 g/dl. Maximum of adolescent girls (72.00%) were moderately anaemic and 28.00 per cent of them were mildly anaemic and neither of the subjects belonged to moderately anaemic group (74.66%) followed by mild anaemic category (25.33%).In transitional group also similar results were observed. Overall prevalence of anaemia in present study was found to be 100 per cent. Similar results the prevalence of anemia may be to less than 50 per cent adequacy of blood forming nutrients viz, ascorbic acid, vitamin $B_{12,}$ folic acid and iron.

Conclusion:

From the study it can be concluded that the height and weight of the adolescent girls of dry and transitional zone were similar but were shorter and lighter compared to NCHS standards and also diet of adolescent girls was inadequate with regard to energy and blood forming nutrients. It was alarming to note that all the selected subjects (100% were anaemic in both the zones. But, the mean haemoglobin level of adolescent girls was comparatively high in transitional zone than dry zone. It was observed that intake of blood forming nutrients was drastically low in both the zones which may be because of lack of awareness about the importance of iron rich foods. Hence there is a educate about the importance of iron rich foods and improve the nutritional status.

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H.M.Sc.A:-03

PHYSICAL ACTIVITY PATTERN OF ADOLESCENT GIRLS

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Introduction:

Healthy living and physical fitness are closely connected. Being physically fit helps people to live longer. Physical activity is important for physical health, emotional well-being, and achieving a normal weight, physical activity may help us to control our weight by using excess calories that would otherwise be stored as fat.

The question of how much and what types of exercise are needed to obtain these results is still a subject of debate. It is recommended, however, that people of different ages include a minimum of 30 min of physical activity of moderate intensity, such as brisk walking, all most if not some days of the week. The activity need not necessarily be continuous, but could, for instance, be split up into three sections of 10 min. The intensity should be sufficiently high to cause a moderate degree of breathlessness, which represents a level of 50% to 60% of one's maximal capacity and which has been shown to produce a training effect. In the case of most people, the more vigorous and prolonged the activity, the greater are the health benefits, provided that the increments in activity level are not too abrupt (Astrand 2003).

By active recreation is meant a stimulating hobby or activity that involves some muscular activity, as opposed to passive recreation which, although it may be stimulating, lacks any marked demand on the circulation or loco motor organs. Watching television, reading a book, playing cards or chess, stamp collecting, and listening to music are all examples of passive recreation. It is extremely important to have something enjoyable to look forward to every 'week, and possibly

every day, and passive recreations are in this respect very valuable. However, they should be supplemented by active recreation, preferably outdoors. Good examples of active recreation are gardening, botany, and of course sports, including fishing, hurtling and mountaineering, and walking. Important beneficial effects of active recreation, depending on the type of activity chosen, are improved strength and endurance and increased range of movement.

Physical activity was associated with numerous health benefits. The dose-response relations observed in observational studies indicate that the more physical activity, the greater the health benefit. Results from experimental studies indicate that even modest amounts of physical activity can have health benefits in high-risk youngsters (e.g., obese). To achieve substantive health benefits, the physical activity should be of at least a moderate intensity. Vigorous intensity activities may provide even greater benefit. Aerobic-based activities had the greatest health benefit, other than for bone health, in which case high-impact weight bearing activities were required.

Most individuals are physically lazy from the age of puberty. Therefore, training and active recreation must be offered in a positive manner. The cost of simple sports grounds, possibly with changing rooms, showers, and sauna, is low compared with the cost of building and running a hospital. Hence this study was undertaken to elicit information on physical activity pattern of adolescent girls.

Objectives:

1. To find the daily activities of the adolescent girls,
2. To find out energy expenditure of adolescent girls
3. To determine the relationship between age and activity.

Methodology:

To study the physical activity pattern of adolescent girls, Survey method and Questionnaire was the tool used. A sample of 60 adolescent girls with the age range of 16 to 19 years was chosen for the study. A pilot study was conducted to assess the feasibility of the questionnaire. A modified questionnaire was used for the main study. The questionnaire consisted of questions related to the background information of the respondents, Anthropometric measurements, physical activity pattern and food habits.

Results and Discussion:

The background information shows that higher percentage of the respondents belonged to the age of 17 years followed by 18 and 19 years respectively. The ordinal position of majority of the respondents was second followed by first and third respectively. The anthropometric measurements show the mean height of the respondents was 154.28cms and mean weight was 47.73 kgs respectively. The body mass indexes of majority of the respondents were below normal only a few adolescent girls were normal. Majority of the respondents belongs to the nuclear family type and fewer amounts to joint family. The numbers of family members of the majority of the respondents were in the range of 3-4 members followed by 5-6 and 7-8 respectively. The family incomes per month of the majority of the respondents were below Rs.10000 followed by Rs.10001-20000 and above Rs.20000 respectively. The number of earning members in the family of most of the respondents was one followed by two or three.

Table – 1: Food habits of the Respondents

N=60

Characteristics	Category	Respondents	
		Number	Percent
No of meals consumed per day	Two	8	13.3
	Three	25	41.7
	Four	27	45.0
Meals consumed by respondents	Breakfast	48	80.0
	Lunch	57	95.0
	Dinner	60	100.0
	Snacks	34	56.7
Enjoy eating junk foods	Yes	60	100.0
	No	0	0.0
Total		60	100.0

Table 1 reveals the food habits of the respondents. Higher percentage of the respondents consumed four meals per day followed by two and three respectively.Cent percent of the respondents consumed dinner regularly followed by breakfast, lunch, and snacks. Cent percent of the respondents enjoyed eating junk foods.

Fig 1: Type of snacks regularly used by the Respondents

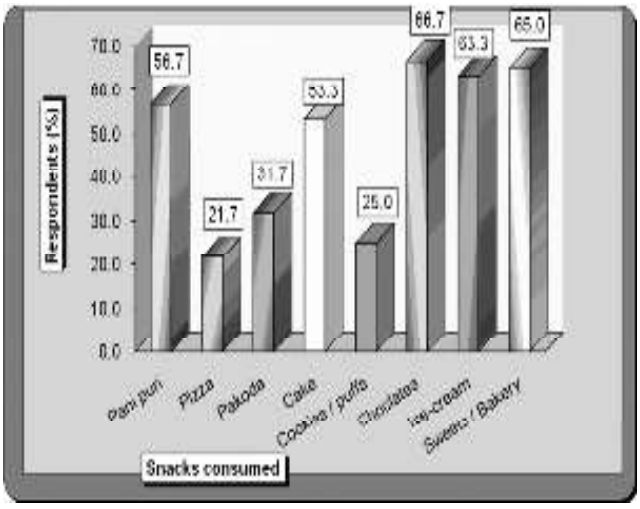


Figure 1 show the type of snacks used by the respondents regularly. Higher percentage (66.7%) of the respondents had chocolates followed by ice- cream, sweets, panipuri, cake and a fewer respondents had pakoda followed by cookies, and pizza respectively.

Table – 2: Activity levels at work by the Respondents

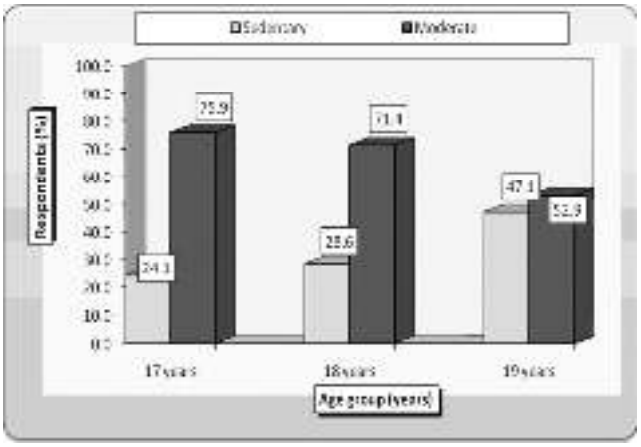
N=60

Aspects	Activity levels at work					
	Yes		No		Total	
	N	%	N	%	N	%
Sitting – light work	26	43.3	34	56.7	60	100.0
Sitting – moderate work	30	50.0	30	50.0	60	100.0
Sitting – light work	60	100.0	0	0.0	60	100.0
Sitting – light/mode rate work	38	63.3	22	36.7	60	100.0
Sitting – moderate/ heavy work	35	58.3	25	41.7	60	100.0
Walking at work –carry ing heavy bags	52	86.7	8	13.3	60	100.0
Walking – carrying something more	30	50.0	30	50.0	60	100.0

Table 2 depicts the activity levels at work by the respondents. Cent percent of the respondents did sitting light work followed by walking at work, carrying heavy bags, sitting light or moderate work and a few respondents did sitting moderate /heavy work, walking carrying something more, sitting moderate work, and sitting light work respectively.

Table 3 shows that Cooking and washing was observed to be the highest performed activity by 76.7 percent of respondent's everyday followed by cleaning of the house by 15 percent of the respondents. Shopping and browsing in shops for other items was performed by a majority of the adolescents 1 to 2 times in a week followed by caring for preschool children or babies at home (48.4%). The study reveals that most of the adolescents performed only 1 or 2 times in a month the activities like laundry and ironing (61.6%), shopping for food and groceries and caring for elderly at home (48%), cleaning of the house (28%) and cooking and washing (15%).

Fig 2: Association between Age of respondents and PAL classification



From Figure 2 it was found that the association between age group and physical activity level. The respondents belonged to the age of 17 years had higher physical activity level when compared to 18 and 19 years respectively. But there was a non significant difference between age and physical activity level when analyzed statistically.

Table – 3: Respondents Activity in and around the home

No of hours / week	Activity in and around the home (%)							
	None	1-2 times/ month	1-2 times/ week	3-4 times/ week	1-2 times/ day	3-4 times/ day	5-6 times/ day	Other
Cooking & washing	0.0	15.0	0.0		76.7	8.3	0.0	0.0
Shopping for food and groceries	0.0	48.3	1.7	50.0	0.0	0.0	0.0	0.0
Shopping and browsing in shops for other items	0.0	8.3	76.7	15.0	0.0	0.0	0.0	0.0
Cleaning the house	0.0	28.3	0.0	48.4	15.0	8.3	0.0	0.0
Doing the laundry and ironing	1.7	61.6	0.0	28.3	0.0	0.0	0.0	0.0
Caring for pre-school children or babies at home	43.3	8.3	48.4	0.0	0.0	0.0	0.0	0.0
Caring for handicapped, elderly or disabled people at home	43.3	48.4	8.3	0.0	0.0	0.0	0.0	0.0

Table – 4: Association between Body mass index and PAL Classification

N = 60

Body mass index	PAL Classification						X^2 Value
	Below 1.40		1.40-2.40		Total		
	N	%	N	%	N	%	
Below Normal	18	32.7	37	67.3	55	100.0	0.34 NS
Normal	1	20.0	4	80.0	5	100.0	
Total	19	31.7	41	68.3	60	100.0	

NS : Non-Significant, X^2 (0.05,1df) = 3.841

According to table 4, physical activity level was high for the adolescent girl having normal body mass index (80.0) when compared to below normal (67.3). However there was a non significant difference between body mass index and physical activity level when analyzed statistically.

Table – 5: Mean and SD of Total Energy Output of Respondents

N = 60

Characteristics	Category	Sample	Total Energy Output		F- Value
			Mean	SD	
Age Group	17 years	29	1562	292	5.36*
	18 years	14	1621	270	
	19 years	17	1822	300	
Ordinal position	One	34	1673	296	2.15 NS
	Two	19	1647	262	
	Three	7	1517	212	
Body mass index	Below normal	55	1624	268	8.16*
	Normal	5	2104	323	
Type of family	Nuclear	45	1663	316	1.32 NS
	Joint	15	1668	264	
Combined		60	1664	302	

NS: Non-significant, * significant at 5% level

Table 5, shows that, as the age increases the energy expenditure also increased. When analyzed statistically it was found that there was a significant difference been age and energy expenditure and non significant difference between ordinal position and energy output. The total energy output was high for those respondents having normal body mass index than below normal and found to have significant difference between body mass index and energy expenditure and non significant difference between type of family and energy expenditure.

Conclusion:

The study on activity pattern of adolescent girls revealed that the physical activity varied from moderate to low. It was found that as the age of the respondents increased the physical activity level decreased.

The energy expenditure of adolescent girls increased with age and decreased with ordinal position. The respondents having normal body mass index spent more energy when compared to below normal. There was non- significant difference between type of family and energy expenditure.

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H.M.Sc.A:-04

PHILOSOPHY AS A RESOURCE OF MEDICINE

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In the evolution of practice of indigenous medicine in India, one needs to consider the influence rendered by the school of philosophical thoughts. From the time human beings began to take interest in the physical health care , they have been curious and have formed many hypotheses. The earliest presumption base on human experience has been that every symptom is the manifestation of a particular act, hence, an individual deity had been presumed for each particular disease symptom. Thus gods of rain, wind, fire and light affecting human health had been conceived. Much later these

were synthesized and consolidated into doctrines of faith. Still further, with the increasing development of different deliberations and analyses schools of thought emerged that seriously considered the structures of body and mind and the resultant impact of their behaviour under different circumstances. In due course, we find distinguished scholars , a few of them like the Buddhist Nagarjuna as physician and Amara Simha the lexicographer and a learned person recording the careful observations of different plants and animals. It is important to note that Simha's use of each synonym describes the particular character of the recorded plants and animals interestingly. It is believed that the records Chinese pilgrims like Fa- hiyen and Hiuyen-tsang coming to India had made spoke highly of the Indian medicine. They have added the informations derived from the Indian sources on medicines to their libraries by resorting to Chinese translations.

The intellectual schools of thought especially the philosophical ones that developed in India, produced the influential system of ideology devised to explain and analyze the human behaviours and their consequences on individuals' health in general while aiming to free them from the worldly pains. World is speculated as a place in which people suffer and often have rare hopes that anything or anyone can make a difference when the situation is extremely grave. While emphasizing on the theory of freedom, these schools point out that if such a situation continues for majority of humans then we have to imagine what it would be like to live in a world of people who may not have any wish to live since they don't feel better. Also ,the fact that they are equally unable to help each other to overcome miseries/ ailments is a matter for despair.The way out of this is not so easy. The schools of thought had developed theories with far-reaching consequences on human health and life and perhaps this is the reason that the history of medicine, not to mention the history of religion , as some scholars feel, would have hardly been different from a history of quacks and conmen ingeniously exploiting the hopelessly vulnerables.

For the school of Sankhya thought, probably the most ancient one in the history of Indian thought, the question has always been, what if anything can be done ? Only when we acknowledge the drawbacks of living in a world in which everyone's unhappiness renders everyone else clueless, can we review our options and their histories with some sense of relief. We have to take measures when we begin to feel in someway troubled. Physicians believe that pain has made us so inventive. Sankhya makes pain the point of departure to construct a theory of liberation from pain. The theory indicates that state which releases humanity from all kinds of pain and misery in a way that goes beyond the state of medical application and brings about the end of suffering and its supercession by a kind of knowledge which will never revert the body in any medical state.

Sankhya raises the issue that pain often shows no signs of withering away and its staying power makes people more like victim than seekers in quest for remedies/ therapies. Hence, we would do better to think of some solutions instead of sneering at them. It is true that most of the therapies could be provisional and uncertain, and misgivings about the availability of these may turn into an impatience with suffering itself. Scepticism about treatment becomes suspicion in many contexts. The many practices of cures, if it does nothing else, keeps the idea of cure alive ; but it tends to make people excessively judgemental of them that they are the final stages. Sankhya, on the other hand, links the problems of miseries to the theory of freedom from the miseries/ pain and disease in such a way as to bring about a change in the said thinking. Since the symptoms are left as disconnected fragments of a coherent design not being attended with a proper understanding , they remain ever intriguing to the process of cure.

The intricate complexity between symptoms and cures and between what people are considered to be suffering from and what they claim to be suffering from , has made the history of medicine and the school of Sankhya in it's broadest sense , of much interest. First to be discredited , is the prediction that the cure by themselves are revolutionary. In fact it is not so. It has periods of crisis. Often, it may fail to produce mass healing. Could it be reformed without self-contradiction. Apart fromt this the the appeal of cure is dimmed by economic reasons of unaffordability by the mass population due to their existence often below poverty line.

The dynamism that Sankhya wants to provide for both prevention and remedy of health disorders, it claims, is at once remarkable breakthrough and reputable. First to tbe credited at least as far as the non-metaphysical world is concerned is the prediction that mind inevitably impacts the bodily behaviour and if it implodes then with it will collapse all health projects since they are closely connected with each other. Mind , as described in the Sankhya with it's structure retains it's fascination, though it is not linked to any scheme of historical stages. Sankhya phrases about mind have the ability to be serviceable for any other school of thought which feels itself influenced by the implied psychological structures. In fact Sankhya explanation on mind has been fairly topical.

Following the Sankhya interpretation the mind structurally is speculated to be the part of the ' Antahkarana' or the ' Internal Organ' , in which the mind called 'manas', besides ahankara , chitta and buddhi i.e. ego, cognition and intelligence respectively are components of the whole unit.The shifting interpretations of the meaning and nature of these faculties render the legacy that have faithfully tracked shifts in the demand for them as ideas. This vindicates Sankhya belief that the individuals use ideas they need rather than need the ideas for their use. It was made clear by the Sankhya that the analyses born of the examination of these faculties are either solutions or problems in themselves, or both. Sankhya makes it clear that all these faculties matter, for good or ill , that they

need to be worked with since they ultimately account for all psycho-somatic behaviours.

The context of all pain and miseries have been seriously discussed by the Sankhya school. Pain is categorized into three groups , viz. Adhibhautika, Adhidaivika and Adhyatmika which in simple terms mean those originating from Nature, others from the sources which humans cannot deal with and yet others which are supposed to be trans-physical (the causes of which are mentioned to be the deeds of past births etc.) respectively. It is interesting to note that the said school emphasizes that the psycho-social contexts for these pain/ diseases are not just simple contexts but are the deciding factors of any health project. While the collapse of the health projects are due to non-comprehension of the root causes, the analyses of which often remain unattempted. Sankhya therefore , is of the view that linking the causes with the consequences can be rationally discerned in the light of which explanations can be given and tasks undertaken.

Often we live entirely in the present. For most people, the past has little meaning. One may think that there is no future on the horizon except may be more of ambiguous present , speculates Sankhya. Given this situation, Sankhya pursues a methodical investigation that traces the source of all physical and mental behaviour to the function and behaviour of Matter, termed in Sankhya school as ' Prakriti'. Prakriti is explained as the first cause of the universe , in fact, of everything (except Consciousness at a higher level, termed by it as ' Purusha') . The nature of prakriti/matter is deduced from the nature of the common things of experience by the aid of reason alone. As the material cause of things, prakriti/matter should consists of what is common to all of them. For, the effect / product , according to a fundamental postulate of the system, must be essentially the same as the material cause.

By a process of analysis , the essential characteristics of the physical universe are reduced to three viz. , 'Sattva', 'Rajas' and 'Tamas'. Prakriti / matter is conceived as constituted of them. It is thus complex in it's nature. These three factors are described as 'gunas'. Their conception is said to be of utmost importance in the system of the Sankhya thought. One of the meanings of this term 'guna' is 'entanglement' besides it's other renderings being 'quality'/ characteristics encompassing both the psycho-somatic dimensions. For instance, Sattva represents wisdom/intelligence/ discretion. Rajas represents agility/ action / enthusiasm while Tamas stands for inertia and hence, they are figuratively described to manifest characteristics like lightness, restlessness and heaviness respectively. The totality of all this indicating both the behaviours of physical and mental is said to have emerged from prakriti / matter. Hence, any psycho-somatic behaviour is an expression of prakriti / matter , speculates the Sankhya.

Matter being present everywhere in the universe and the above said factors coming from matter ironically disclose if one may note the most constitutively the natural problem of all , that Nature and people could have considerable influence over each other. That body and brain affect each other in daunting ways and that because of this influence , often , the body parts may appear as rhetorical organs have been brought to light by the neurologists and psychiatrists of the nineteenth and early twentieth centuries. Joseph Babinski, the French neurologist described an extraordinary syndrome – anosognosia, the inability to perceive that one side of one's own body is paralyzed and the often –bizarre attribution of the paralyzed side to another person. By virtue of it's sheer magnitude , the prakriti / matter appears as a theatrical spectacle and as the medical treatment makes it clear that bodies are persuasive and further that the appetite for persuasion and for being persuaded is exorbitant. It may appear odd, in retrospect , that this should have seemed as shocking in the past as it is now. Prakriti / matter , is an extravagant acknowledgment of the power of cosmos/nature and the body through it's various historical formations and deformations has remained a great deal of mystry. It has the reputation for being the problem and the solution.

What matter / prakriti has always been convincingly exposing is just how insignificant humans can be. The milieu of prakriti / matter embraces innumerable life forms inhabiting air, soil, water, energy created billions of years ago, of which human beings form an integral component. The environmental and cosmic balances are products of natural evolution, the history of which may be traced back to the evolution of life. The birth and death of organisms, their life systems, diseases, inter-relationships in the background of natural phenomena like earthquake, lightening, erosion form a complex nature in which the process and continuity of evolution is maintained by prakiti / matter, in the contexts of the Adhibhautika and Adhidaivika , maintains Sankhya. Humans themselves though a product of evolution have created an environment of their own , taking the raw materials from the air, soil, water, energy etc. referred to as the 'Panchabhutas', the products of prakriti / matter.

However, as a corollary of progress in science and technology, humans unfortunately, have polluted many of prakriti's / matter's resources and have caused a grave problem endangering lives and beings with innumerable illnesses and miseries. It was not always the positive results they were after. They wanted to be thrilled and excited . Considering the context of cloning , for instance, it is difficult to comprehend the ethical challenges that it raises. It is not the logic or the informations that are provided by such adventures as the complexities that surround the questions of very health care itself. It may make the disease more volatile than one will not want it to be , and diagnosis much less influential which one thinks it should not be .

The Sankhya does not make it's stand an unnecessary spectacle but declares frankly that there are areas and contexts of

something fundamental and disturbing about human nature. Hence, life without disease is contradiction in terms. Diseases are essential components of life since they also help provide immunity. They justify human existence, in other words, life is inhabited by them. Hence they become an area for historical research and consequently, endlessly speculative historical debates. Such debates have been recorded by the Sankhya school along with it's own significant contribution. It is the contention of the Sankhya that the three 'gunas' described earlier at the root of psycho-somatic causes are sensations waiting to happen all the time. Hence, we must go back to these causes to understand why things happen the way they happen. The ground of these causes show impressive details, making the text of this school almost symptomatic.

The text mentions that the basic elements of the universe which are the earth, water, fire/ energy, air and space (prithivi, ap, tejas, vayu and akasha respectively) along with three humors viz. 'va ta' or wind, 'pitta' or bile and 'kapha' or phlegm are supposed to be responsible in maintaining the well being or otherwise of human health. These have a generic , physiological and cosmological concepts at their background. Equilibrium is regulated by peoples' age , temperament in dynamic relationship to cosmic principles and environmental culture. Hence, food consumption and other activities have to be planned accordingly. The principle underlying is that the arrangement and balance of elements in the human body are only microscopic versions of their arrangement in the universe at large. The microcosm fulfilling it's vast circuits and epicycles of meticulous precision, it's risings and it's settings, it's movements within movements, is an immense body fashioned after the likeness of a person's body. This conception rationalized the relation of human beings to their environment by making preventive and curative medicine and in turn to make efforts to maintain or to restore cosmic equilibrium.

Thus, complete knowledge of humans and their relationship to their environment included understanding of the causes of mankind's ailments. Indian medicine's inherent philosophical orientation led to theories about causes of mankind's affections. Although it's exact origin cannot be determined, the etiology particular to Indian medicine is the three humors (tridosha) theory. Nearly all maladies plaguing humans are explained by means of three peccant humors or 'doshas'— wind , bile and phlegm as mentioned earlier. The doshas act as vitiators by disrupting the normal balance of the bodily elements (dhatus), which in turn are the modifications of the five basic elements (described above) found in prakriti / matter. The resulting disequilibrium of the bodily elements produce disease. Also, their empirical orientation led the medical theoreticians to include environmental factors, daily regimen and external factors in their overall consideration of the causes of diseases.

Another emphasis of the intellectual understanding is to elucidate more thoroughly the contributions of Buddhists renunciants to the developments of Indian medicine. Pursuing the Buddha's key teaching of the Middle Way or Madhyama Marga i.e. the balance between the extremes of world- indulgence and self- denial, healing became part of Buddhism by providing the means to maintain a healthy bodily state characterized by an equilibrium both within the organism and between the body and it's environment. The symbiotic relationship between Buddhism and medicine facilitated the spread of Buddhism in India, led to the teaching of medicine in the conglomerate monasteries , and assisted the acceptance of Buddhism in other parts of Asia (Zysk 1991).

What Indian philosophy intends medical history to know is how the speculations that preceded is integral to understanding of history of medicine and why mere physical diagnosis etc. are displaced by the stronger rationality of psycho-somatic analysis. The Buddhism, a product of the ancient Indian thought process , maintains that mankind's suffering is eightfold : bile, wind and their combination (sannipata), changes of seasons (ritu), stress of unusual activities (visamparihara), the external agencies (upakrama), and the result of actions (karmavipaka), all these are the causes of suffering. The inclusion of actions (also past) as a category of medical etiology is quite old. In modern context, the notion of actions contributing to an individual's overall physical state may appear in conflict with the general empirico-rational physiology of Indian medicine.

The perpetuation of ideologies by Indian philosophical schools that encompassed the concerns for the development of body and mind had it's effects on prescriptions of not only medicines but also of the daily routine of the eating habits. In their view , the first beginnings of a good health care is that we ought to have informations to maintain a proper balance between mind and body, the measures for which can be pursued meticulously. The possibility that we are able to deal quite rationally with these ideas and that they do not appear absurd may not allow room for skepticism. In fact the word Ayurveda (the science of living a long life) evolves in the context of not only curing disease but also promoting such health that would resist disease. This is done after the observations and examinations of various factors related to health which in due course led the medical learning to go for medicines that would have evolved it's various usages .

The Buddha did propagate a theory which support that the human well being is dependent on his/ her actions. Besides, it is also responsible for high /low births and that in turn lead one to good and bad contexts respectively. However, these accounts may not agree with the ones mentioned in the books on medicine viz. Charaka and Susruta. The theory of Karma (action in the past birth), when counted as a factor in the eightfold enumeration of the causes of disease , recognized

by the Buddhists suggests that the medical theoreticians , on the level of theory, had accepted it quite early. This utopian definition , some felt has several disadvantages. It implies that the condition of being healthy is static and absolute , and it does not provide for differences in perspectives. Yet others opine that such provision is desirable since conditions may be regarded as healthy in one society and unhealthy in another. This necessitates a deeper investigation.

There are however, significant attempts by the experts of the modern medicine who use therapeutic techniques , to understand and explore the meaning derived from all the apparently bewildering psycho physical causes rendered by the investigating contributors in past. Freud is said to have tried to conceptualize much of the psychic terrain and unspeakable desires to which other writers of the period seemed to have attempted to comprehend vaguely. Yoga school of thought in India, dealing especially with the psyche is also not curiously snobbish regarding mind's activities and other nuances and did not allow them to be unnecessarily lost. Any system of medicine thus cannot be allowed to be a historical monolith , entirely constructed by an isolated terrain.

It is significant to note how the available intellectual and cultural ingredients act as determinate factors pervading the psycho-physical behaviour were found interesting in order to investigate the malady. If the laboured pathos of the story of philosophy behind medical history now causes us to flinch, it should be remembered that that many contemporary schools of thought in ancient India too were as deeply absorbed by the themes of the ideologies that cater to human health and it's welfare. Ironically, these may seem somehow deficient in the modern era of new technology. By dividing the world into the informed and the uninformed and especially when doing so without historical hindsight , do medical histories sound merely ahead of game is the question that needs to be raised.

Comparing with the modern aggressive medical system the Sankhya school of thought becomes a significant departure in understanding the holistic approach that brings positive and interesting results making people feel comfortable and empowered. It allows them to understand suitable recovery along with a changed perception regarding emotional and physical problems. Materially, technology is the new frontier. However, the frontier of psychic functions are associated with the frontiers of somatic functioning hence Sankhya says that 'immigration' has to be understood as a passage across either boundaries. The growing influence of the globalisation is productively busy in naturalizing the mass market approach to health care which has risk factors that are often fatal while philosophical source has no hidden agenda.

Just as it would require enormous wrench on all our parts to extirpate the prejudice that the early religio history and philosophy has talked more of occultism than health issues, so it will require an enormous wrench for medical scientists to unthink the kind of wrong notions that has badly effected the medical history and to create something more useful in it's place.

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H.M.Sc.A:-05

EFFECT OF POSTURE ON THE MUSCULOSKELETAL SYSTEM OF INDUSTRIAL WORKERS

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Introduction: In recent year's investigations of Work- Related MusculoSkeletal Disorders (WRMSDs) has attracted considerable attention because of its importance in assessing ergonomics risk factor involved in industrial workplaces. Occupational risk factors such as force, posture, movement and vibration can affect the WRMSDs (Kilbom 1994). For many workers in developing countries, ergonomic problem may not be high on the list of Priority health and safety problems they face. While most of the industrial work in mechanized, there are still many jobs that must be done manually, involving heavy physical strain. The risk of WRULDS may caused by the postural stress and demands of work (Punnett and Bergqvist 1997). This results in back aches, neck pains, eyestrain, sore wrists, arm and leg strain. Hence, this study is

taken up to know the effect of wrong posture on the musculoskeletal system of Industrial workers.

According to Michael Spallek, et al, (2010) observed that rate of musculoskeletal complaints were disproportionately higher among experienced workers performing new tasks and young trainees. The most common MSD in this group were disorders of flex or tendons of the forearms.

Sakineh Varmazyar, et al, (2009) in the study consisting of 38 pharmacy packaging workers, found that 44.7% have been reported knee pain and 36.8%, 31.6% back pain and neck pain respectively. The final RULA score (mean 4.87) emphasize on poor workstation design among pharmacy packaging workers.

Baker, N.A, et al, after analyzing the data from 19 different postures from all 42 people, reported that only one factor demonstrated good ability to predict who had an MSD of upper extremities, that is, neck flexion at an angle >_ 20 degrees. This means that the participants who had their heads pointing downwards had a higher likelihood of having some form of upper extremity problem.

The objectives of the study was to obtain information on awareness of posture among the employees, to observe the working postures of the workers and to know the effects of working environment on the health of the worker.

Methodology: The study aims to know the effect of wrong posture on musculoskeletal system of industry workers. The sample consisted of 30 employees in seated posture and 50 employees in standing posture working in electroplating of automobile parts were selected.

Required data related to personal details and musculoskeletal problems was collected by using an Interview schedule. The first section requested information included of background information such as age, sex and work history. In this study the worker position was evaluated by the RULA method. The RULA method evaluates the ergonomics risk factor by observation the posture of employees while they are working at their workstation directly (McAtamney and Corlett 1993).

The second part of the questionnaire was based on body map chart. The presence of pains, aches or discomfort and reported as ''yes'', their absence as ''no''.Self-report Body Discomfort Chart provide a valid index for assessing of body discomfort - were given to all employees to specify the regions of body that they were suffering during workday. Employees were asked to report musculoskeletal symptoms in a last year in any part of body such as neck, shoulder, hand and other regions.

Results:

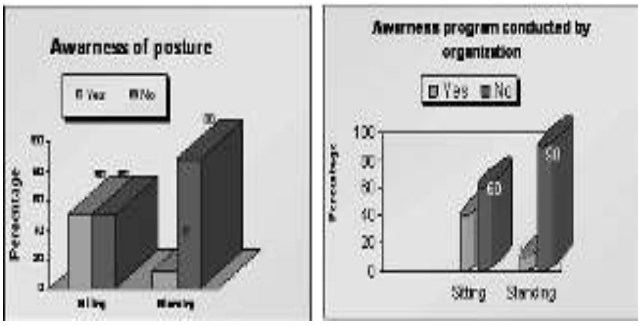
The sample consisted of 77 and 72 percent in the age group of 15-25 years working in sitting and standing posture respectively. The mean weights were 50-60 and mean height was 152-167cms in sitting and standing posture employees

Table 1: Years of service and duration of work

Years in service	Sitting (Percentages)	Standing (Percentages)
0-5	**83**	**64**
5 -10	14	26
10-15	-	08
15-20	03	02
Duration of work (hrs)		
Time in Hours		
0 - 8	20	**48**
8 - 12	33	30
12 - 16	**47**	22

It can be observed from table I that, 83 and 64 percentage of workers in sitting and standing posture was working from 0 to 5 years. 48 percent and 17 percent of them worked for 0-8 hours and 12-16 hour every day in sitting and standing posture respectively.

Figure1: Awareness of posture and Awareness program conducted by organization



It can be observed from the figure that a 50 percent of them in sitting posture and majority in standing posture were not aware of right posture at work. It can also be observed that a majority in standing posture received training in right standing posture.

Table 2: Habituated to bending while working.

Bending at work	Sitting	Standing
Yes	33	22
No	67	78

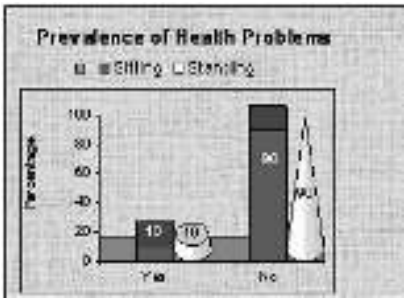
It can be noted from table 2, that a majority of them working in both the posture were not habituated to unnecessary bending while at work. Amongst the 33 percent in sitting posture and 22 percent in standing posture were found to have lower and upper back pain.

Table 3: Use of supportive Backrest

Back rest	sitting
Yes	23
No	77

IT was found from table 3 that, 23 percent of employees used supportive back rest while sitting, while the rest of the 77 percent had no back rest as their were sitting on stools to do the work.

Figure 2: Prevalence of health problem



It can be observed from the above figure that a majority of the workers in both the postures of work did not experience any health problems which interfere in their work.

Table: 4 Type of work and Satisfaction obtained

Type of work		
Work condition	Sitting	Standing
Strenuous	17	16
Active	83	84
Satisfaction Obtained		
Satisfaction	Sitting	Standing
Yes	93	94
No	07	06

A majority of the workers in both sitting and standing posture find the work active and enjoy the work they are doing. This is reflected in the percentage of workers satisfied with their work. A majority of them were satisfied with the work (table 4).

Figure 3: Experience of Numbness

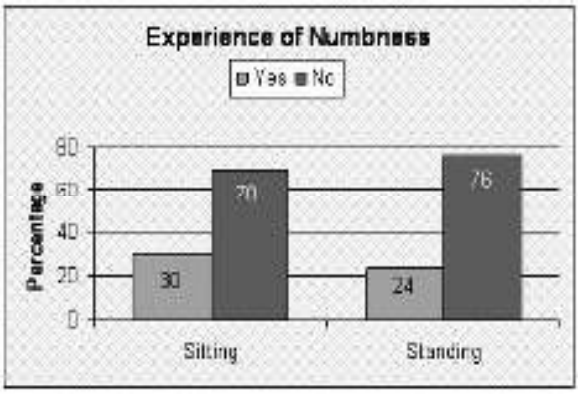


Figure 3 shows the experience of numbness by the employees during work. While a majority of the workers did not experience any form of numbness, a few of them in both the postures of work felt numbness in their fingers, palms and toes. This was due to the use if heavy machinery as well as the use of acids frequently. The numbness was not seasonal but throughout the year.

Table 5: Degree of Bending Neck, Trunk and Legs in standing posture

Degree of Bending Neck	
Degree	Percentage
0 - 10	54
10- 20	22
20 +	18
In extension	06
Degree of Bending Trunk	
0	52
0 – 20	20
20 -60	22
60+	06
Degree of Bending Legs	
Straight	90
Bent	10

Table 15 reveals the degree of bending of different body parts while working. About 54 percent, 52 percent and 90 percent of the workers adopted correct angle of bending neck, trunk respectively while at work. About 18 percent and 06percent of them were found to be adopting wrong posture. Only 10 percent of the workers were bending the legs in standing posture.

Table 6: Degree of bending Wrist and neck in sitting posture

Degree of Bending Wrist	
Degree of deviation	Percentage
0	30
0 – 10	37
15 Below	23
15 above	10
Degree of Bending Neck	
10 -20	50
20+	43
Side Bending	07

The correct of wrist while working is 0 degree adopted by 30 percent of the workers. About 23 percent of them bent 15 degrees below towards ground and 10 percent 15 degrees upwards, both the postures were wrong. About half the employees bend their neck 10 – 20 degrees which is right, while the remaining of them bend about 20 degree or side ways while working.

Summary & Conclusion:

It can be summarized that the employees were working for longer duration than recommended for monetary benefits. Most of them were aware of the right posture of work and a few of them had health problems and experience numbness in different parts of the body while at work. While most of them were adopting right posture at work, a few of them were deviating more than required and suffering from musculoskeletal discomfort.

Recommendation:

1. To design Work unit for specific tasks which can reduce the stress on workers body?
2. To study the appropriate tools required for specific tasks.

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H.M.Sc.A:-06

AROMATHERAPY THE ANCIENT TREASURE

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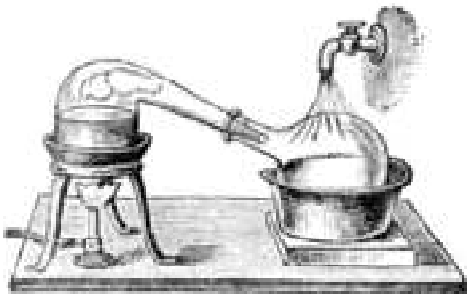
Aromatherapy

• Definition : Aromatherapy meaning treatment with fragrance and Sweet Smelling. It is a mental, physical, and Spiritual balancing process as well as detoxifying the body System using Essential oil extracts from the plant kingdom In India the records indicates, that herbs have been in use for treating disease since ancient times reference to the curatives properties of some herbs in the Rigveda between 3500 and 1800 BC. Aromatherapy has an ancient history going back 3,500 years. Parallel development of distillation methods in Egypt, Mesopotamia, India, and China saw the use of essential oils in the medical systems of each culture. Aromatherapy is the art and science of using aroma and scent to rejuvenate, revitalize, and heal the body. Distillation of plant materials produces essential oils, which are the active principle or life force of the plant. Completely different in nature from vegetable oils.



• . Essential oils have been produced in India for thousands of years but usually were only available to the royal classes and their physicians. Thus, Ayurveda's strong tradition in the use of medicated oils (Bhrami, Neem, Maha-Nayaran, Dashmool, etc.) and limited traditional use of essential oils.

• Essential oil are volatile, natural substance that are the actual immune system of the plants from which they are extracted. Traditional ayurvedic practices include fumigation by burning neem leaves, use of holy basil or rose petals in water while bathing, and burning incense sticks during meditation. has survived in almost all cultures.

• In the eastern cultures of India and China, however, the tradition remained unbroken. Vaidyas, ayurvedic physicians, treated Indian royalty with dried and fresh herbs, floral waters and aromatherapy oil massage..

• Dr. Valnet had two students who did their internship with him who were responsible for expanding his work. Dr. Paul Belaiche and Dr. Jean Claude Lapraz. They discovered that essential oils contain antiviral, antibacterial, antifungal and antiseptic properties as well as being powerful oxygenators with the ability to act as carrying agents in the delivery of nutrients INTO the cells of the body.

• Essential oils are volatile, natural substance that are the actual immune system of the plants from which they are extracted. Essential oils has *antiseptic, antibiotic, antiviral, anti-inflammatory*

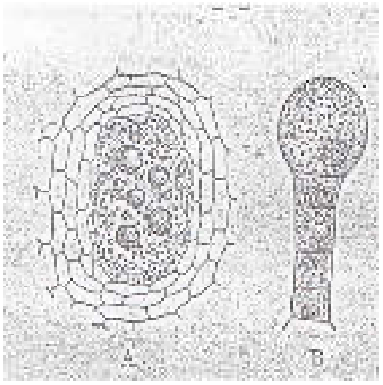
THE EXTRACTION OF VOLATILE OILS :

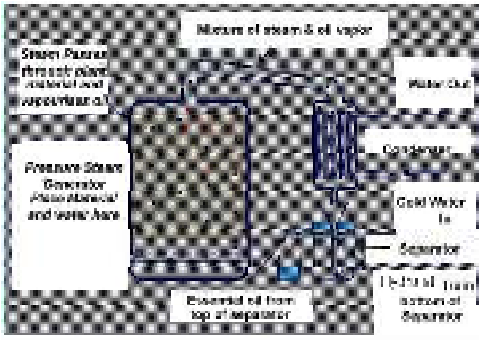
• These are extracted from stems and flower and are the life force of the respective plants. There are two ways of extracting the oil.

(1) Steam distillation

(2) Expression

Distillation in an effective method of extracting essential oils from plants. Sometime the plant material has to be crushed or broken up or chopped in order to make the oil cell more accessible to the Steam and (help in escape or release the oil from oil glands) Steam is directed to the grid and is forced through the tightly packed plant material. Thus liberating the volatile molecules. The steam and the essential oil cells thus liberating the volatile molecules. The steam and plant vapour rice and travel via pipe into a cooling chamber. As the 2 vapours are cooled down inside the pipe they condense and reform into the water separate quickly essential oils are less dense than water and will float making the separation easy.





• Expression : is a mild process used only for extracting the essential oils from citrus fruits and is simply the Squeezing or pressing of the peel of Citrus fruit, which release the oils.

• The Glandular tissues is made of glands which are special structure containing some secretary products. Glands may consists of single isolated cells are small groups of cells with or without a central cavity 2 type of gland internal or external.

• Internal oil glands secreating essential oils as in the fruit and leaves of orange, lemon, pumelo, etc.,

• External glands are commonly short having tipped by glands where the gummy substance are secreted.

CHEMICALLY :

• The essential oils are mixture of unsaturated hydrocarbons, alcohol, aldehydes, ketones. The empherical compositions of terpenoids is given by the formula (C_5H_8)a of (C_5H_8)nO. The other common essential oil with their chief constituent are

Oil of Cardamon	Terpineol
Oil of Cajeput	
Oil of Caraway	Limonene
Oil of lemon grass	Citral
Oil of Camphor	Camphor
Oil of roses, geranium	Linalool
Lavender	
Oil of peppermint	Menthol
Oil of Eucalyptus	cineal

• The essential oils are responsible for the odours and flavours associated with the plants. There fragrant smelling substance final application in Medicine food flavouring and perfumery . olto wallach in 1887 Suggested that the Skeletal Structure of all naturally occurring terpenoids are built of isoprene units.

• Terpenes are classified according to the no. of unit isoprene Monoterpenes, Sesuquiterpenes Diterpenes triterpenes Subdivided into acyclic or Cyclic.

To get one drop of oil, you may require distilling 100 gm of plant material This is the most perfect way to improve our home environment, either to help us relax, relieve tension and headaches, dispel odors, or just create an atmosphere of peace and harmony. If you have children, or suffer from Emphysema, Sinusitis, Asthma, and allergies, diffusing essential oils into your home will make an essential difference for you and your family's health.

GENERAL PROPERTIES OF ESSENTIALS

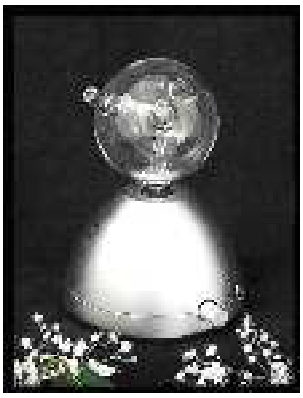
1. The terpenes are camphors are colourless pleasant smelling and highly refractive liquid.
2. They are volatile in stream they are unsaturated crystalline compounds.
3. Detoxified removes waste material from our blood steam oxygenate as oxygen is added it has an effect of stimulating the tissue.
4. Regulates and balance body functions. Improves circulation by regulating the action of capillaries.
5. Restores vitality they evaporate quickly. Regulates and balance body functions.
6. Helps balance the nervous system and has the power of healing rapidly BLENDING
7. Essentials oils are highly concentrated and must be *diluted in vegetables oils for 3-4 drop of essential oil,* 5 ml of carrier oil to be mixed.
8. METHODS ESSENTIAL OILS ARE USED
9. Historically, there have been three models for using essential oils: the French, the German, and the English.
10. The English traditionally dilute a small amount of essential oil in vegetable oil and massage the body to relax and relieve stress.
11. The French prefer to ingest (swallow) therapeutic-grade essential oils. Many French practitioners have found that taking the oils internally is highly effective.
12. The Germans recommend inhalation of the essential oils.

METHOD OF USING THE OILS

Vapourisation : Using in diffuser, good method to destroy bacteria.

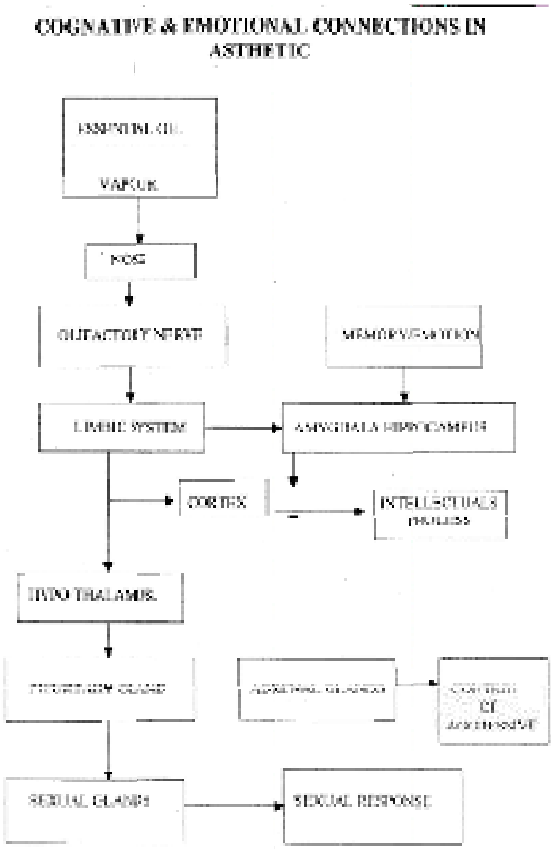
Steam inhalation : Take some streaming water in bowl or use a steamer. Add 3 drop of essential oil and inhale, good for congestion

Cotton plug : 2 drop s of essential oil in cotton plug and sniff.



One of the causes of disease in both plants and the human body is the inability of nutrients to penetrate the cell wall. Unless there is an adequate delivery agent to assist the cell to receive needed nutrients, the cell becomes deprived of nutrition, its wall thickens, thus preventing delivery of nutrients. This causes cell deterioration, leading to cell mutation, creating a host for bacteria and disease. If your food supplement program has seemingly hit a "wall of limitation," it may be for the above reason.

Aroma therapy treats the whole person both mind and body. It is a very helpful way of treating the stress related problems that many of us seen to suffer now that over lives have become so presented and mechanical life style.



THEME:-05

CIVIL, MECHANICAL, AEROSPACE AND TRANSPORTATION SCIENCES ALSO IT, BT, NT

C. M. A. T. IT, BT. NT:-01

INDIGENOUS DESIGN AND DEVELOPMENT OF METAMATERIALS BASED RADOME FOR AIRCRAFT STEALTH AT ADE.

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Introduction:

Radar **S**tealth or Low Observability in a strategic aircraft or unmanned air vehicle is crucial to achieve ***'first shot'*** and ***'first kill'*** capability on ***'first day'*** in modern electronic warfare. Stealth ensures air-superiority and essentially involves minimizing all **signatures** of the aircraft such as radar, infrared, acoustic, visual etc. Radar stealth or radar signature reduction assumes importance, as radar is the primary sensor. Radar stealth translates to reduction of radar cross-section (RCS) of the air vehicle. RCS expressed in dBsm, is an electromagnetic parameter and is a strong function of the frequency, incident angle and polarization of the impinging electromagnetic wave. Four important ***design*** methods of reducing monostatic RCS are by

i. External geometric shaping of the aircraft,

ii. Application of radar absorbers, designed as radar absorbing structures,

iii. Minimizing the in-band RCS of all antennas by careful design and

iv. Designing radomes for reduction of out-of-band RCS. **Radome** (contraction of radar and dome) is a structural, weatherproof enclosure that protects a microwave or radar antenna. The radome is constructed of material that minimally attenuates the electromagnetic signal transmitted or received by the antenna (SKOLNIK, 1981 [1]). The radome is transparent to radar or radio waves. Radomes protect the antenna surfaces from the environment and/or conceal antenna electronic equipment from public view. They also protect nearby personnel from being accidentally struck by fast-rotating antennas. For demanding radar, telemetry and communications systems, radomes safeguard against environmental concerns, such as wind, blowing sand, snow, ice, rain, ultra violet sun light, temperature, fungus and corrosion. A metamaterial/FSS radome has to be designed to function as RF spatial filter, in addition to normal radome functions mentioned above.

These radomes have to be designed using the concept of ***Metamaterials/ Frequency Selective Surfaces (FSS).*** The FSS radomes have to be designed for maximum Radio Frequency (RF) transparency in the antenna-operating band and to act as ***band-pass spatial RF filter***, FSS can be designed to attenuate or transmit desired radar signal frequencies. (E.F. KNOTT, 1993 [2]). The FSS radome can be shaped to shield or conceal an antenna from all signals except those at the antenna operating frequencies. At all other frequencies outside the radiating band of the concealed antenna, it behaves like a good deflector when shaped to reflect the incident threat signal in directions away from the threat source.

An RF filter functions with designated inputs for a designed output, whereas, an FSS radome has a *unique challenge* of various angles of incidence of the incoming electromagnetic wave and different polarizations such as linear or circular. The ever increasing demands on the bandwidth of the FSS radome is another added design challenge. The FSS radome has to be designed as a functional RF structure for RF transparency and band pass filtering action along with the necessary mechanical/ structural characteristics, to sustain aerodynamic loads. Most important, the FSS radome technology for aircraft stealth is highly classified and not available from any source. ***As the FSS Radome technology is classified and considered a critical technology, it is imperative to gain the expertise through indigenous efforts.***

In this paper, work done on metamaterials/ FSS radome at Aeronautical Development Establishment (ADE), DRDO is described. This work assumes **national importance** as the FSS radome technology is categorized as critical technology and ADE is the first DRDO laboratory where the FSS radome work started and is progressing well. The FSS radome presented in this paper is analyzed using the mode matching technique, designed and developed as high performance, RF/ microwave printed circuit boards (PCBs). The designs are first simulated using a commercially available high performance, 3D electromagnetic simulation software, HFSS. The FSS radomes are experimentally evaluated for their performance by carrying out measurements in the microwave *anechoic* chamber.

Electromagnetic Metamaterials

An electromagnetic (EM) metamaterial derives its *exotic* EM properties from its *structure* rather than by its composition. Metamaterials are a *new* class of ordered composites that exhibit exceptional properties not readily observed in nature. These properties arise from qualitatively new response functions that are: (i) not observed in the constituent materials and (ii) result from the inclusion of artificially fabricated, extrinsic and low dimensional in- homogeneities.

An illustration of the classification of FSS as EM metamaterial is shown in Figure 1. This is taken from (YAHYA RAHMAT SAMII, 2001 [3]).

FSS have attracted considerable attention in telecommunications, antenna design and

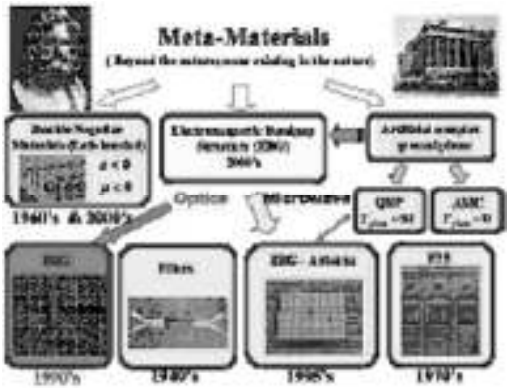

Fig. 1Three basic categories of metamaterials with applications illustrated from open literature. (*Source:* Yahya Rahmat Samii [3]).

electromagnetic compatibility (EMC) recently. These surfaces provide uninhibited transmission in specific frequency bands and simultaneously suppress transmission in the other bands.

Design of FSS Radomes

FSS Elements, Shapes and Sizes:

Aperture element FSS reflects at low frequencies and transmits at high frequencies (similar to *high pass filter*), where as the *patch-element FSS* transmits at high frequencies and reflects at low frequencies (similar to *low pass filter*). FSS may also be categorized as thick and thin screen, depending on the thickness of the element. The thin-screen FSS usually refer to a screen with printed circuit type element- that is, patch or aperture elements less than 0.001λ thick, where λ is the wavelength at resonant frequency. The thin screen FSS is lightweight low volume and inexpensively fabricated with conventional printed circuit technology. The thick-screen FSS, used mostly for high pass application (aperture type), is a periodic array of elements with electrically large thickness. It is heavy, and fabrication requires precise and expensive machining of a thick metal block (T.K. WU, 1995 [4]).

At ADE, we have developed various types of FSS radomes (CHANDRIKA S., etal, 2009 [7], 2010 [8]), as high performance PCBs. In [7], FSS radomes based on single square loop (SSL) design, analysis and development was reported and in [8], a ***single screen triband radome*** based on double square loop (DSL) FSS was discussed.

In this paper, we describe an FSS panel radome, which is designed for multiband operation. We have achieved the desired multiband specifications using the concept of dielectric loading.

Circular Ring Multiband FSS Radome

Analysis of circular ring FSS by using mode-matching technique (T.K.Wu and K.Woo and S.W. Lee, 1998 [5]), where the unknown fields are represented by using series of *Floquet's* modes whose coefficients are determined by solving proper boundary conditions between two regions. For circular ring FSS, especially with finite but very small thickness, the mode matching technique results in less number of expansion modes (E.PARKER etal, 1981 [6]). The mode matching technique is suitable one in terms of computational efficiency and accuracy. If the width of the ring is electrically small, it can be assumed that the current on the ring has no radial variation. But for the desired multiband operation, the use of thicker rings was necessary. Hence, a more exact theory for rings with arbitrary width reported in [5] is used. This theory is similar to the standard modal analysis and the expansion function used to represent the current on the ring is related to the field in a standard coaxial wave-guide. In the theoretical model, the FSS is assumed to be a 2-dimensional periodic array of conducting ring patch elements. The fields in free space region and the dielectric slabs are represented by the Floquet's mode expansions. The current expansion function is expressed in terms of coaxial wave-guide modes for the transverse electric (TE) component as follows

$$TE\ :\psi\ =\left\{\begin{bmatrix} C^{V}_{mn} \\ C^{H}_{mn}\end{bmatrix} e^{-j\tau_{mn}^{2}} + \begin{bmatrix} D^{V}_{mn} \\ D^{H}_{mn}\end{bmatrix} e^{j\tau_{mn}^{2}}\right\}$$

$$Z'_{m}\left(\chi_{mn}, \frac{\rho}{c}\right)\begin{bmatrix}\cos m\phi \\ \sin m\phi\end{bmatrix}$$

$$\chi'_{mn} = nth\ root\ of\ Z'_{m}\left(\tau\chi'_{mn}\right),$$

the derivativeof the Bessel – Neumann function

The superscripts V and H indicate vertically and horizontally polarized components.

Where,

$$\Gamma_{mn} = \left[k^{2} - \left(\frac{\chi'_{mn}}{c}\right)^{2}\right]^{\frac{1}{2}}$$

$$Z'_{m}\left(\chi'_{mn}\frac{\rho}{c}\right) = Q_{l}\left[J_{m}\left(\chi'_{mn}\frac{\rho}{c}\right)N'_{m}\left(\chi'_{mn}\right) - N_{m}\left(\chi'_{mn}\frac{\rho}{c}\right)J'_{m}\left(\chi'_{mn}\right)\right]$$

$$Q_{l} = \pi\sqrt{30\varepsilon_{m}}\left\{\left[\frac{J'_{m}\left(\chi'_{mn}\right)}{J'_{m}\left(\tau\chi'_{mn}\right)}\right]^{2}\left[1-\left(\frac{m}{\tau\chi'_{mn}}\right)^{2}\right] - \left[1-\left(\frac{m}{\chi'_{mn}}\right)^{2}\right]\right\}^{\frac{1}{2}}$$

$$\varepsilon_{m} = \begin{cases} 1, & if\ m = 0 \\ 2, & if\ m \neq 0 \end{cases}$$

C_{mn} *and* D_{mn} *are unknown coefficients*

and τ = *width of the rings.*

A similar relation exists for the TM field. Fields in different regions are matched at their respective interfaces. This procedure leads to a set of matrix equations. The size of the matrix is equal to the number of modes used in the coaxial wave-guide. Normally, 7 to 20 modes are sufficient to ensure the convergence of the FSS solution.

Applying appropriate boundary conditions, a matrix equation is formed and the unknown coefficients are found by solving the matrix equation. The matrix equation allows the

determination of the unknown coefficients C and D for the current J_s on the metallic ring. Once the current is found, the incident and reflection coefficients at dielectric interface are calculated.

In a multi-band FSS radome design, the *dielectric loading* effect may be employed to reduce the ring size and provide the element spacing necessary to *avoid* grating lobes at the Ku-band (12-14 GHz) frequencies, especially when the RF incident angle is large. By dielectric loading, the shift in resonant frequency variations due to variations in the incident angle and polarization of the incoming wave is stabilized. The dielectric loading effect is accomplished either by placing a thin (.064 cm) substrate of very high dielectric constant (ε_r=10.0) on one side of the FSS screen or by placing thin and relatively low dielectric constant (ε_r=3.5) material on both sides of the screen. The specification of pass band for the FSS radome presented in this paper from 7.4 GHz to 9 GHz was achieved by using the dielectric-loading concept.

ELECTROMAGNETIC SIMULATION OF CIRCULAR RING FSS RADOME

The multiband circular ring FSS radome design was simulated using commercially available, high performance 3D EM simulation software, the HFSS™, from Ansoft. The solver used in HFSS is based on finite element method (FEM) and FEM allows detailed visualization of structures with bends and or twists and indicates the distribution of stresses and displacements. The desired level of accuracy required and associated computational time requirements are managed simultaneously to address most engineering applications. FEM solver used in the HFSS simulation software allows entire design to be constructed, refined and optimized before the design is fabricated/manufactured and serves as a virtual manufacturing tool.

The FEM is a numerical method that is used to solve boundary-value problems characterized by partial differential equations (PDEs) and a set of boundary conditions. The geometrical domain of a boundary-value problem is discretized using sub-domain elements called the finite elements and the differential equation is applied to a single element after it is brought to a "weak" integro-differential form. A set of shape functions is used to represent the primary unknown variable in the element domain. A set of linear equations is obtained for each element in the discretized domain. A global matrix system is formed after the assembly of all elements.

FSS radome is a periodic structure and its simulation in HFSS is performed by simulating a single cell based on unit cell approach. *Master* and *slave* boundaries enable the designer to model planes of periodicity where the electric (E) field on one surface matches the E-field to another to within a phase difference. They force the E-field at each point on the slave boundary to match the E-field to within a phase difference at each corresponding point on the master boundary. Hence they are useful for simulating devices such as infinite periodic surfaces such as FSS, using the Floquet's theorem.

A unit circular ring FSS geometry model simulated in HFSS is shown in Figure 2. A high performance dielectric substrate with dielectric constant, ε_r= 10 and thickness 25 mils is used for simulation. The same substrate is used for FSS radome PCB fabrication. Figure 2 shows the circular ring FSS geometry used in HFSS simulation.

The simulation performance curves of FSS radome for transmission and reflection are given in Figure 3. It is observed from the figure that the X-band transmission loss is –15 dB (stop band) and in S and Ku bands (pass bands), the transmission loss is less than –2 dB and meets the desired specifications. This design is used for fabrication of FSS radome.

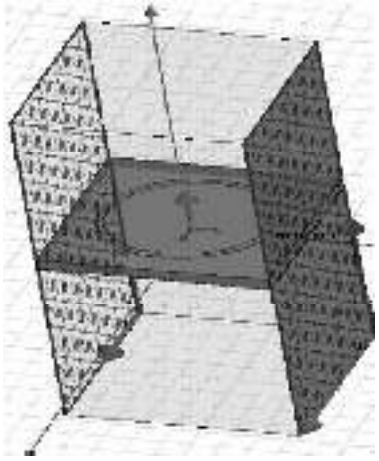

Fig. 2. Unit cell circular ring FSS geometry model in HFSS with one set of boundary conditions.

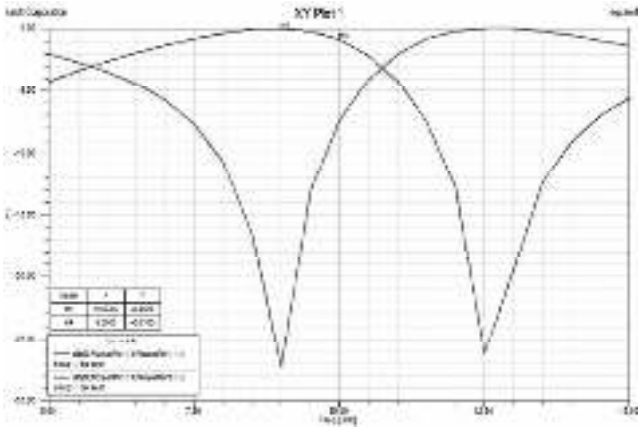

Fig. 3. HFSS simulation results of circular ring FSS radome

RADOME PCB DESIGN AND FABRICATION

The FSS radome reported in this paper is designed and developed as high performance printed circuit board (PCB), on very low loss microwave laminates using conventional PCB design and fabrication technology available at ADE.

The radome FSS geometry is input to the PCB design software, Visula™ version 2.3. The layout is designed depending on the radome panel strictly adhering to the microwave PCB design rules. The approved layout is created as a *.gbr*

file and photo films are generated. These photo films are used for radome PCB fabrication.

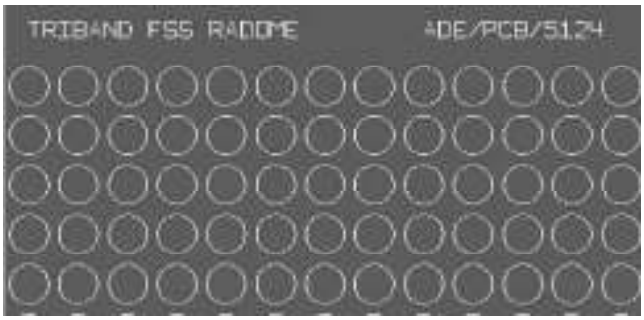

Fig. 4. Single screen circular ring FSS radome PCB design.

The FSS radome PCB comprises of an electrical loop array of a conductive material, which is a thin, copper film supported on a dielectric substrate. Since the FSS is supported by a dielectric substrate, the electrical design includes the effective electrical properties of the constitutive materials. The material properties and fabrication process have a direct effect on the electrical performance of the FSS. The dielectric substrate used in the radome PCB fabrication is mil conforming, homogeneous ceramic substrate.

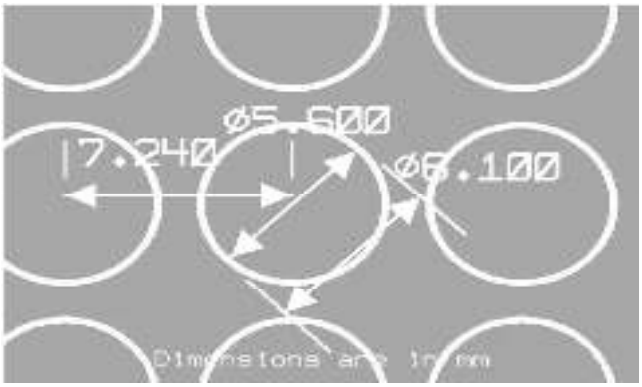

Fig. 5. Radome PCB design parameters

The FSS radome PCB is fabricated by the thick-film chemical etching of a copper coated thin film using standard PCB fabrication technology. The circular ring FSS radome is fabricated on a ceramic substrate with dielectric constant, $\varepsilon_r = 10$ in the gigahertz frequency range, with a dissipation factor, tanδ=0.02, and its temperature application range is -40°C to 200° C. The primary selection requirements in the choice of material system are the radio frequency (RF) compatibility with low dielectric loss, survivability in the application environment and the ability to manufacture a low thermal expansion, dimensionally stable composite structure and should be available commercially with various thicknesses. The thickness of the substrate used is 0.16 mm. The FSS is directly fabricated on this material. The substrate comprises a structural fiber that is supported by a polymeric resin. The choice of the fiber and resin is dictated by the electrical, mechanical and environmental requirements that the FSS will see. For aircraft/UAV applications, the environmental requirements determine the selection and choice of materials. For an aircraft/UAV FSS radome application, the radome may experience a thermal environment from -40°C to +60° C in air.

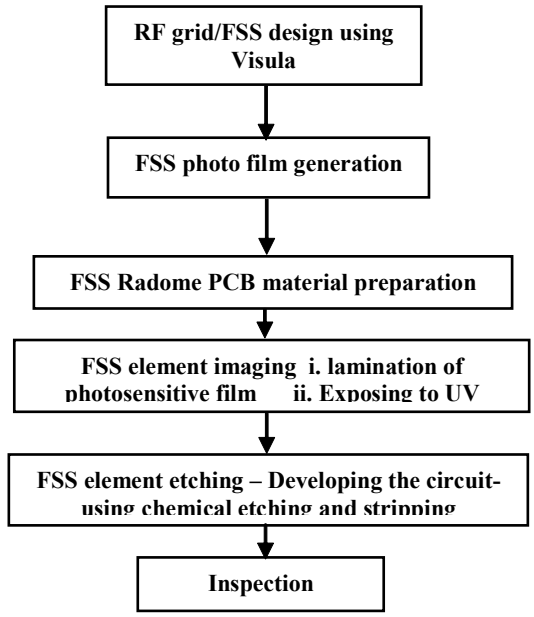

Fig. 6. Flow chart showing FSS radome PCB fabrication process.

The radome PCB fabrication process comprises the following essential steps and the flow chart is given in Figure 6.

The electrical properties of the composite face sheets are determined by the constitutive properties of the fiber and resin. The fiber and resin each have distinct electrical properties, but when they are fabricated as a composite, the resulting substrate material has homogeneous electrical properties. A photograph of the circular ring FSS radome PCB is shown in Figure 7.

Microwave testing of FSS Radome

The FSS radome is evaluated for its performance in the microwave anechoic chamber at ADE. An RF anechoic chamber is a shielded room designed to suppress EM energy reflected from internal surfaces and to simulate an RF anechoic environment equivalent to free space for measurement of the FSS radome

Fig. 7. Photograph of the circular ring FSS panel radome. *Inset: A blown up single cell*

The microwave shielded anechoic chamber where the measurements are performed is a rectangular anechoic room, with a quiet zone of –30 dB in a one cubic foot cylindrical volume. The chamber is designed for operation from UHF to millimeter wave frequency bands. The chamber is designed for antenna, radome and radar cross-section (RCS) measurements. A photograph of the FSS radome testing in the microwave anechoic chamber is shown in Figure 8.

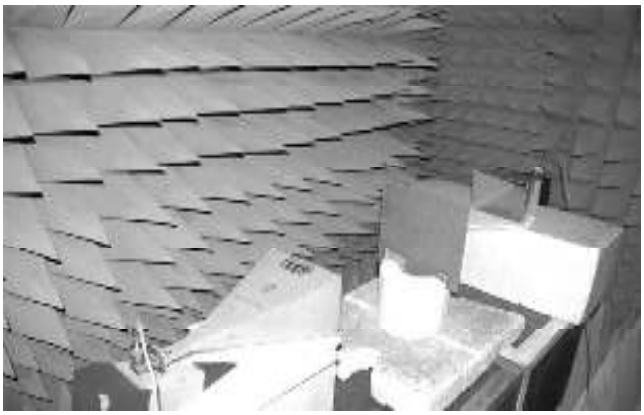

Fig. 8. FSS radome testing in the anechoic chamber.

The required microwave frequencies are generated by using RF synthesized signal generator. The transmitter, a synthesized signal generator from Agilent systems operates from 20 MHz to 26 GHz. The transmitted RF energy is connected to the high directivity standard gain horn antenna through a low-loss RF cable. Standard, low-loss, matched wave-guide to coaxial adaptors are used for connecting the RF cables to the horn antenna. The FSS radome panel is securely fixed on slotted thermocol fixture, which serves as a RF transparent stand. The stand, fabricated from thermocol is lightweight, highly RF transparent and low-loss and aids in accurate radome measurements. The RF energy incident on the FSS radome panels is partly transmitted through the radome depending on the design of the radome. The transmitted energy is received by the receiving antenna, which is a standard gain, high-directivity horn antenna. The received RF energy is measured and displayed in the spectrum analyzer connected to the receiving horn antenna. The FSS radome panels are thus *completely* evaluated for transmission performance over the designed frequencies of operation and the results are tabulated.

Table 1**. Insertion loss measurement results of Circular Ring FSS radome in** *first pass band* (2-4 GHz).

Frequency in GHz	Insertion loss in in dB (TE mode)	Insertion loss in dB (TM mode)
2.0	0.67	0.69
2.2	0.97	0.92
2.4	0.52	0.57
2.6	0.62	0.60
2.8	0.60	0.63
3.0	0.65	0.67
3.2	0.83	0.82
3.4	1.29	1.26
3.6	1.68	1.65
3.8	1.92	1.9
4.0	1.8	1.75

Table 1 and Table 2 give the measured results of circular ring FSS radome in the *first pass band* (2 to 4 GHz) and *second pass band* (12-14 GHz) respectively. Table 3 gives the measured results of circular ring FSS radome for the stop band (7.4 to 9 GHz.).

Table 2. Insertion loss measurement results of Circular ring FSS radome for TE & TM polarizations for ***second pass band*** **(12 –14 GHz).**

Frequency in GHz	Insertion loss in dB (TE incidence)	Insertion loss in dB (TM incidence)
12.0	1.05	1.1
12.2	1.2	1.3
12.4	0.8	0.82
12.6	0.45	0.46
12.8	0.69	0.68
13.0	0.47	0.49
13.2	1.01	1.1
13.4	0.71	0.72
13.6	0.9	0.88
13.8	0.78	0.74
14.0	0.13	0.15

Table 3. **Insertion loss measurement results of Circular Ring FSS radome for TE & TM polarizations in** *stop band* **(7.4-9 GHz).**

Frequency in GHz	Insertion loss in dB (TE mode)	Insertion loss in dB (TM mode)
7.4	12.6	13.0
7.6	12.4	15.7
7.8	13.5	17.4
8.0	14.7	15.2
8.2	16.9	20.5
8.4	19.3	19.0
8.6	22.8	19.9
8.8	23.4	22.1
9	21.5	15.9

DISCUSSION OF RESULTS

From the experimental results, it is observed that the circular ring FSS radome meets the desired specifications in the two pass bands and a single stop band. This characteristic of the circular ring FSS radome qualifies the radome for multiband/ triband applications. In the first pass band (2 to 4 GHz), the desired specification of </= 2 dB has been achieved (table 1). The stringent specifications of the pass band insertion loss was </= 1 dB in the frequency range 12-14 GHz has been achieved (table 2). At the band edges, the recorded readings are slightly higher than 1 dB. This is due to the limitation in the experimental setup. With a single screen radome, the

stop band specifications that can be realized are from 8 to 9 GHz. But the desired stop band specification of 7.4 to 9 GHz was achieved by dielectric loading of the substrate as mentioned earlier as the single substrate/screen cannot give the desired bandwidth.

CONCLUSION

The critical technology of FSS radome, which is crucial in stealth technology, has been successfully indigenised and self-reliance has been achieved.

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C. M. A. T. IT, BT. NT:-02

RECENT DEVELOPMENTS IN IDENTIFYING THE FLAWS IN MANUFACTURED PRODUCTS (PETROL PIPES) AND HEAVY MOULDS USING NON DESTRUCTIVE TESTING METHODS

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Problem statement

General problems faced by the production companies nowadays or from past is the quality of the product developed, so when we see the developed product we find different types of problems such as flaws, cracks, slag formation etc.These problems cannot be identified by the naked eye so the defect is called as the "internal defect" .

These type of defects may be caused by many reasons, but the small problem lead to very high destructions, failure etc. Best example of this problem was "Bhopal gas tragedy" It occurred on the night of December 2-3, 1984 at the pesticide plant in Bhopal, Madhya Pradesh the leak caused 558,125 injuries including 38,478 temporary partial and 3900 severely and permanently disabling injuries.Hence these type of problem has to be taken as the challenging event to reduce the accidents in the future, and the other reason is the economic criteria . So the problem starts from the small parts to the heavy bodies and the recent problem is in the field of the oil extraction and detection of the flaws or the crakes due to wears or the manufacturing defects.

Beginnings of Nondestructive Evaluation (NDE)

Nondestructive testing has been practiced for many decades, with initial rapid developments in instrumentation spurred by the technological advances that occurred during World War II and the subsequent defense effort. During the earlier days, the primary purpose was the detection of defects. As a part of "safe life" design, it was intended that a structure should not develop macroscopic defects during its life, with the detection of such defects being a cause for removal of the component from service. In response to this need, increasingly sophisticated techniques using ultrasonics, eddy currents, x-rays, dye penetrants, magnetic particles, and other forms of interrogating energy emerged.

In the early 1970's, two events occurred which caused a major change in the NDT field. First, improvements in the technology led to the ability to detect small flaws, which caused

more parts to be rejected even though the probability of component failure had not changed. However, the discipline of fracture mechanics emerged, which enabled one to predict whether a crack of a given size will fail under a particular load when a material's fracture toughness properties are known. Other laws were developed to predict the growth rate of cracks under cyclic loading (fatigue). With the advent of these tools, it became possible to accept structures containing defects if the sizes of those defects were known. This formed the basis for the new philosophy of "damage tolerant" design. Components having known defects could continue in service as long as it could be established that those defects would not grow to a critical, failure producing size.

A new challenge was thus presented to the nondestructive testing community. Detection was not enough. One needed to also obtain quantitative information about flaw size to serve as an input to fracture mechanics based predictions of remaining life. The need for quantitative information was particularly strongly in the defense and nuclear power industries and led to the emergence of quantitative nondestructive evaluation (QNDE) as a new engineering/research discipline. A number of research programs around the world were started, such as the Center for Nondestructive Evaluation at Iowa State University (growing out of a major research effort at the Rockwell International Science Center); the Electric Power Research Institute in Charlotte, North Carolina; the Fraunhofer Institute for Nondestructive Testing in Saarbrucken, Germany; and the Nondestructive Testing Centre in Harwell, England.

Introduction

The quality of the products stated after the Second World War, since the manufacturing of the products and the wastage has to be reduced, hence the quality team was started

The problems in the industries are the reducing the wastage in the developed goods. This causes a heavy loss in the company so this has to be solved this can be solved by the non destruction of the material and thus can reduce the losses in the company, so the new technologies and techniques have started to avoid the losses hence this process is so called as the nondestructive process, this technology is been adopted in every field example, electronics, electrical industry, so this technology is being adopted in the detection of cracks in the large production company like rubber industry , plastic industries

Problem facing in production companies

So when the companies like rubber tyres manufactures require the die as the main key for the production so the continuous analysis and quality checking in this field is the most important task, the die will be at a very high cost around 3-4 lakhs this is the huge amount and the quality less die will also changes the quality of the finished goods hence

There are many ways and techniques to identify the problems

- Ultrasonicsonic testing
- Magnetic separation
- Liquid penetration test
- Radiography testing

Ultrasonic testing

Basic Principles of Ultrasonic Testing

Ultrasonic Testing (UT) uses high frequency sound energy to conduct examinations and make measurements. Ultrasonic inspection can be used for flaw detection/evaluation, dimensional measurements, material characterization, and more. To illustrate the general inspection principle, a typical pulse/echo inspection configuration as illustrated below will be used.

A typical UT inspection system consists of several functional units, such as the pulser/receiver, transducer, and display devices. A pulse/receiver is an electronic device that can produce high voltage electrical pulses. Driven by the pulse, the transducer generates high frequency ultrasonic energy. The sound energy is introduced and propagates through the materials in the form of waves. When there is a discontinuity (such as a crack) in the wave path, part of the energy will be reflected back from the flaw surface. The reflected wave signal is transformed into an electrical signal by the transducer and is displayed on a screen. In the applet below, the reflected signal strength is displayed versus the time from signal generation to when an echo was received. Signal travel time can be directly related to the distance that the signal traveled. From the signal, information about the reflector location, size, orientation and other features can sometimes be gained.

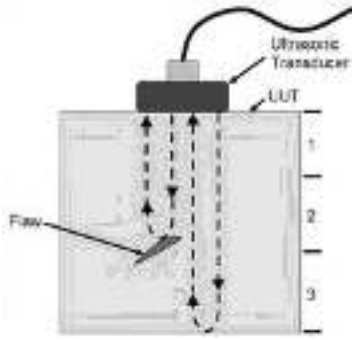


Figure Basic principle of the ultrasonic transducer

Ultrasonic Inspection is a very useful and versatile NDT method. Some of the advantages of ultrasonic inspection that are often cited include:

- It is sensitive to both surface and subsurface discontinuities.
- The depth of penetration for flaw detection or measurement is superior to other NDT methods.
- Only single-sided access is needed when the pulse-echo technique is used.
- It is highly accurate in determining reflector position and estimating size and shape.

- Minimal part preparation is required.
- Electronic equipment provides instantaneous results.
- Detailed images can be produced with automated systems.

It has other uses, such as thickness measurement, in addition to flaw detection. As with all NDT methods, ultrasonic inspection also has its limitations, which include,Surface must be accessible to transmit ultrasound. Materials that are rough, irregular in shape, very small, exceptionally thin or not homogeneous are difficult to inspect.

- Cast iron and other coarse grained materials are difficult to inspect due to low sound transmission and high signal noise.
- Linear defects oriented parallel to the sound beam may go undetected.
- Reference standards are required for both equipment calibration and the characterization of flaws.

The above introduction provides a simplified introduction to the NDT method of ultrasonic testing. However, to effectively perform an inspection using ultrasonics, much more about the method needs to be known. The following pages present information on the science involved in ultrasonic inspection, the equipment that is commonly used, some of the measurement techniques used, as well as other information.

The important points in ultrasonic testing

- The detection of internal flaws in this type is easy
- This do not required any type of the raw materials
- This type says exact position in the material

The drawbacks of ultrasonic testing

- Flaws cannot be detected in "Near field"
  $N=D^2/4(lambda)$
- This type require the regular calibration of the sensors
- Identifying the discontinuity and to specify the type is difficult
- Experience and skills are more required

Basic principle of magnetic detection

Magnetic particle testing is a sensitive method of nondestructive testing for surface breaking and some sub-surface discontinuation in 'Ferro-magnetic' materials.

The testing method is based on the principle that magnetic flux in a magnetized object is locally distorted by the presence of discontinuity. This distortion causes some of the magnetic field to exit & re-enter the test object at the discontinuity. This phenomenon is called magnetic flux leakage. Flux leakage is capable of attracting finely divided particles of magnetic materials that in turn form an 'indication' of the discontinuity. Therefore, the test basically consists of three operations:

a) Establish a suitable magnetic flux in the test object by circular or longitudinal magnetization. b) Apply magnetic particles in dry powder of a liquid suspension

c) Examine the test object under suitable lighting conditions for interpreting & evaluating the indications.

Fluorescent or black oxide particles in the aerosol cans are used during critical areas of aircraft structure/components inspection when using either permanent or electromagnets. Fluorescent particle inspection method is evaluated by black light (Black light consists of a 100 watt mercury vapour projection spot lamp equipped with a filter to transmit wave length between 3200 to 3800 Angstrom unit and absorb substantially all visible white light).

Important points regarding the magnetic testing

- This process identify the surface cracks and subsurface cracks
- The process is simple and easy
- The foreign particle identification is easy
- The process is applicable only for the ferromagnetic materials
- Demagnetization of the materials is required
- Post and pre cleaning is required
- It requires sequential inspections to clarify

Basic principle of liquid penetration

Liquid penetrate inspection is a nondestructive testing method that reveals surface breaking flaws by bleed out of a penetrating liquid colored with a visible or fluorescent dye from the flaw. The technique is based on the ability of a liquid to be drawn into a "clean" (in other words, unobstructed) surface breaking flaw by capillary action. After an appropriate period of time for penetration has completes, called the "dwell time," excess penetrant on the surface is removed and a developer applied. The developer acts as a blotter and draws the penetrant from the flaw to reveal its presence. Penetrants with a visible dyed added (color contrast) require sufficient white light to insure proper inspection, while penetrants with a fluorescent dye added need to be used in darkened conditions with an ultraviolet or "black light". This method is used to inspect a variety of product forms including castings, forgings, and weldments. The structural steel, automotive, petrochemical, power generation, and aerospace industries are a few examples that utilize liquid penetrant inspection.

This course requires no prior training or experience by the student in this method of NDT. The material is presented in a manner that promotes understanding and the ability to make immediate application. This is an excellent course for NDT trainees who must have Level I and II training in order to qualify for certification as well as facility personnel who are responsible for or oversee the application of testing or Quality Control/Quality Assurance

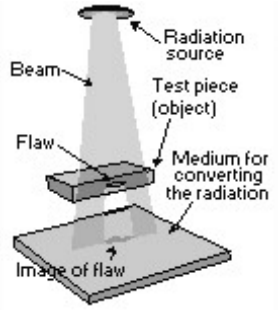
Important points regarding the liquid testing

- Small cracks (4microns) can be identified
- But the rough or porous surfaces are likely to produce false indications
- Pentrant is quite expensive

Radiography Testing - (RT)

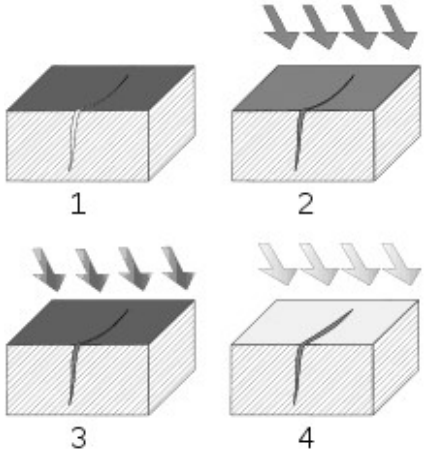
This technique involves the use of penetrating gamma or X-radiation to examine parts and products for imperfections. An X-ray machine or radioactive isotope is used as a source of radiation. Radiation is directed through a part and onto

film or other media. The resulting shadowgraph shows the internal soundness of the part. Possible imperfections are indicated as density changes in the film in the same manner as an X-ray shows broken bones.



Radiographic applications fall into two distinct categories evaluation of material properties and evaluation of manufacturing and assembly properties. Material property evaluation includes the determination of composition, density, uniformity, and cell or particle size. Manufacturing and assembly property evaluation is normally concerned with dimensions, flaws (voids, inclusions, and cracks), bond integrity (welds, brazes, etc.), and verification of proper assembly of component pieces.

Weld verification



1. Section of material with a surface-breaking crack that is not visible to the naked eye.
2. Penetrant is applied to the surface.
3. Excess penetrant is removed.
4. Developer is applied, rendering the crack visible.

In manufacturing, welds are commonly used to join two or more metal surfaces. Because these connections may encounter loads and fatigue during product lifetime, there is a chance that they may fail if not created to proper specification. For example, the base metal must reach a certain temperature during the welding process, must cool at a specific rate, and must be welded with compatible materials or the joint may not be strong enough to hold the surfaces together, or cracks may form in the weld causing it to fail. The typical welding defects, lack of fusion of the weld to the base metal, cracks or porosity inside the weld, and variations in weld density, could cause a structure to break or a pipeline to rupture.

Welds may be tested using NDT techniques such as industrial radiography using X-rays or gamma rays, ultrasonic testing, liquid penetrant testing or via eddy current. In a proper weld, these tests would indicate a lack of cracks in the radiograph, show clear passage of sound through the weld and back, or indicate a clear surface without penetrant captured in cracks. Welding techniques may also be actively monitored with acoustic emission techniques before production to design the best set of parameters to use to properly join two materials.

Structural mechanics

Structures can be complex systems that undergo different loads during their lifetime. Some complex structures, such as the turbo machinery in a liquid-fuel rocket, can also cost millions of dollars. Engineers will commonly model these structures as coupled second-order systems, approximating dynamic structure components with springs, masses, and dampers. These sets of differential equations can be used to derive a transfer function that models the behavior of the system.

In NDT testing, the structure undergoes a dynamic input, such as the tap of a hammer or a controlled impulse. Key properties, such as displacement or acceleration at different points of the structure, are measured as the corresponding output. This output is recorded and compared to the corresponding output given by the transfer function and the known input. Differences may indicate an inappropriate model (which may alert engineers to unpredicted instabilities or performance outside of tolerances), failed components, or an inadequate control system

Conclusion

- The NDT is the effective tool to identify the cracks
- The process is the very cost effective
- Welding techniques may also be actively monitored with acoustic emission techniques before production to design the best set of parameters to use to properly join two materials
- In NDT testing, the structure undergoes a dynamic input, such as the tap of a hammer or a controlled impulse. Key properties, such as displacement or acceleration at different points of the structure, are measured as the corresponding output.

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C. M. A. T. IT, BT. NT:-03

EXPERT SYSTEM FOR CONTROL & OPERATION OF AN ELECTRICAL SYSTEM

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INTRODUCTION

An Expert System attempts to produce performance that resembles human reasoning in a limited area of expertise. The essential components of an Expert system are:
User Interface
Knowledge base and
Inference Engine.
To solve expert-level problems, expert systems need access to a substantial domain knowledge base, which must be built as efficiently as possible. They also need to exploit one or more reasoning mechanisms to apply their knowledge to the problems they are given. Then they need a mechanism for explaining to the users as to what has been done.
One way to look at Al in a very broad sense is that they represent applied Al in a very broad sense.
In order for an expert system to be an effective tool, people must be able to interact with it easily. To facilitate this interaction, the expert system must have the following two capabilities in addition to the ability to perform the underlying task.
• **Explain its reasoning.** In many of the domains in which expert systems operate, people will not accept results unless they have been convinced of the accuracy of the reasoning process that produce those results. This is particularly true in an electrical system in a process industry where an unwarranted shut down has to be avoided at any cost. In this case the maintenance-in-charge has to be fully convinced that the shut down recommended by the expert system is legitimate. Thus it is important that the reasoning process used in such programs proceeds in understandable steps and that enough meta-knowledge (knowledge about the reasoning process) is available so that the explanations of those steps can be generated.
• **Acquire new knowledge and modification of old knowledge.** Since Expert Systems derive their power from the richness of the knowledge bases they exploit, it is extremely important that these knowledge bases be as complete and as accurate as possible. But often, there exists no standard codification of that knowledge; rather it exists only in the minds of the human experts. One way to get this knowledge into the program is through interaction with a human expert. Another way is to have the program learn expert behaviour from raw data.
In designing an expert system, typically, a knowledge engineer interviews a domain expert to elucidate expert knowledge, which is translated into rules. After the initial system is built, it must be iteratively refined until it approximates expert-level performance. However this process is expensive as well as time consuming, so it is worthwhile to explore for more automatic ways of constructing expert knowledge bases. There are many programs that interact with the domain experts to extract expert knowledge efficiently. These programs support the following activities:
Entering Knowledge
Maintaining knowledge base consistency
Ensuring knowledge base completeness
The strengths of expert systems are as follows:
Reasoning using previously established rules
Separation of knowledge base and the inference engine
Explanation capability
Quick solution - efficiency
Standard Output - Consistency
Replication
Perform repetitive tasks and frees up the human expert
Increases the problem solving abilities of a novice
The limitations of expert systems are as follows:
Narrow knowledge domain, they are developed to solve very specific problems
Knowledge acquisition from experts
Need for commitment from expert (s)
Cannot generalize - Very brittle/lack flexibility
Cannot apply common sense logic
Cost of Development and maintenance.

OBJECTIVES :

NEED FOR EXPERT SYSTEMS IN ELECTRICAL SYSTEMS

Consider an emergency situation in a large interconnected power system during a cascade tripping of breakers accompanied by a large -scale blackout. The load dixspatcher starts getting several alarms, the indications, the printouts etc. from the control panel and is in a dilemma. In such situations digital computer aided artificial intelligence systems called "expert systems" can come to his rescue. The expert systems should tell him within seconds the probable location of the

line fault and suggest steps to e taken for restoring the system. Such Expert Systems are now beginning to emerge as a practical tool for helping the operation and maintenance personnel to deal with increasingly complex power/electrical systems. By encoding critical domains of human expertise for computer manipulation, an expert system can sort through enormous amounts of data to provide a system despatcher/ Power Plant Operator/ Maintenance engineer/testing engineer with provisional diagnosis of problems and a list of corrective actions to be taken.

In such circumstances, Expert systems are designed to calculate exact solutions to specific mathematical problems in the manner of conventional computer programs. The Expert Systems imitate human logic by applying a series of 'If-then' rules based on past experience.

Expert Systems have opened new era in power systems by integrating the following:
- Protection
- Controls
- Computers
- Diagnostics

-Accumulated human knowledge

Commercial applications of Al based on-line or off-line expert systems are being introduced by EPRI(USA), Westinghouse(USA) and other Electrical manufacturing/ Research/Power supply companies in several areas of power systems. A Few of the commercially available expert systems available since 1989 are:

Generator Expert monitoring System (GEMS) It is a diagnostic tools for improving the generators operation, reliability and availability on the basis of available monitoring information.

Customer Restoration and Fault Testing (CRAFT) This identifies and isolates faults in multi-tapped transmission lines. It is an effective means available at the Load Control Centre of a large interconnected AC system

On-Line Diagnostic System for Emergency Diesel Generators It is a microcomputer based system to help the plant engineer in identifying operating trends and problem areas before complete failure of emergency power supply system.

Plant Systems Inspection (PSi). It is an Expert System for maintenance engineer for inspection of the plant. The PSI inspects the plant periodically and performs predictive and preventive maintenance.

On-Line Monitoring Systems (QMS). Such a system collects and interprets data and advises operator about possible failures and advises corrective actions.

In Traditional protective systems the protection is not actuated until the fault occurs. The conventional protective system does not prevent a fault. Conventional protective systems do not assist the operator in finding a solution regarding actions to be taken. Hence the need for Expert systems is felt in the Power systems scenario to overcome the aforesaid drawbacks.

METHODOLOGY

This attempts to solve a typical case of Auto Starting and auto synchronization of three DGs in the event of failure of the Electricity Board supply.

On Failure of Power supply the System Bus has to be isolated from the incomer and the plant loads have to derive the power from the captive power plant, which might have one or more generators. In this we consider that there are three Generators required to simultaneously meet all of the Plant Load requirements. For this to happen the three generators have to be synchronized.

Synchronization

Synchronizing is the process of electrically connecting two AC power sources with rotating machines.

The various types of synchronization are:

Single Generator to a Bus (Dead Bus / Live Bus)

Multiple Generators to a Bus

Manual & Auto Synchronization etc.

The Parameters governing synchronization are Voltage, frequency and phase angle. When all of the above are found to be within the set limits the Generators connected to the plant loads.

Synchronization is a critical process as incorrect synchronization can cause

Reverse Active Power Flow (Frequency effect).

Jolt to the system, fatigue to the shaft, damage to bearings, Overheating of stator (Phase Angle effect)

Reverse Reactive Power Flow (Voltage effect)

In the above scheme Auto Starting and synchronization can be achieved as follows

When the EB supply fails (detected by means of an Under Voltage Relay), the system will initiate the start of the DG selected by the Master Selector switch. Irrespective of the load, all the four DCs will switch ON and synchronize one after another. Before switching on the breakers, the system will check for the enable operation signals by reading the input (Breaker status, Engine fault signal, reset signals etc.)

EXPERIMENT

System to monitor for the operation of U/V Relay for detection of Mains Failure Upon detection of failure of the main supply, the EB Breaker should be switched OFF.

The Master Selector Position is monitored to detect which of the DCs is the Master (i.e. which will undergo Dead Bus Synchronization)

Cyclically check for Engine Failures and Individual DG Breaker status and carry out synchronization accordingly.

If Failure of Master DG make the consecutive DG as Master

If Engine Failure in any of the DG Engines keep the corresponding DG Breaker in the OFF Condition.
Upon running the program a Front-end displaying the SLD is visible. All equipments marked in Green indicate that they are in ON condition. All equipments in Red/Orange are in OFF condition.

Upon Pressing the Command Button marked " Enter Initial State" opens the **Master Selector Dialog Box.** Enter the Master DG Number and Press OK. This opens **Status Input Dialog Box.** The status of the various equipment in the SLD can be initialized. On Pressing OK, the Front-end reappears. Press the U/V relay button (this simulates the mains failure condition). Press Command button "Simulate". This simulates the system operation for the given status of the various equipments.

RESULTS AND DISCUSSIONS
The Unique Point about this project is that it gives even a novice a fair idea of the functioning of paralleled Generators through a graphical User interface.

CONCLUSION
It can be used to simulate the various fault conditions, which might not be possible in a real life scenario. However the limitations are
No parameters are quantified as the knowledge base and the Inference engine are implemented using Boolean Logic. (i.e. in the event of the Plant Loads exceeding the generators's total capacity, How will Load Shedding take place?, the Generator starting times and the inherent delays involved are not taken into consideration from the point of view of system stability)

The synchronization is inherently assumed to take place. The simulation is not on par with the actual synchronization that takes place(I.e. in terms of Frequency, voltage and Phase angle matching). For this the generators have to be simulated.

Hence the Next Step would be to incorporate load Sharing, Modelling and simulation of actual power system equipment & processes and decision making based on quantified values.

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C. M. A. T. IT, BT. NT:-04

HAND GESTURE RECOGNITION USING NEURAL NETWORKS. (ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS)

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INTRODUCTION
Since the introduction of the most common input computer devices not a lot have changed. This is probably because the existing devices are adequate. It is also now that computers have been so tightly integrated with everyday life, that new applications and hardware are constantly introduced. The means of communicating with computers at the moment are limited to keyboards, mice, light pen, trackball, keypads etc. These devices have grown to be familiar but inherently limit the speed and naturalness with which we interact with the computer.

As the computer industry follows Moore's Law since middle 1960s, powerful machines are built equipped with more peripherals. Vision based interfaces are feasible and at the present moment the computer is able to "see". Hence users are allowed for richer and user-friendlier man-machine interaction. This can lead to new interfaces that will allow the deployment of new commands that are not possible with the current input devices. Plenty of time will be saved as well.

Recently, there has been a surge in interest in recognizing human hand gestures. Hand gesture recognition has various applications like computer games, machinery control (e.g. crane), and thorough mouse replacement. One of the most structured sets of gestures belongs to sign language. In sign language, each gesture has an assigned meaning (or meanings).

Computer recognition of hand gestures may provide a more natural-computer interface, allowing people to point, or rotate a CAD model by rotating their hands. Hand gestures can be classified in two categories: static and dynamic. A static gesture is a particular hand configuration and pose, represented by a single image. A dynamic gesture is a moving gesture, represented by a sequence of images. We will focus on the recognition of static images.

Interactive applications pose particular challenges. The response time should be very fast. The user should sense no appreciable delay between when he or she makes a gesture or motion and when the computer responds. The computer vision algorithms should be reliable and work for different people.

There are also economic constraints: the vision-based interfaces will be replacing existing ones, which are often very low cost. Even for added functionality, consumers may not

want to spend more. When additional hardware is needed the cost is considerable higher.

Academic and industrial researchers have recently been focusing on analyzing images of people. While researchers are making progress, the problem is hard and many present day algorithms are complex, slow or unreliable. The algorithms that do run near real-time do so on computers that are very expensive relative to the existing hand-held interface devices.

OBJECTIVES

Applications: Creating a proper sign language (ASL - American Sign Language at this case) dictionary is not the desired result at this point. This would combine advanced grammar and syntax structure understanding of the system, which is outside the scope of this project. The American Sign Language will be used as the database since it's a tightly structured set. From that point further applications can be suited. The distant (or near?) future of computer interfaces could have the usual input devices and in conjunction with gesture recognition some of the user's feelings would be perceived as well. Taking ASL recognition further a full realtime dictionary could be created with the use of video. As mentioned before this would require some Artificial Intelligence for grammar and syntax purposes. Another application is huge database annotation. It is far more efficient when properly executed by a computer, than by a human.

PRODUCT DESIGN

American Sign Language:

American Sign Language is the language of choice for most deaf people in the United States. It is part of the "deaf culture" and includes its own system of puns, inside jokes, etc. However, ASL is one of the many sign languages of the world. As an English speaker would have trouble understanding someone speaking Japanese, a speaker of ASL would have trouble understanding the Sign Language of Sweden. ASL also has its own grammar that is different from English. ASL consists of approximately 6000 gestures of common words with finger spelling used to communicate obscure words or proper nouns. Finger spelling uses one hand and 26 gestures to communicate the 26 letters of the alphabet. Another interesting characteristic that will be ignored by this project is the ability that ASL offers to describe a person, place or thing and then point to a place in space to temporarily store for later reference. ASL uses facial expressions to distinguish between statements, questions and directives. The eyebrows are raised for a question, held normal for a statement, and furrowed for a directive. There has been considerable work and research in facial feature recognition, they will not be used to aid recognition in the task addressed. This would be feasible in a full real-time ASL dictionary.

METHODOLOGY

Research on hand gestures can be classified into three categories. The first category, glove based analysis, employs sensors (mechanical or optical) attached to a glove that transduces finger flexions into electrical signals for determining the hand posture. The relative position of the hand is determined by an additional sensor. This sensor is normally a magnetic or an acoustic sensor attached to the glove. For some data glove applications, look-up table software toolkits are provided with the glove to be used for hand posture recognition.

The second category, vision based analysis, is based on the way human beings perceive information about their surroundings, yet it is probably the most difficult to implement in a satisfactory way. Several different approaches have been tested so far. One is to build a three-dimensional model of the human hand. The model is matched to images of the hand by one or more cameras, and parameters corresponding to palm orientation and joint angles are estimated. These parameters are then used to perform gesture classification. A hand gesture analysis system based on a three-dimensional hand skeleton model with 27 degrees of freedom was developed by *Lee and Kunii.* They incorporated five major constraints based on the human hand kinematics to reduce the model parameter space search. To simplify the model matching, specially marked gloves were used.

The third category, *analysis of drawing gestures,* usually involves the use of a stylus as an input device. Analysis of drawing gestures can also lead to recognition of written text. The vast majority of hand gesture recognition work has used mechanical sensing, most often for direct manipulation of a virtual environment and occasionally for symbolic communication. Sensing the hand posture mechanically has a range of problems, however, including reliability, accuracy and electromagnetic noise. Visual sensing has the potential to make gestural interaction more practical, but potentially embodies some of the most difficult problems in machine vision. The hand is a non-rigid object and **even** worse self-occlusion is very usual.

Full ASL recognition systems (words, phrases) incorporate data gloves. *Takashi and Kishino* discuss a Data glove-based system that could recognize 34 of the 46 Japanese gestures (user dependent) using a joint angle and hand orientation coding technique.

Here it seems the test user made each of the 46 gestures 10 times to provide data for principle component and cluster analysis. A separate test was created from five iterations of the alphabet by the user, with each gesture well separated in time. While these systems are technically interesting, they suffer from a lack of training.

Excellent work has been done in support of machine sign language recognition by *Sperling and Parish,* who have done Careful studies on the bandwidth necessary for a sign conversation using spatially and temporally sub-sampled

images. Point light experiments (where "lights" are attached to significant locations on the body and just these points are used for recognition), have been carried out by *Poizner.* Most systems to date study isolate/static gestures. In most of the cases those are fingerspelling signs.

Neural Networks:
Neural networks are composed of simple elements operating in parallel. These elements are inspired by biological nervous systems. As in nature, the network function is determined largely by the connections between elements. We can train a neural network to perform a particular function by adjusting the values of the connections (weights) between elements. Commonly neural networks are adjusted, or trained, so that a particular input leads to a specific target output. There, the network is adjusted, based on a comparison of the output and the target, until the network output matches the target. Typically many such input/target pairs are used, in this *supervised learning* to train a network.

Neural networks have been trained to perform complex functions in various fields of application including pattern recognition, identification, classification, speech, vision and control systems.
Today neural networks can be trained to solve problems that are difficult for conventional computers or human beings. The supervised training methods are commonly used, but other networks can be obtained from *unsupervised training* techniques or from direct *design* methods. Unsupervised networks can be used, for instance, to identify groups of data. Certain kinds of linear networks and Hopfield networks are designed directly. In summary, there are a variety of kinds of design and learning techniques that enrich the choices that a user can make.

Supervised Learning:
Supervised learning is based on the system trying to predict outcomes for known examples and is a commonly used training method. It compares its predictions to the target answer and "learns" from its mistakes. The data start as inputs to the input layer neurons. The neurons pass the inputs along to the next nodes. As inputs are passed along, the weighting, or connection, is applied and when the inputs reach the next node, the weightings are summed and either intensified or weakened. This continues until the data reach the output layer where the model predicts an outcome. In a supervised learning system, the predicted output is compared to the actual output for that case. If the predicted output is equal to the actual output, no change is made to the weights in the system. But, if the predicted output is higher or lower than the actual outcome in the data, the error is propagated back through the system and the weights are adjusted accordingly. This feeding errors backwards through the network is called "back-propagation." Both the Multi-Layer Perceptron and the Radial Basis Function are supervised learning techniques. The Multi-Layer Perceptron uses the back-propagation while the Radial Basis Function is a feed-forward approach which trains on a single pass of the data.

Unsupervised Learning:
Neural networks, which use unsupervised learning, are most effective for describing data rather than predicting it. The neural network is not shown any outputs or answers as part of the training process—in fact, there is no concept of output fields in this type of system. The primary unsupervised technique is the Kohonen network. The main uses of Kohonen and other unsupervised neural systems are in cluster analysis where the goal is to group "like" cases together. The advantage of the neural network for this type of analysis is that it requires no initial assumptions about what constitutes a group or how many groups there are. The system starts with a clean slate and is not biased about which factors should be most important.

RESULTS AND DISCUSSIONS
Advantages of Neural Computing:
There are a variety of benefits that an analyst realizes from using neural networks in their work. Pattern recognition is a powerful technique for harnessing the information in the data and generalizing about it. Neural nets learn to recognize the patterns, which exist in the data set. The system is developed through learning rather than programming. Programming is much more time consuming for the analyst and requires the analyst to specify the exact behavior of the model. Neural nets teach themselves the patterns in the data freeing the analyst for more interesting work. Neural networks are flexible in a changing environment. Rule based systems or programmed systems are limited to the situation for which they were designed—when conditions change, they are no longer valid. Although neural networks may take some time to learn a sudden drastic change, they are excellent at adapting to constantly changing information.

Neural networks can build informative models where more conventional approaches fail. Because neural networks can handle very complex interactions they can easily model data which is too difficult to model with traditional approaches such as inferential statistics or programming logic. Performance of neural networks is at least as good as classical statistical modeling, and better on most problems. The neural networks build models that are more reflective of the structure of the data in significantly less time. Neural networks now operate well with modest computer hardware. Although neural networks are computationally intensive, the routines have been optimized to the point that they can now run in reasonable time on personal computers. They do not require supercomputers as they did in the early days of neural network research.

Limitations of Neural Computing:
There are some limitations to neural computing. The key limitation is the neural network's inability to explain the

model it has built in a useful way. Analysts often want to know why the model is behaving as it is. Neural networks get better answers but they have a hard time explaining how they got there.

There are a few other limitations that should be understood. First, It is difficult to extract rules from neural networks. This is sometimes important to people who have to explain their answer to others and to people who have been involved with artificial intelligence, particularly expert systems which are rule-based. As with most analytical methods, you cannot just throw data at a neural net and get a good answer. You have to spend time understanding the problem or the outcome you are trying to predict. And, you must be sure that the data used to train the system are appropriate and are measured in a way that reflects the behavior of the factors. If the data are not representative of the problem, neural computing will not product good results. This is a classic situation where "garbage in" will certainly produce "garbage out."

Finally, it can take time to train a model from a very complex data set. Neural techniques are computer intensive and will be slow on low end PCs or machines without math coprocessors. It is important to remember though that the overall time to results can still be faster than other data analysis approaches, even when the system takes longer to train. Processing speed alone is not the only factor in performance and neural networks do not require the time programming and debugging or testing assumptions that other analytical approaches do.

Approach:

Image database:

The starting point of the project was the creation of a database with all the images that would be used for training and testing. The image database can have different formats. Images can be either hand drawn, digitized photographs or a 3D dimensional hand. Photographs were used, as they are the most realistic approach. Images came from the ASL databases on the Internet. This meant that they have different sizes, different resolutions and sometimes almost completely different angles of shooting. Images belonging to the last case were very few but they were discarded, as there was no chance of classifying them correctly.

The system could be approached either in high or low-level. The former would employ models of the hand, finger, joints and perhaps fit such a model to the visual data. This approach offers robustness, but at the expense of speed. A low-level approach would process data at a level not much higher than that of pixel intensities. Although this approach would not have the power to make inferences about occluded data, it could be simple and fast. Some transformation T, converts an image into a feature vector, which will be then compared with feature vectors of a training set of gestures. We will be seeking for the simplest possible transformation T, which allows gesture recognition. Histogram orientation has the advantage of being robust in lighting change conditions. If we follow the pixel-intensities approach certain problems can arise for varying illumination.

Taking a pixel-by-pixel difference of the same photo under different lighting conditions would show a large distance between these two identical gestures. For the pixel-intensity approach no transformation T has been applied. The image itself is used as the feature vector.

Another important aspect of gesture recognition is translation invariance. The position of the hand within the image should not affect the feature vector. This could be enforced by forming a local histogram of the local orientations. This should treat each orientation element the same, independent of location. Therefore, orientation analysis should give robustness in illumination changes while histogramming will offer translational invariance. This method will work if examples of the same gesture map to similar orientation histograms, and different gestures map to substantially different histograms.

Orientation Histograms:

We want gestures to be the same regardless of where they occur with the images boarders. To achieve this we will ignore position altogether, and tabulate a histogram of how often each orientation element occurred in the image. Clearly, this throws out information and some distinct images will be confused by their orientation histograms.

In practice, however, one can choose a set of training gestures with substantially different orientation histograms from each other. One can calculate the local orientation using image gradients. I used two 3 - tap x and y derivative filters. The outputs of the x and y derivative operators will be dx and dy. Then the gradient direction is **atan (dx, dy).** I had decided to use the edge orientation as the only feature that will be presented to the neural network. The reason for this is that if the edge detector were good enough it would have allowed me to test the network with images from different databases. This would lead though to testing the algorithm with only similar images. Apart from this the images before resized should be of approximately the same size. This is the size of the hand itself in the canvas and not the size of the canvas. Once the image has been processed the output will be a single vector containing a number of elements equal to the number of bins of the orientation histogram. Blurring can be used to allow neighboring orientations to sense each other.

Operation:

The program can be 'divided' in 6 steps. Lets examine them one by one.

Stepl
The first thing for the program to do is to read the image database. A *for* loop is used to read an entire folder of images and store them in MATLAB's memory. The folder is selected by the user from menus. A menu will firstly pop-up asking you whether you want to run the algorithm on test or train sets. Then a second menu will pop-up for the user to choose which ASL sign he wants to use.

Step2
Resize all the images that were read in Stepl to 150x140 pixels. This size seems the optimal for offering enough detail while keeping the processing time low.

StepS
Next thing to do is to find the edges. As mentioned before 2 filters were used. For the x direction x = [0 -1 1] For the y direction y= [1 10] , which is the same as x but transposed and multiplied by -1.

As this would mean the only feature extracted from the images it had to offer enough discrimination among them. From the images above it doesn't seem like a good edge detector. In fact it doesn't look like an edge detector that much.

Step 4
Dividing the two resulting matrices (images) *dx* and *dy* element by element and then taking the atan. This will give the gradient orientation.

Step 5
Then the MATLAB function *im2col* is called to rearrange the image blocks into columns. This is not a necessary step but it has to be done if we want to display the orientation histogram. Each group is shown as one bin. While developing the algorithm those histograms are the fastest way of getting a good idea how good the detection is done.

Step 6
Converting the column matrix with the radian values to degrees. This way we can scan the vector for values ranging from 0 to 90. This is because for real elements of X, atan(X) is in the range. This can also be seen from the orientation histograms where values come up only on the first and last quarter. Determining the number of the histogram bins was another issue that was solved by experimenting with various values. The smaller the vector the faster the processing. Finally, the actual resolution of each bin was set to 10, which means 19 bins.

The algorithms development was organized having in mind MATLAB weaknesses. The major one is speed. MATLAB is perfect for speeding up the development process but it can be very slow on execution when bad programming practices have been employed. Nested loops slow down the program considerably. It is probably because MATLAB is built on loops. Therefore, unnecessary backtracking was avoided and even some routines were written in full instead of using *for* loops. The code is not much in any case. The same techniques were put in practice for the following program as well.

CONCLUSION
This project gave an exciting opportunity to work on topics like neural nets., AI, MATLAB amongst others. The foundation laid by Dr. Anasuya Devi during her classes was a real help in compiling this project. It also opened me up to the practical aspects of image processing and neural nets. The only regret is that I was not able to go further due to want of time.

The speed of the program can be used if C/C++ is used as a programming language.

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C. M. A. T. IT, BT. NT:-05

HIGH ALTITUDE THERMAL RESISTANT FABRICS

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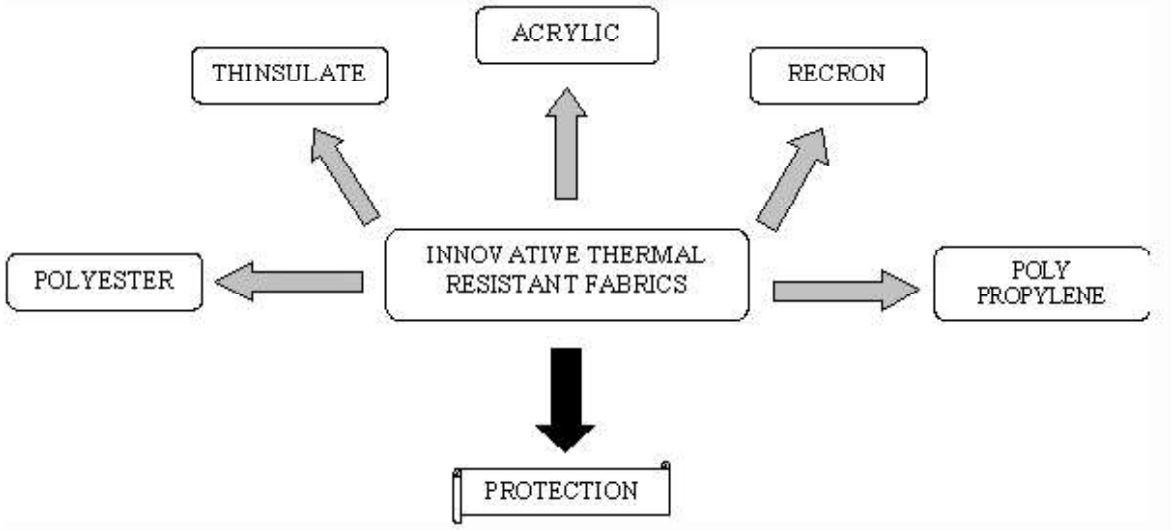
Textile has always been considered as an essential pre-requisite of the evolving rapidly changing socio-economical mankind. Safety and comfort has always been the pre-ordained, primordial task of procreative apparel manufacturers. Protective apparels have assumed new dimensions over the centuries imparting a greater meaning to the life style of the hi-fi human race inculcating the following:

- Lucratively light-weight, ballistic protection and thermal resistant
- Eco friendly, smart and having aesthetic appeal

Sustenance, survivability is of paramount functional, technical importance with the incorporation of new speciality policies and components, sensors, actuators and enhanced technologies. To cater and execute the ultimate cause that is protection against all types of:

- Environmental fluctuations, natural disasters
- Fire hazards, war threats, thermal & mechanical threats

Incorporating thermal / flame-retardants or self-extinguishing outer clothing, equipments in textiles. Minimizing evolution of thermal stress and discomfort by using light weight non woven and wool synthetic blends.



• A HIGH ALTITUDE THERMAL RESISTANT FABRIC can be produced using the technique of RAISING and BRUSHING fabric surface by NEEDLE PUNCH method so as to,
- Increase thickness
- Produce low density & high thermal insulation

• This is obtained using non-woven synthetic fibers such as,
- Polyester – hollow PET (HRL composite)
- Recron
- Thinsulate – T:40 and T:70

FUTURISTIC DEVELOPMENTS IN THIS ASPECT:
• HAND PROTECTION – HEAT RESISTANT GLOVES FROM NITRILE
• COLON'S – FLAME RETARDANT FABRICS
• BALLISTIC VESTS, COMBAT HELMETS
• POLAR TEC'S – RANGE OF WIND, WATER – PRO FABRICS

INTRODUCTION
INSIGHT TO HIGH ALTITUDE THERMAL RESISTANT FABRICS
• Wind, water & fire – the major disaster causing hazardous environmental elements calamities & destruction.
• Satisfaction of clothing comfort can be obtained when,
- Physical & Psychological
- Thermo physiological & Neurophysiologic factors are addressed.

• A high temperature environment attributes chemical, fire, noxious contaminants, and harmful gases from burning substance with intensified effects of blast, radiations from nuclear explosions.
• A protection is sought by the defense personnel & civilians from the above hazardous elements.
• Thermal resistance is the ability of fiber/fabrics to remain relatively unchanged when exposed to,
- Radiant, Conductive & Connective heat
- Environmental conditions

• High altitude thermal resistant fabrics can be produced using the technique of raising, brushing fabric surface so as to,
- Increase thickness & reduce density
- High thermal insulation fabrics

• This is obtained by using non-woven synthetic fibers such as,
- Polyester – hollow PET (HRL)
- Recron
- Thinsulate – T40 & T70

OBJECTIVES
• Multi-layered fabrics have air entrapped between inter and intra layers of clothing with increased insulation under extreme conditions.
• Low weight and less bulky fabrics enable mobility and operational efficiency.
• Protection against high intensity thermal radiations.
• Moisture vapor permeability.
• Following parameters are taken into account for the appliance of a good thermal insulative & resistive fabric,
- Fabric weight, thickness & density
- Fibre volume & optical porosity

• Synthetic wool, acrylic blended fibres such as Thinsulate, polyester – HR composites & Hollow PET (HRL) have 2-3 times the thermal insulation provided by the conventional polyester fibre wadding of the same thickness.
• Other synthetic materials such as pure dry spun silica fibres have high resistance to high temperatures of up to 1100^0 and good thermal and electrical insulation.
• Non-woven synthetics find greater applications since they have better economic considerations such as,
- Easy care & minimal maintenance
- Long storage life
- Readily available & minimal cost
- De-contaminable & repairable

RESEARCH METHODOLOGY
THERMAL RESISTANCE
• Thermal resistance is the ratio of temperature difference

between two faces of the material to the rate of heat transfer per unit area of the material normal to the faces.

• Thermal resistance in fabrics can be achieved in two ways,

➢ Inherently thermal resistant materials & fibers.

➢ Using special treatments on fibers & fabrics.

THERMAL INSULATION

• Thermal insulation is the heat flow in unit time from unit area of surface or the ratio of temperature difference between the two faces of the fabric to the relative heat flow.

• Thermal insulation can be defined as the effective resistance to transmission of heat or the fundamental basis to maintain the normal temperature of human body under equilibrium conditions.

DETERMINATION OF T.I.V OF NON-WOVEN SAMPLES

• The following tests were conducted at ATIRA for the determination of thermal insulation of non-woven & wool-acrylic blends so as to determine their heat keeping ratio.

• The equipment used is a thermal insulation tester known as the KES – FM THEMO LOBO II tester.

• An advanced system for the measurement of thermal insulation developed by Professor Kawabata – Japan.

PRINCIPLE – HOT PLATE METHOD

• A specific temperature of hot plate is maintained with or without the specimen.

• The electricity consumed in watts used to maintain the specific temperature of hot plate with the sample.

• The electricity consumed in watts used to maintain the specific temperature of hot plate without the sample. The ratio is expressed as %.

TECHNIQUES USED

• All tests were made with the air flow 25cm/sec – 100cm/sec.

• A wet technique simulates the sweating body condition.

➢ **Dry contact** The sample is placed in direct contact with the hot plate.

➢ **Dry space** The sample is placed at 5mm from the hot plate.

➢ **Wet contact** A wet filter is placed B/W the hot plate & the specimen.

➢ **Wet space** A wet filter is placed at 5mm from the speci men.

RESULTS AND DISCUSSIONS

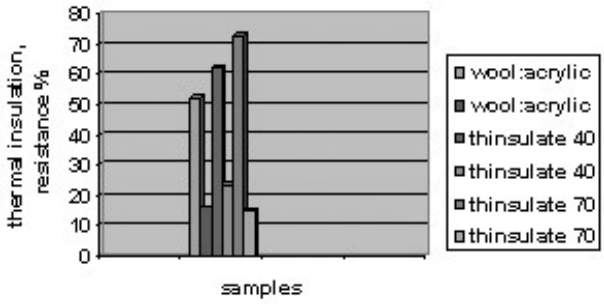
• Thermal insulation, resistance is deduced at ATIRA for non-woven & wool- acrylic blended samples.

➢ **Instrument** T.I.V TESTER (KES–FM THERMOLOBO II)

➢ **Principle** HOT PLATE METHOD

➢ **Techniques** Dry Contact, Space method & Wet Contact, Space method

➢ **Unit** TOGS 100cms/s



• The cumulative data shows **Thinsulate-70** has greater Thermal resistance & Thermal insulation from the above two samples followed by **Thinsulate-40**.

• Both are extremely Thermal resistant & enable the personal / civilian to endure comfort during the operation period.

CONCLUSION

• Wool – acrylic blends has,

• Enhanced strength, abrasion, low crimp behavior, aesthetic appeal and reduced discomfort and physical stress against extreme cold climates.

• Reticence of still air is highly thermal insulative, resistant under all conditions with,

➢ Being a porous solid

➢ Low density (2.0 lb/ft^3 – 3.2 kg/m^3)

➢ Low emissive surface

➢ Air and water permeable

➢ High togs/inch value in less bulky, synthetic non-woven blends offers high thermal protection against varying alti-

SAMPLES	THERMAL INSULATION VALUE % 100 cms/sec		THERMAL RESISTANCE VALUE TOGS 100 cms/sec		AIR PERMEABILITY VELOCITY 100 cms/sec	
	DC INST.	DW INST.	DC INST.	DW INST.	AIR – ATM(A) M3/m2/min	R.P
NO SPECIMEN	-	-	2.34	2.53	-	-
THERMAL SOCKS (Wool:Acrylic) 50:50	52.49	16.06	4.71	3.09	130-1300 NLPH	94-95
Thinsulate - 40	62.32	23.66	5.51	3.46	6-6 NLPH	94-95
Thinsulate - 70	72.83	14.95	7.86	3.15	25-250 NLPH	94-95

tude levels.

• Smart textiles with high thermal radiations demark the new generation of innovative expertise to suit harsh and rigorous changing environmental fluctuations.

- Shield and heal
- Assist and communicate
- Locate, resist and protect against NBCs.

- Lightweight non-woven fabrics are wind proof, excellent thermal resistant with optimum performance.

• Non-wovens such as HOLLOW PET – HRL a purely polyester needle punched has a thickness of – 0.87 & 0.37 GSM.
• Have high thermal resistance, insulation and efficiency.
• Used as interlinings for jackets, wind proof materials at high altitude levels
• Innovative futuristic lightweight incorporated in all fields.
• COMFORT, SAFETY primordial requisites with INQUISITIVE, EXHAUSTIVE usage to CATER a large PERSONNEL/ CIVILIANS etc.

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C. M. A. T. IT, BT. NT:-06

AI IN CONCURRENT ENGINEERING

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INTRODUCTION

Because of a shortening in the life cycle of products in the increasingly competitive manufacturing environment, delayed entrance into the market in serve losses to many producers. These manufacturers are aware that the timely introduction of a product to the market is crucial. Much effort has been made to develop approaches to shorten product development. To gain speed, many companies, since the 1980's have realized that the early stage of product introduction, the product design stage, is very important and that between 70 and 75% of both cost and time spent manufacturing technology.

After working on these aspects individually, researchers, especially from NASA noticed that working on those individual aspects of design for X could not reduce the product development life cycle, so they then introduced the concept of simultaneous engineering, also known as concurrent engineering, in 1988.

Concurrent engineering (CE) is the approach of doing all activities at the same time. It is the union of all the facets of the product life cycle to minimize modifications in the prototype .i.e., to decrease the design iterations performed during product design,

OBJECTIVES

The main goal of a concurrent engineering system for product design is to produce products that meet given cost, function, and quality requirements as rapidly as possible (short lead time).

PRODUCT DESIGN

Product design may be described as being compared of three rather distinct but integrated stages:

1. User need analysis(Market Analysis)
2. Product design specifications
3. Product manufacturing evaluation.

User need analysis can be obtained market analysis, competitor analysis, technological forecasts and statistical analysis of historical cost patterns. The outcome is a customer requirement definition and a product development plan for satisfying and perceived need. In product design specification stage, the product requirement are converted into performance specifications (technical specifications) for the product, and a production functional analysis is then made in which designers and engineers seek ways of simplifying or rationalizing a product's design by starting from what it should do rather than what it does now or did in previous designs.

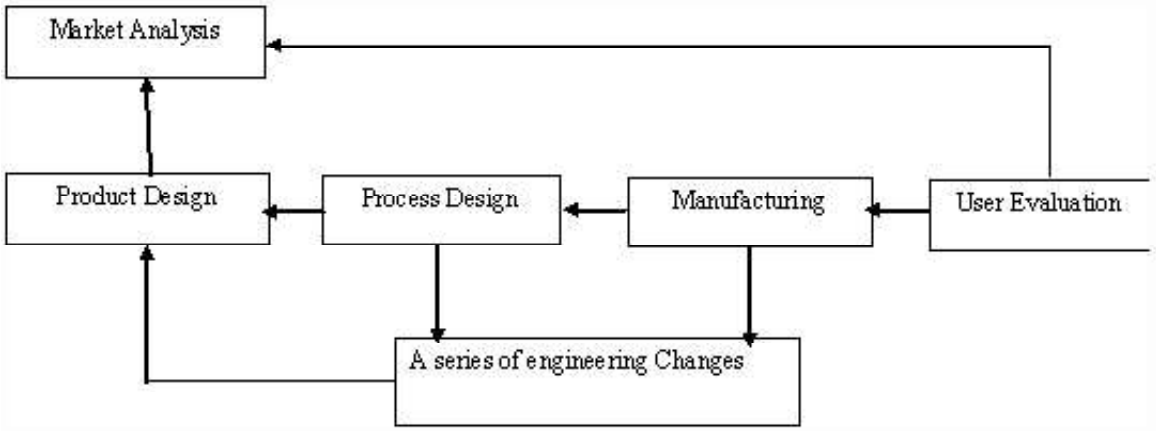
The manufacturing evaluation stage determines the material and process parameters critical to the production of the required product as well as the manufacturing operations to be used in the production stage.

Perspective model of design is which includes the general type of design and prototype design, Computational model of design, which is composed of optimization and simulation.

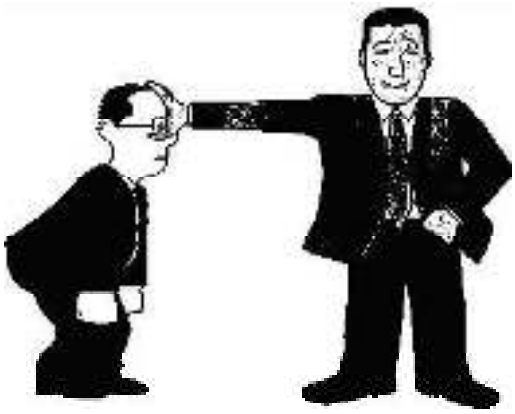
METHODOLOGY

TRADITIONAL APPROACH TO PRODUCT DESIGN

The design process varies from industry to industry and product to product; it also takes different forms in response to the product and system to be developed and the resources that are available. Traditionally however, design engineers develop product specifications based primarily on input from sales and marketing of customers needs without considering the available, process, technology, or process limitations.



Sequential progression in the design process



DESIGN ENGINEER VS. MANUFACTURING ENGINEER

Other Approaches to Product Design.

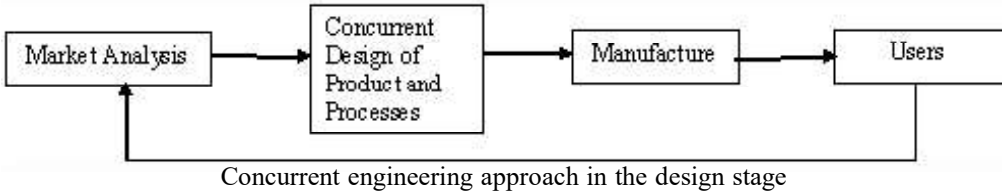
Design for Cost (DFC) Design for Assembly (DFA) Design for Quality (DFQ) Design for Manufacture (DFM)

EXPERIMENT

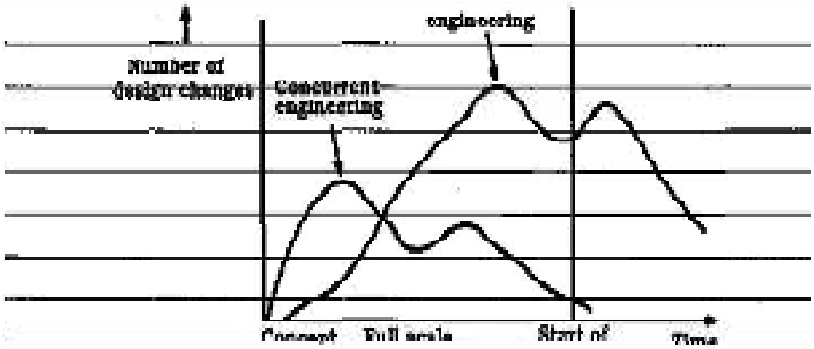
CONCURRENT ENGINEERING

CE is the systematic approach to the integrated, concurrent design of products and related process including manufacture and support. This approach causes product developers, from the outset, to consider all the elements of the product life cycle from conception through disposal including quality, cost, and schedule and user requirements. The mam goal of a concurrent engineering system for product design is to produce products that meet given cost, function, and quality requirements as rapidly as possible (short lead time).A successful rapid development system, by its very definition, requires design decisions(for product processes) to be made very early in the cycle when only incomplete information is available. Thus many analyses, such as interval analysis, impact and risk assessment, and neural representations, are require. Therefore, to develop well defined CE in system, it is necessary to consider the following:

1. Careful development of the incomplete/uncertain information in early stages.
2. Need to handle the data and knowledge from different stages.
3. Need to define interval dependent on time.
4. Need to open for additional functions.
5. Need to define the cost predictions model including overhead cost.



Concurrent engineering approach in the design stage



Example of design changes as a function of time for an American and Japanese automobile

RESULTS AND DISCUSSIONS

Case study - Alternative product generation by applying a rule-based expert system:

Due to shorter life cycle and a competitive manufacturing world, concurrent engineering (CE) becomes very important, especially in product design. The development of new products can be viewed as alternative products generated from customers needs and existing parts. There have been many attempts in constraints, and, thus, the cost of errors is highest at this stage. There have been many attempts in recent years to produce computer-based systems that support the generation of alternative products. Typically, these involve using checklists, decision trees and other algorithmic methods such as XCON, MAPLE, COSSCACK and PIPPA. Classical rule-based expert systems have been more successful, although knowledge maintenance has been shown to be a problem because previous or existing designs or part-designs provide a stimulus for developing a new configuration structure. Then alternative configuration are evaluated where possible, and a careful trade-off of number of possibly configuring factors take place, such as efficiency, cost complexity , and reuse of existing components to reduce design and tooling cost. The product -related knowledge can be grouped into four categories:

1. Knowledge about components
2. Knowledge about relations between components
3. Constraints on properties of materials involving part formation.
4. Relations between components and user preferences.

Model Development

From the product realization model, the modifiable parts and related attributes due to customers needs for these parts and assembly index for measuring the relationship due to assembly are identified and derived. Considering the information of modifiable parts and related attributes based on customers need, a knowledge engineering approach with the help of a database can be applied to generate the product alternative configuration for product optimization. The concept of the decomposition -composition technique and the constructive-deductive approach are developing a knowledge-based system. At the first stage, the existing product is decomposed to the parts level, and each part can be represented as physical functional attributes and non-physical attributes. The assembly constraints and indices becomes the rule for composition.

Expert System Implementation

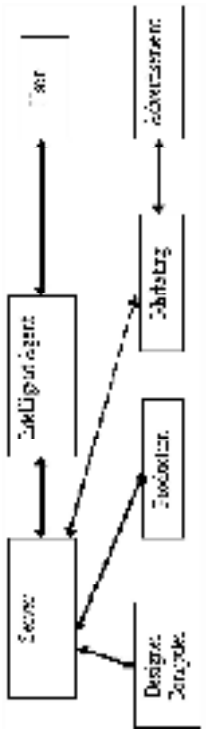
For specific application or characterization of the product, it is necessary to define the basic alternative parts attached to the corresponding attributes and rules for the expert system module. Most of the rules are generated based on a specific type of product (Eg gear box). Below ate listed some of the important rules:

- Rules of feasibility
- Rules for Axis Arrangement
- Rules for speed Reduction Need
- Rules for Design Constraints
- Rules for single stage
- Rules for input output arrangement
- Rules for selecting gear materials

CONCLUSION

INTELLIGENT INTERNET CAD DEVELOPMENT

The expert system is composed of a traditional CAD system for generation of alternative product configurations by customers request through internet. The general framework development of the intelligent internet CAD system is illustrated in figure below:



The Framework of an intelligent internet CAD system

The structure of the intelligent CAD system is primarily composed of the integration of experts system and CAD system. Because of its object-oriented programming (OOP) capabilities and Java programming compatibility, Java Expert system shell (JESS) is used to generate the knowledge base of the intelligent internet CAD expert system. With the JESS, the Java applet can have the ability to reason. Considering the CAD software, AutoCAD software is selected due to the effectiveness of the drawing and design tools available to the drawing professional.

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FUZZY LOGIC AND FUZZY SYSTEMS

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INTRODUCTION

The concept of Fuzzy Logic (FL) was conceived by Lotfi Zadeh, a professor at the University of California at Berkley, and presented not as a control methodology, but as a way of processing data by allowing partial set membership rather than crisp set membership or non-membership. In this context, FL is a problem-solving control system methodology that lends itself to implementation in systems ranging from simple, small, embedded micro-controllers to large, networked, multi-channel PC or workstation-based data acquisition and control systems. It can be implemented in hardware, software, or a combination of both. FL provides a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise, noisy, or missing input information. FL's approach to control problems mimics how a person would make decisions, only much faster. That is, it uses an imprecise but very descriptive language to deal with input data more like a human operator. It is very robust and forgiving of operator and data input and often works when first implemented with little or no tuning. Fuzzy logic control and analysis systems may be electro-mechanical in nature, or concerned only with data, for example economic data, in all cases guided by "If-Then rules" stated in human language.

OBJECTIVES

HOW IS FL DIFFERENT FROM CONVENTIONAL CONTROL METHODS?

FL incorporates a simple, rule-based IF X AND Y THEN Z approach to a solving control problem rather than attempting to model a system mathematically. The FL model is empirically-based, relying on an operator's experience rather than their technical understanding of the system. For example, rather than dealing with temperature control in terms such as "SP =500F", "T <1000F", or "210C <TEMP <220C", terms like "IF (process is too cool) AND (process is getting colder) THEN (add heat to the process)" or "IF (process is too hot) AND (process is heating rapidly) THEN (cool the process quickly)" are used. These terms are imprecise and yet very descriptive of what must actually happen. Consider what you do in the shower if the temperature is too cold: you will make the water comfortable very quickly with little trouble. FL is capable of mimicking this type of behavior but at very high rate.

WHY USE Fuzzy Logic?

Fuzzy Logic offers several unique features that make it a particularly good choice for many control problems.

1) It is inherently robust since it does not require precise, noise-free inputs and can be programmed to fail safely if a feedback sensor quits or is destroyed. The output control is a smooth control function despite a wide range of input variations.

2) Since the FL controller processes user-defined rules governing the target control system, it can be modified and tweaked easily to improve or drastically alter system performance. New sensors can easily be incorporated into the system simply by generating appropriate governing rules.

3) FL is not limited to a few feedback inputs and one or two control outputs, nor is it necessary to measure or compute rate-of-change parameters in order for it to be implemented. Any sensor data that provides some indication of a system's actions and reactions is sufficient. This allows the sensors to be inexpensive and imprecise thus keeping the overall system cost and complexity low.

4) Because of the rule-based operation, any reasonable number of inputs can be processed (1-8 or more) and numerous outputs (1-4 or more) generated, although defining the rule-base quickly becomes complex if too many inputs and outputs are chosen for a single implementation since rules defining their interrelations must also be defined. It would be better to break the control system into smaller chunks and use several smaller FL controllers distributed on the system, each with more limited responsibilities.

5) FL can control nonlinear systems that would be difficult or impossible to model mathematically. This opens doors for control systems that would normally be deemed unfeasible for automation.

What is fuzzy logic?

Fuzzy logic is a superset of conventional (Boolean or crisp) logic that has been extended to handle the concept of partial truth (fuzzy) — truth values between completely true" and "completely false". The process of converting a crisp input value to a fuzzy value is called "fuzzification".

The input variables in a fuzzy control system are in general mapped into by sets of membership functions similar to this, known as "fuzzy sets".

Fuzzy sets:

Just as there is a strong relationship between Boolean logic and the concept of a subset, there is a similar strong relationship between fuzzy logic and fuzzy set theory. In classical set

theory, a subset U of a set S can be defined as a mapping from the elements of S to the elements of the set {0, 1},

U: S —> {0, 1}

This mapping may be represented as a set of ordered pairs, with exactly one ordered pair present for each element of S. The first element of the ordered pair is an element of the set S, and the second element is an element of the set {0, 1}. The value zero is used to represent non-membership, and the value one is used to represent membership. The truth or falsity of the statement x is in U is determined by finding the ordered pair whose first element is x. The statement is true if the second element of the ordered pair is 1, and the statement is false if it is 0.

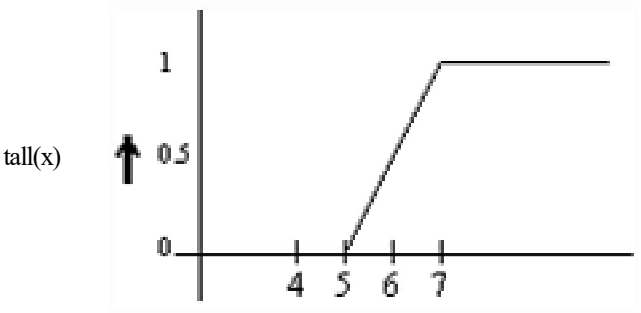
Similarly, a fuzzy subset F of a set S can be defined as a set of ordered pairs, each with the first element from S, and the second element from the interval [0,1], with exactly one ordered pair present for each element of S. This defines a mapping between elements of the set S and values in the interval [0,1]. The value zero is used to represent complete non-membership, the value one is used to represent complete membership, and values in between are used to represent intermediate DEGREES OF MEMBERSHIP. The set S is referred to as the UNIVERSE OF DISCOURSE for the fuzzy subset F. Frequently, the mapping is described as a function, the **MEMBERSHIP FUNCTION** of F (the most common shape of membership functions is triangular, although trapezoidal and bell curves are also used, but the shape is generally less important than the number of curves and their placement. From three to seven curves are generally appropriate to cover the required range of an input value). The degree to which the statement,

x is in F

is true is determined by finding the ordered pair whose first element is x. The DEGREE OF TRUTH of the statement is the second element of the ordered pair. In practice, the terms "**membership function**" and **fuzzy subset** get used interchangeably. That's a lot of mathematical baggage, so here's an example. Let's talk about people and "tallness". In this case the set S (the universe of discourse) is the set of people. Let's define a fuzzy subset TALL, which will answer the question "to what degree is person x tall?" we can describe TALL as a LINGUISTIC VARIABLE, which represents our cognitive category of "tallness". To each person in the universe of discourse, we have to assign a degree of membership in the fuzzy subset TALL. The easiest way to do this is with a membership function(μ(x)) based on the person's height.

$$tall(x) = \begin{cases} 0, & if\ height(x) < 5\ ft \\ (height(x) - 5ft)/2, & if\ 5ft <= height(x) <= 7\ ft \\ 1, & if\ height(x) > 7\ ft \end{cases}$$

A graph of this looks like:

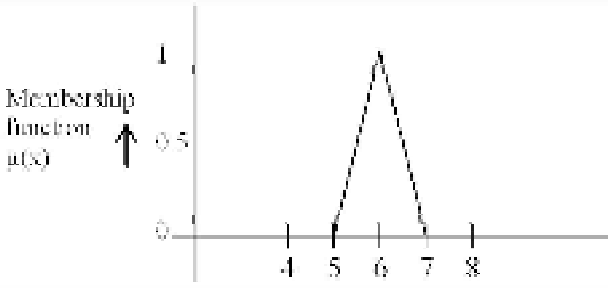


Given this definition, here are some example values:

Person	Height	degree of tallness	
Ramu	3' 2"	0.00	[I think]
Raju	5' 5"	0.21	
Arun	5' 9"	0.38	
Derik	5' 10"	0.42	
Shankar	6' 1"	0.54	
Ashok	7' 2"	1.00	[depends on who you ask]

Expressions like "A is X" can be interpreted as degrees of truth,
e.g., "Arun is TALL" = 0.38.

Note: Membership functions used in most applications almost never have as simple a shape as tall(x). At minimum, they tend to be triangles pointing up, and they can be much more complex than that.



Also, the discussion characterizes membership functions as if they always are based on a single criterion, but this isn't always the case, although it is quite common. One could, for example, want to have the membership function for TALL depend on both a person's height and their age (he's tall for his age). This is perfectly legitimate, and occasionally used in practice. It's referred to as a two-dimensional membership function, or a "fuzzy relation". It's also possible to have even more criteria, or to have the membership function depend on elements from two completely different universes of discourse.

Logic Operations:

Now that we know what a statement like "X is LOW" means in fuzzy logic,
how do we interpret a statement like X is LOW and Y is HIGH or (not Z is MEDIUM)
The standard definitions in fuzzy logic are:
truth (not x) = 1.0 - truth (x) —— Negation
truth (x and y) = minimum (truth(x), truth(y)) — Conjunction
truth (x or y) = maximum (truth(x), truth(y)) —— Disjunction
truth (x => y) = maximum (1 – truth(x), truth(y)) — Implication

Some researchers in fuzzy logic have explored the use of other interpretations of the AND and OR operations, but the definition for the NOT operation seems to be safe. Note that if we plug just the values zero and one into these definitions, we get the same truth tables as we would expect from conventional Boolean logic. This is known as the EXTENSION PRINCIPLE, which states that the classical results of Boolean logic are recovered from fuzzy logic operations when all fuzzy membership grades are restricted to the traditional set {0, 1}. This effectively establishes fuzzy subsets and logic as a true generalization of classical set theory and logic. In fact, by this reasoning all crisp (traditional) subsets are fuzzy subsets of this very special type; and there is no conflict between fuzzy and crisp methods.

What is a fuzzy expert system?
A fuzzy expert system is an expert system that uses a collection of fuzzy membership functions and rules, instead of Boolean logic, to reason about data. The rules in a fuzzy expert system are usually of a form similar to the following:
if x is low and y is high then z = medium

where x and y are input variables (names for know data values), z is an output variable (a name for a data value to be computed), low is a membership function (fuzzy subset) defined on x, high is a membership function defined on y, and medium is a membership function defined on z. The antecedent (the rule's premise) describes to what degree the rule applies, while the conclusion (the rule's consequent) assigns a membership function to each of one or more output variables. Most tools for working with fuzzy expert systems allow more than one conclusion per rule. The set of rules in a fuzzy expert system is known as the rule-base or knowledge base.

The general inference process proceeds in three (or four) steps.
1. Under FUZZIFICATION, the membership functions defined on the input variables are applied to their actual values, to determine the degree of truth for each rule premise.
2. Under INFERENCE, the truth value for the premise of each rule is computed, and applied to the conclusion part of each rule. This results in one fuzzy subset to be assigned to each output variable for each rule. Usually only MIN or PRODUCT are used as inference rules. In MIN inferencing, the output membership function is clipped off at a height corresponding to the rule premise's computed degree of truth (fuzzy logic AND). In PRODUCT inferencing, the output membership function is scaled by the rule premise's computed degree of truth.
3. Under COMPOSITION, all of the fuzzy subsets assigned to each output variable are combined together to form a single fuzzy subset for each output variable. Again, usually MAX or SUM are used. In MAX composition, the combined output fuzzy subset is constructed by taking the pointwise maximum over all of the fuzzy subsets assigned to variable by the inference rule (fuzzy logic OR). In SUM composition, the combined output fuzzy subset is constructed by taking the pointwise sum over all of the fuzzy subsets assigned to the output variable by the inference rule.
4. Finally is the (optional) DEFUZZIFICATION, which is used when it is useful to convert the fuzzy output set to a crisp number. There are more defuzzification methods than you can shake a stick at (at least 30). Two of the more common techniques are the CENTROID and MAXIMUM methods. In the CENTROID method, the crisp value of the output variable is computed by finding the variable value of the center of gravity of the membership function for the fuzzy value. In the MAXIMUM method, one of the variable values at which the fuzzy subset has its maximum truth value is chosen as the crisp value for the output variable.

Extended Example:
Assume that the variables x, y, and z all take on values in the interval [0,10], and that the following membership functions and rules are defined:
low(t) = 1 - (t / 10)
high(t) = t / 10

rule 1: if x is low and y is low then z is high
rule 2: if x is low and y is high then z is low
rule 3: if x is high and y is low then z is low
rule 4: if x is high and y is high then z is high

Notice that instead of assigning a single value to the output variable z, each rule assigns an entire fuzzy subset (low or high).
In the fuzzification subprocess, the membership functions defined on the input variables are applied to their actual values, to determine the degree of truth for each rule premise. The degree of truth for a rule's premise is sometimes referred to as its ALPHA. If a rule's premise has a nonzero degree of truth (if the rule applies at all...) then the rule is said to FIRE. For example,

x	y	low(x)	high(x)	low(y)	high(y)	alpha1	alpha2	alpha3	alpha4
0.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0
0.0	3.2	1.0	0.0	0.68	0.32	0.68	0.32	0.0	0.0
0.0	6.1	1.0	0.0	0.39	0.61	0.39	0.61	0.0	0.0
0.0	10.0	1.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0
3.2	0.0	0.68	0.32	1.0	0.0	0.68	0.0	0.32	0.0
6.1	0.0	0.39	0.61	1.0	0.0	0.39	0.0	0.61	0.0
10.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0
3.2	3.1	0.68	0.32	0.69	0.31	0.68	0.31	0.32	0.31
3.2	3.3	0.68	0.32	0.67	0.33	0.67	0.33	0.32	0.32
10.0	10.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0

In the inference subprocess, the truth value for the premise of each rule is computed, and applied to the conclusion part of each rule. This results in one fuzzy subset to be assigned to each output variable for each rule. MIN and PRODUCT are two INFERENCE METHODS or INFERENCE RULES. In MIN inferencing, the output membership function is clipped off at a height corresponding to the rule premise's computed degree of truth. This corresponds to the traditional interpretation of the fuzzy logic AND operation. In PRODUCT inferencing, the output membership function is scaled by the rule premise's computed degree of truth.

For example, let's look at rule 1 for x = 0.0 and y = 3.2. As shown in the table above, the premise degree of truth works out to 0.68. For this rule, MIN inferencing will assign z the fuzzy subset defined by the membership function:

$$rule1(z) = \begin{cases} z/10, & \text{if } z \le 6.8 \\ 0.68, & \text{if } z \ge 6.8 \end{cases}$$

For the same conditions, PRODUCT inferencing will assign z the fuzzy subsetdefined by the membership function:

rule1(z) = 0.68 * high(z)

= 0.068 * z

Note: The terminology used here is slightly nonstandard. In most texts, the term "inference method" is used to mean the combination of the things referred to separately here as "inference" and "composition." Thus you'll see such terms as "MAX-MIN inference" and "SUM-PRODUCT inference" in the literature. They are the combination of MAX composition and MIN inference, or SUM composition and PRODUCT inference, respectively. You'll also see the reverse terms "MIN-MAX" and "PRODUCT-SUM" – these mean the same things as the reverse order. It seems clearer to describe the two processes separately.

In the composition sub process, all of the fuzzy subsets assigned to each output variable are combined together to form a single fuzzy subset for each output variable.

MAX composition and SUM composition are two COMPOSITION RULES. In MAX composition, the combined output fuzzy subset is constructed by taking the pointwise maximum over all of the fuzzy subsets assigned to the output variable by the inference rule. In SUM composition, the combined output fuzzy subset is constructed by taking the pointwise sum over all of the fuzzy subsets assigned to the output variable by the inference rule. Note that this can result in truth values greater than one! For this reason, SUM composition is only used when it will be followed by a defuzzification method, such as the CENTROID method, that doesn't have a problem with this odd case. Otherwise SUM composition can be combined with normalization and is therefore a general purpose method again.

For example, assume x = 0.0 and y = 3.2. MIN inferencing would assign the
following four fuzzy subsets to z:

$$rule1(z) = \begin{cases} z/10, & \text{if } z \le 6.8 \\ 0.68, & \text{if } z \ge 6.8 \end{cases}$$

$$rule2(z) = \begin{cases} 0.32, & \text{if } z \le 6.8 \\ 1 - z/10, & \text{if } z \ge 6.8 \end{cases}$$

rule3(z) = 0.0

rule4(z) = 0.0

MAX composition would result in the fuzzy subset:

$$fuzzy(z) = \begin{cases} 0.32, & \text{if } z \le 3.2 \\ z/10, & \text{if } 3.2 \le z \ge 6.8 \\ 0.68, & \text{if } z \ge 6.8 \end{cases}$$

PRODUCT inferencing would assign the following four fuzzy subsets to z:

rule1(z) = 0.068 * z

rule2(z) = 0.32 - 0.032 * z

rule3(z) = 0.0

rule4(z) = 0.0

SUM composition would result in the fuzzy subset:

fuzzy(z) = 0.32 + 0.036 * z

Sometimes it is useful to just examine the fuzzy subsets that are the result of the composition process, but more often, this FUZZY VALUE needs to be converted to a single number — a CRISP VALUE. This is what the defuzzification subprocess does.

There are more defuzzification methods than you can shake a stick at. A couple of years ago, Mizumoto did a short paper that compared about ten defuzzification methods. Two of the more common techniques are the CENTROID and MAXIMUM methods. In the CENTROID method, the crisp value of the output variable is computed by finding the variable value of the center of gravity of the membership function for the fuzzy value. In the MAXIMUM method, one of the variable values at which the fuzzy subset has its maximum truth value is chosen as the crisp value for the output variable. There are several variations of the MAXIMUM method that differ only in what they do when there is more than one variable value at which this maximum truth value occurs. One of these, the AVERAGE-OF-MAXIMA method, returns the average of the variable values at which the maximum truth value occurs.

For example, go back to our previous examples. Using MAX-MIN inferencing and AVERAGE-OF-MAXIMA defuzzification results in a crisp value of 8.4 for z. Using PRODUCT-SUM inferencing and CENTROID defuzzification results in a crisp value of 5.6 for z, as follows.

To compute the centroid of the function f(x), you divide the moment of the function by the area of the function. To compute the moment of f(x), you compute the integral of x*f(x) dx, and to compute the area of f(x), you compute the integral of f(x) dx. In this case, we would compute the area as integral from 0 to 10 of (0.32+0.036*z) dz, which is

$= (0.32 * 10 + 0.018*100)$

$= (3.2 + 1.8)$

$= 5.0$

and the moment as the integral from 0 to 10 of (0.32*z+0.036*z*z) dz, which is

$= (0.16 * 10 * 10 + 0.012 * 10 * 10 * 10)$

$= (16 + 12)$

$= 28$

Finally, the centroid is 28/5 or 5.6.

Note: Sometimes the composition and defuzzification processes are combined, taking advantage of mathematical relationships that simplify the process of computing the final output variable values.

EXPERIMENT

Air conditioner controller:

The air conditioner controller system comprises of a dial to control the flow of warm/hot or cool/cold air and a thermometer to measure the room temperature(T^0 C). when the dial is turned positive, warm/hot air is supplied from the air conditioner and if it is turned –ve, cool/cold air is supplied. If set to zero, no air is supplied.

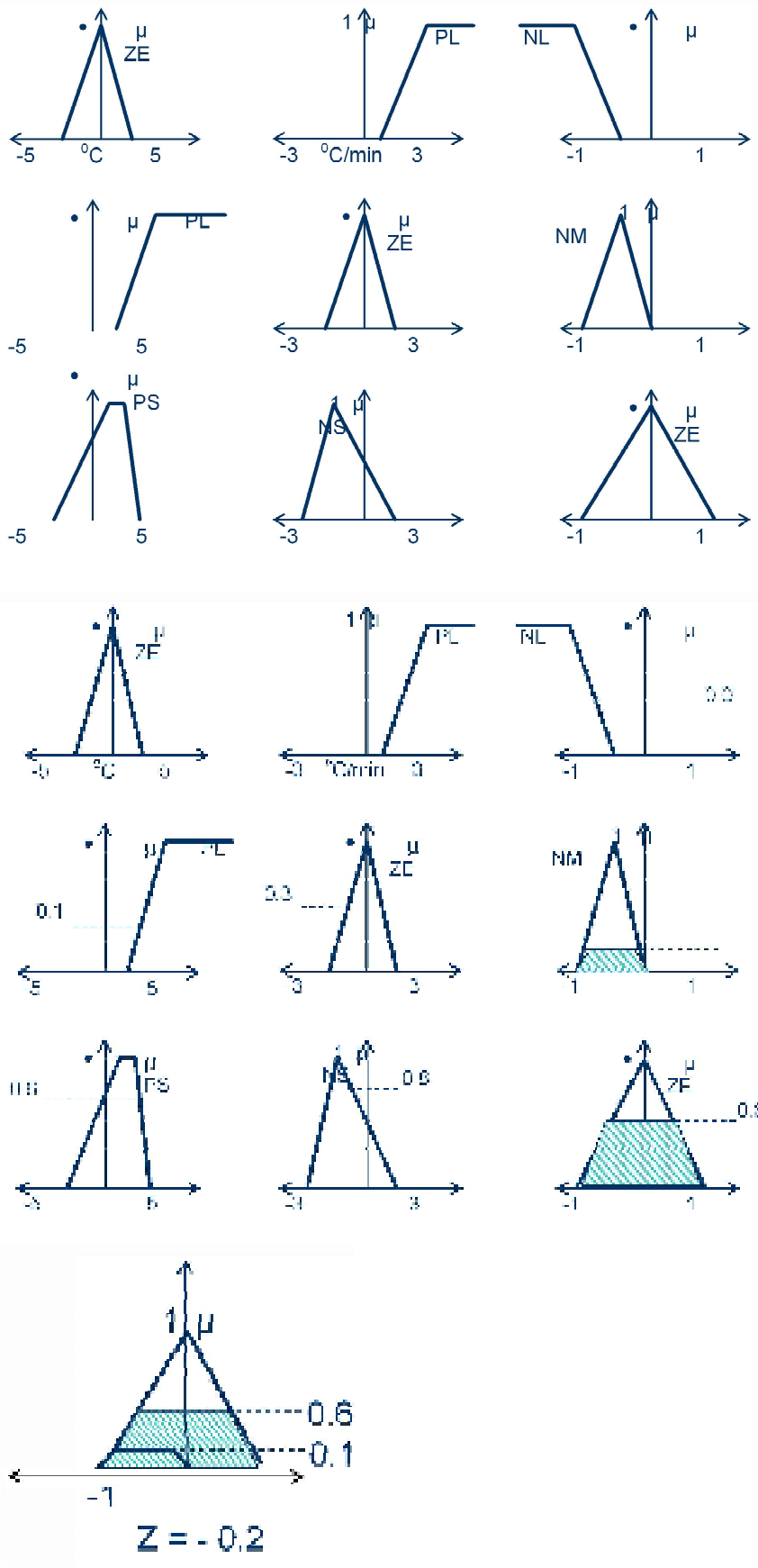
RESULTS AND DISCUSSIONS

A person now notices the difference in temperature (ΔT^0 C) between the room temperature (T^0 C) as measured by the thermometer and the desired temperature(T^0 C) at which the room is desired to be kept(set point). The problem now is to determine to what extent the dial should be turned so that appropriate supply of air (hot/warm/cool/cold) will nullify the change in temperature.

For the above problem the rule base is as shown in table.

Sl. No	Fuzzy rule (descriptive)	Fuzzy rule (notational)
1	If the room temperature is approximately equal to the setpoint $T_0{}^0$C, ΔT is approximately Zero (ZE) AND the temperature is rapidly changing higher, i.e., $\frac{d\Delta T}{dt}$ is positively large(PL) Then blow cold air rapidly, i.e., turn the dial negative large(NL).	If ΔT is ZE and $\frac{d\Delta T}{dt}$ is PL Then dial should be NL If ΔT is PL and $\frac{d\Delta T}{dt}$ is ZE
2	If the room temperature is high and there is no change in temperature i.e., ΔT is PL and $\frac{d\Delta T}{dt}$ is approximately ZE Then blow cold air at an intermediate level, i.e., turn the dial negative medium (NM)	Then dial should be NM
3	If room temperature is a little bit higher than the set point and the temperature is gradually decreasing i.e., ΔT is positively small (PS) and $\frac{d\Delta T}{dt}$ is negatively small (NS) Then there is no need to blow hot or cold air i.e., turn the dial to approximately ZE	If ΔT is PS and $\frac{d\Delta T}{dt}$ is NS Then dial should be ZE

The fuzzy sets for the system inputs, namely ΔT and, $\frac{d\Delta T}{dt}$ and the system output, namely turn of the dial are as shown in figure below.



CONCLUSION

Consider the system inputs, $\Delta T = 2.5^0C$ and = $\frac{d\Delta T}{dt}$ $-1^0C/min$. Here the fuzzification of system inputs has been directly done by noting membership value corresponding to the system inputs as shown below.

The rule strengths of rules 1, 2, 3 choosing the minimum of the fuzzy membership value of the antecedents are 0, 0.1 and 0.6 respectively. The fuzzy output is as shown in figure.

The defuzzyfication of the fuzzy output yields Z= -0.2 for $\Delta T = 2.5^0C$ and = $\frac{d\Delta T}{dt}$ $-1^0C/min$. hence the dial needs to be turned in the negative direction, i.e., -0.2 to achieve the desired temperature effect in the room.

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THEME:-06

ELECTRICAL, ELECTRONICS, COMMUNICATION & ENERGY

E.E.C.E:-1

SYSTEM IDENTIFICATION USING FAST BLOCK LMS ADAPTIVE FILTER IN MATLAB & CC STUDIO FOR ACTIVE VIBRATION CONTROL APPLICATION

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In the signal processing domain, there is a need for a system, which is capable of adjusting itself to the environment in order to meet the desired requirements. Such a system is possible by using adaptive filter. The frequency domain adaptive filtering is based on a complex form of the LMS algorithm and performed in frequency rather than the time domain. Fourier Transformation of the input signal and independent weighting of the contents of each frequency bin can accomplish adaptive filtering in the frequency domain. The frequency domain filter performs similarly to a conventional adaptive transversal filter but the computational efficiency of the Fast Fourier Transform algorithm, the FFT, reduces the overall complexity of the convolution sum as well as the adaptation cycle. Frequency domain method promises a significant reduction in computation time when the number of weights equals or exceeds 64. Thus the method promises great improvement in computational efficiency.

In control applications, particularly in Active Vibration Control, System identification plays an important role. In this paper the implementation details of the frequency domain LMS algorithm along with system identification using Fast Block LMS (FBLMS) has been brought out. The FBLMS algorithm implementation required the use of the '***overlap – save'*** technique for convolution in order to overcome the peculiarities associated with the periodic nature of the Discrete Fourier Transform. Here 2N samples are used to compute N output values via the Transform domain. The program has been implemented in MATLAB as well as Code Composer STUDIO (CC studio) and has been successfully tested in simulation for various input signals.

E.E.C.E:-2

4G WIRELESS TECHNOLOGY

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Fourth generation wireless system is a packet switched wireless system with wide area coverage and high throughput. It is designed to be cost effective and to provide high spectral efficiency . The 4g wireless uses Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Radio Band (UWB),and Millimeter wireless. Data rate of 20mbps is employed. Mobile speed will be up to 200km/hr.The high performance is achieved by the use of long term channel prediction, in both time and frequency, scheduling among users and smart antennas combined with adaptive modulation and power control. Frequency band is 2-8 GHz. it gives the ability for world wide roaming to access cell anywhere.

Wireless mobile communications systems are uniquely identified by "generation designations. Introduced in the early 1980s, first generation (1G) systems were marked by analog frequency modulation and used primarily for voice communications. Second generation (2G) wireless communications systems, which made their appearance in the late 1980s, were also used mainly for voice transmission and reception The wireless system in widespread use today goes by the name of 2.5G-an "in between " service that serves as a stepping stone to 3G. Whereby 2G communications is generally associated with Global System for Mobile (GSM) service, 2.5G is usually identified as being "fueled " by General Packet Radio Services (GPRS) along with GSM. In 3G systems, making their appearance in late 2002 and in 2003, are designed for voice and paging services, as well as interactive media use such as teleconferencing, Internet access, and other services. The problem with 3G wireless systems is bandwidth-these systems provide only WAN coverage ranging from 144 kbps (for vehicle mobility applications) to 2 Mbps (for indoor static applications). Segue to 4G, the "next dimension " of wireless communication. The 4g wireless uses Orthogonal Frequency Division Multiplexing (OFDM), Ultra Wide Radio Band (UWB), and Millimeter wireless and smart antenna. Data rate of 20mbps is employed. Mobile speed will be up to 200km/hr.Frequency band is 2]8 GHz. it gives the ability for world wide roaming to access cell anywhere.

THEME:-07

COSMOLOGY, GEOLOGY, GEOGRAPHY, ARCHAEOLOGY, EARTH SCIENCES, ECOLOGY, BIODIVERSITY, ENVIRONMENT

C. G. G. A. E. S. E. B. E:-01

NATURALLY COLOURED COTTON FOR TEXTILE USAGE- A REVIEW

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Introduction

While Bt cotton has been raising waves of protest in India and other parts of world, one of its old time cousins, the naturally coloured cotton is making its come back. Majority of the cotton grown commercially in the world is white lint but in recent years the colour linted cotton has gradually gained popularity. About 35 million hectares of land is used for cotton cultivation globally. Out of this only 0.02 per cent is used for coloured cotton cultivation (Gokarneshan, 2003)

Environmental degradation has been a cause of increasing global concern. Ever increasing attention is being paid worldwide to stop this degradation and restore ecological balance. High doses of synthetic fertilizers and insecticides have degraded cotton agro eco-system. Atmospheric pollution, pollution of ground water, degradation of soil and residues in seed/food are indirect hazards of the excessive use of pesticides. Dyeing and finishing processes used in textiles are a source of environmental pollution and hazards to human health. This has created interest in organic cotton and eco-friendly products abroad particularly in western countries.

The naturally coloured cotton is inherently pigmented fibre that grows in the shades and tints of green, brown, pink and lavender. In olden days the naturally coloured cotton was not that popular because of low yields, less encouraging properties and low spin ability. Naturally coloured cottons are gaining importance in the recent years due to integration of ecology, fashion and public's raising interest in environmental issues and environment friendly production processes. The naturally coloured cottons reduce or eliminate the costly dyeing and bleaching procedures. Due to its eco friendly aspect, coloured cottons have created a growing niche market in the developed countries.

It is noticed that demand from customers for organically produced agricultural products and foodstuff is on the rise. With the signing of GATT, favourable climate has been created for larger exports of organic products including organic cotton products from India. To encash these opportunities, India has to gear up its research and developmental activities in these areas. This has also assumed importance in the context of environmental pollution and escalation in the cost of cultivation.

Naturally coloured cotton: defined as cotton that grows naturally in colour (i.e. the colour is achieved without dyes). Conventional colours are usually obtained by dyeing. Dyeing uses up to 85% of all the energy used to produce textiles and produces more pollution than any other phase of textile manufacturing. Dyeing also uses large quantities of toxic dyes and chemicals, which pollute our land and water. Natural coloured cotton has high quality light and wash fastness, saves resources and prevents pollution. The processing of the fibre into yarns and other finished products is done without using bleaches, dyes and formaldehyde, therefore reducing pollution and conserving natural resources by not using the water and energy that these steps normally require

Naturally coloured cotton is a pigmented fibre that grows in shades of green and brown. The natural colour is from the plants inherent natural genetic properties. Unlike chemically dyed fabric, the textile products made from naturally coloured cotton are spared the traditional processes of dying and bleaching thus avoiding chemical pollution and leaving no hazardous chemical residue within consumer textiles.

Different species: Four species of cotton have different lint lengths, two species found in Africa and Asia, Gossypium arboretum and G.herbaceum, come in naturally coloured varieties, but both have lint lengths that range from short to medium. The two species from South and Central America, G. barbadense and G. hirsutum, have medium to long lint lengths.

BRIEF HISTORY:

Cotton was domesticated in the Americas at least 4500 years ago. In contrast to the old world cottons domesticated for animal feed, new world cotton was domesticated for its fibre and medicinal uses. Bearing lint in tones of gray, brown, tan and white, cottons were selected from the tropical wilds.

Cotton in shades of brown through rust and tan currently grows in the places of original domestication including Peru, Ecuador, Central America, Mexico and South Eastern USA. The lint from these plants is used to make special garments. The short course fibres require both skills and patience to spin by hand into yarn.

Five millennia ago early farming societies in the Americas selected, domesticated and improved two local species of cotton: Gossypium Hirutum and G. barbadense. The former was cultivated in northern Central America and the carribbean, the latter-famous for having the longest, finest fibres of all cottons – in western South America.

The oldest cotton fibre recorded so far in Central America comes from the Tehuacan site near Oaxaca in Mexico and was produced sometime around 2300 B.C. Chocolate brown fibres, unique to G.barbadense, have been unearthed at the most ancient levels of Huaca Prieta, a settlement on the northern Peruvian coast that was occupied between 3100 and 1300 B.C.

The chocolate brown fibre and a light-brown fibre was seen in many of the fabrics made by Andean weavers, which have survived for millennia because of the arid coastal soils of Northern Peru. It appears that these colours were intentionally differentiated and bred by ancient Peruvian fisher folk, who made nets and lines from the darker shades because they were less visible to fish-a tradition and craft that continues today. Peruvian tapestry from A.D. 1000 depicts a cotton plant complete with roots, leaves, stems flowers and ripening cotton bolls spilling forth with naturally pigmented cotton.

Naturally coloured cotton fabrics were among the first items collected as tribute and sold or shipped to Spanish court, and those Indian textiles were more technically sophisticated than anything woven on European looms at the end of the 15th century.

There are certain factors for revival of naturally coloured cotton such as addition of aesthetic value in the production of fashion textiles, saving of dyeing cost, promotion of handloom and artisan fabrics, economic consideration in agriculture and premium price in trade and export which go in favour of sustaining this new impetus in the cultivation of organic coloured cotton. It is also reported that these cottons possess medicinal properties.

Reasons for increasing popularity of naturally coloured cotton are;

- ❖ Naturally coloured cotton is Eco cotton, Ecological and Economical.
- ❖ White cotton needs to undergo various processing's like scouring, bleaching etc, before imparting artificial colours.
- ❖ In many processing's the chemicals and dyes used, & their effluents in dyeing, printing and finishing cause pollution directly or indirectly.
- ❖ Chlorinated products, bleaching agents, phenols and formaldehyde employed for bleaching and imparting special finishes cause skin disease.
- ❖ Dyes containing traces of heavy elements such as arsenic, lead, cadmium, cobalt, zinc and chromium are found skin irritants.
- ❖ Most of the wet processing are water intensive and the discharges and by products from the units pollute water resources and aquatic life.
- ❖ The costs of dyeing cotton, economically and environmentally can be very high especially in the countries with strict pollution standards.
- ❖ The cost of naturally coloured cotton is 31% less than the conventionally grown and dyed yarn.
- ❖ Demand for organically produced agricultural products or safe to use products is on the rise.

"NO DYES" QUALITY IMPROVES ENVIRONMENT

- ❖ Softer and smoother to touch
- ❖ More absorbent and breathable
- ❖ "No dyes" means no dye to fade and gives new look with every wash
- ❖ Free from toxic chemicals, allergy friendly, perfect for people with sensitive skin
- ❖ Machine washable and tumble dry to accommodate a busy lifestyle.
- ❖ Easy care fabrics, the higher elasticity of the "no dye" fibre also help the fabric to revert to their normal position helping to avoid creasing.

Chemical properties of coloured cotton

Sl. No	Colour	Scouring loss (%)	Wax content (%)	Maturity (PM %)	Degree of polymerization
1	Green	15.53	1.23	35	1980
2	Brown	18.97	0.71	38	1564
3	Brown	8.28	1.00	66	2335
4	Brown	21.78	0.55	35	-
5	Brown	8.84	2.05	57	1884
6	Brown	11.69	1.13	53	1798
7	Brown	12.02	1.08	55	1980
8	Brown	9.99	0.98	73	2037
9	White	5-10	0.4-1.2	60-90	2000-3000

The chemical properties of coloured cotton are similar to that of its white counterpart. Normal cotton fibres contain in addition to pure cellulose, non – cellulosic matter like wax and pectin, the proportion of which depend on the extent of cell wall development. It was noted from the above table that, the wax level in the coloured varieties are in general higher than those reported for white varieties. A genetic strain of green coloured lint having 14 – 17 % wax content has also been reported. Dewaxing did not cause substantial change in colour strength. Degree of polymerization and per cent maturity of the coloured varieties indicated that these fibres had lower cell wall development when compared to white cotton.

Research related to naturally coloured cotton

Sunlight has great influence on the development and fading of the colour as reported by Khadi et.al (1996). When the boll bursts, the white lint appears and changes gradually to brown colour in the next few days. It takes almost a week for the complete development of colour whereas the green lint during the time of boll opening starts fading on exposure to sunlight and was found to be rapid.

The Genetic expressions of colour in the lint took place only when the boll bursts and lint to sunlight (Venugopal and Gururajan (1996)). It was interesting to note that sunlight essential for the development of colour was also responsible for the fading due to continuous exposure. Green colour was seen to fade more quickly than the brown. Apart from sunlight, the intensity of colour also depended upon soil mineral content. The shades differed geographically from place to place and season to season.

Charyalu (1996) reported that, colour cotton types created interest among researchers in early 1920s and 1950s for study of their inheritance of lint colour genes. Asiatic brown linted

cotton varieties i.e., Cocanados-1, Cocanados-2, and Red Northerns were grown on commercial scale in Andhra Pradesh during the first half of the century. But due to low productivity and low fibre strength the cultivation was not continued further.

Study on stability of colour among naturally coloured cottons to washing showed that soaking and washing of coloured cotton fibre samples in hot water and detergents increased the intensity of colour, which might be due to spreading of the pigment in the fibres (Maralappanawar, et al., 1996)). This study indicated that the detergents did not adversely affect the naturally coloured cottons and therefore could be used for fabric manufacture.

Ponduru was one of the exclusively naturally hued varieties of khadi as reported by by Sinha S K (1998). The constituent processes from fibre to cloth production were manual hence there was no chance of fibre rupture and thus was possible to produce superfine counts of even up to 120s from short staples.

Some studies on the effect of scouring, bleaching, mercerization and cleansing agent on the physical properties of naturally coloured cotton and white cotton yarns were conducted by Renuka and Shailaja (2003). It was found that there was increase in single yarn strength among all genotypes on scouring but the colour genotypes showed better improvement when scoured with caustic soda and soda ash. In case of pigmentation, scouring, mercerization and washings enhanced the inherent pigment of colour genotypes.

Dry cleaning retained the original colour of cotton fabrics more than laundering. The disadvantage of dry cleaning was its inability to enhance the colour of the coloured cotton, which was possible by laundering as reported by Willium and Horridge (1996).

Naturally coloured cotton is identified as a type of agricultural resource that can be used for manufacturing ecological textile products. Simultaneously, recent emphasis on our national energy policy has encouraged the greater and more economical use of bio based products, such as crops, trees and agricultural residues. Aiming at developing environment friendly bio based products, naturally coloured cotton and fibrous sugarcane waste, known as bagasse were combined to make geo composite textiles.

The research results exhibited that the experimental bagasse /cotton geo composites featured lighter weight, attractive artificial grass appearance, engineered structure and sufficient strength for handling and installation. These advantages would be highly desirable for erosion control applications such as embankment, re-vegetation for highways, reservoirs/ ponds or landfill sites (Chen Y et.al)

Naturally coloured cottons are receiving more attention because they reduce or virtually eliminate costly, harmful dyeing and bleaching processes and are more eco friendly. There have been very few works on developing more shades and colours naturally or chemically from the most commonly available brown and green colours, but work on thermal and burning behaviour is almost untraceable in the literature. Parmer and Chakraborty, (2001) reported that the limited oxygen index value of naturally coloured cottons was also higher than white cotton, which makes its flammability poor A DSC study to determine thermal behaviour clearly indicated that the breakdown of white cotton into hemicelluloses and cellulose and volatalization of the degradation product was complete at around 370 deg C, while for the brown and green cottons, devolatalization was complete at around 390 deg C.

The sun blocking properties of a textile are enhanced when a dye, pigment, delustrant or ultraviolet absorber finish is present which absorbs ultra violet radiation and blocks its transmission through a fabric to the skin. The results of the study conducted by Gwenolyn Hustvedt and Patricia Cox crews demonstrated that naturally pigmented cottons had excellent sun protection properties (high UPF values) which were far superior to conventional, bleached or unbleached cotton (green UPF=30 to 50+ , tan UPF= 20-45, brown UPF= 40-50+, bleached conventional UPF=4 and unbleached conventional UPF=8). The garments manufactured from naturally coloured cotton provide protection from the sun's harmful rays. The UPF values of the naturally pigmented cottons remained high enough even after 80 AFUs light exposure, so that the fabrics merited sun protection ratings of good to very good according to ASTM 6603 voluntary labelling guidelines for UV protective textiles.

End uses of cotton:

Apparel - wide range of apparel like blouses, shirts, dresses, children's wear, active wear, separators, swimwear, suits, jackets, skirts, pants, sweaters, hosiery and neckwear.
Home fashion – curtains, draperies, bedspreads, comforters, sheets, towels, table cloths, table mats and napkins.

Conclusion:

Coloured cotton has always existed in nature but the fibre has been too short and weak to machine spun. The recent genetic investigations in colour cottons highlighted various positive features like higher lint yield, acceptable fibre quality; spin ability, colour stability, enhancement of single yarn strength and pigmentation on scouring and mercerization.
These investigations have further expanded the utility and application of colour linted cotton for clothing, bed linen, and furnishings and other variegated consumer goods as well as household textile fashion fabrics and children's clothes made from naturally pigmented lint are gaining acceptance in Europe and America, while the Khadi and Village Industries Commission of India concentrate on handloom dress materials. In a nutshell, it may be stated that naturally coloured cotton with these inbuilt qualities can occupy a strong place in the textile trade.

Certain measures have to be adopted in order to grow coloured cotton commercially in India. It is necessary to segregate farmland for colour cotton cultivation, which is a different preposition. Coloured cotton should be processed in ginneries exclusively designed for this cotton in order to avoid mixing of seeds. The non tradional areas can be ear marked for coloured cotton cultivation as the question of mixing and cross pollination will not arise there.

As far as the demand is concerned, the world scenario seems to hold promise for coloured cotton. Modern methods of genetic manipulation can lead to dramatic progress in the engineering of colour cotton to give varied colours and enhanced fibre properties which all can lead to increase in consumption. Optimistic futurologists have put the demand for organically produced colour cotton to grow till the consumption reaches about 1%. This will become a reality if only a viable market is established and sustained by eco cotton enthusiasts.

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C. G. G. A. E. S. E. B. E:-02

MULTI CRITERIA APPROACHES (MCA) IN ENVIRONEMTAL STUDIES

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INTRODUCTION:

Geographic Information Systems (GIS), Remote Sensing (RS) and Global Positioning Systems (GPS), are often collectively abbreviated to Three-S technologies, play significant roles in many extensive integrated research related to space and time, and are valuable techniques and tools in obtaining, storing, managing, analyzing and visualizing ecological, water resource and socio-economic data for effective and efficient inventory and optimal policy and decision making. These technical tools are also referred New Generation Technical tools. The Multi Criteria Approach (MCA) technologies often were applied in land use planning, land resource surveying, crop yield evaluating, disaster assessing, flood monitoring, fire preventing, and desertification controlling by interrelated research institutes, universities and government sectors. However, little research has been devoted to the use of Three-S technologies in the field of wetlands.

The field of Remote Sensing is very wide, both in the data acquisition methods, data processing procedures and techniques and the applications it is used for; it is also a fast developing field, in all the above themes.

The role Remote Sensing in understanding of our Earth and the natural and human processes affecting it is immense. Also in image processing phase of data: visualisation, enhancement and classification.

ADVANTAGES:

The advantages of acquiring information by Remote Sensing apply, irrespective of platform or sensor, also for hydrography:

* It is cheaper than conventional surveying;
* It is safer than hydrographic surveying in shoal areas such as coral reefs;
* It is capable of change detection in rapidly developing ports and regular monitoring of mobile areas such as deltas and sandbanks;
* World-wide coverage is commercially available, without security, political, or copyright restrictions, enabling data acquisition from remote areas;
* The inherent geometry and therefore the relative positioning of features within a single scene is generally very good.

IMPORTANCE:

There is an urgent need to adopt modern technology of remote sensing which includes both aerial as well as satellite based systems, allow us to collect lot of physical data rather easily,

with speed and on repetitive basis, and together with GIS helps us to analyze the data spatially, offering possibilities of generating various options (modeling), thereby optimizing the whole planning process. These information systems also offer interpretation of physical (spatial) data with other socio-economic data, and thereby provide an important linkage in the total planning process and making it more effective and meaningful.

Recent technological advances made in domain of spatial technology cause considerable impact in planning activities. This domain of planning is of prime importance for a country like India with varied geographic patterns, cultural activities etc. The purpose of using GIS is that, maps provide an added dimension to data analysis which brings us one step closer to visualizing the complex patterns and relationships that characterize real-world planning and policy problems. Visualization of spatial patterns also supports change analysis, which is important in monitoring of social indicators. This in turn should result in improving need assessment.

OBJECTIVE:
The objectives of this paper are to explain remote sensing and GIS applications in various stages of planning, implementation and monitoring of the urban area and applications of GPS.

The Definition of Remote Sensing in the broadest sense, the measurement or acquisition of information of some property of an object or phenomenon, by a recording device that is not in physical or intimate contact with the object or phenomenon under study. The technique employs devices like camera, lasers, and radio frequency receivers, radar systems, sonar, seismographs, gravimeters, magnetometers, and scintillation counters. In simple words it is a technique where a 3Dimensional figure can be obtained from a 2D figure.
As humans, we are intimately familiar with remote sensing in that we rely on visual perception to provide us with much of the information about our surroundings. As sensors, however, our eyes are greatly limited by Sensitivity to only the visible range of electromagnetic energy; Viewing perspectives dictated by the location of our bodies; and The inability to form a lasting record of what we view.

Because of these limitations, humans have continuously sought to develop the technological means to increase our ability to see and record the physical properties of our environment.

Beginning with the early use of aerial photography, remote sensing has been recognized as a valuable tool for viewing, analyzing, characterizing, and making decisions about our environment. In the past few decades, remote sensing technology has advanced on three fronts: from predominantly military uses to a variety of environmental analysis applications that relate to land, ocean, and atmosphere issues; from (analog) photographic systems to sensors that convert energy from many parts of the electromagnetic spectrum to electronic signals; and from aircraft to satellite platforms.

Today, we define satellite remote sensing as the use of satellite-borne sensors to observe, measure, and record the electromagnetic radiation reflected or emitted by the Earth and its environment for subsequent analysis and extraction of information.

COMPARISON TO MAPS, GIS, AERIAL PHOTOGRAPHY / PHOTOGRAMMETRY, SONAR:
A map is "a conventionalized image representing selected features or characteristics of geographical reality, designed for use when spatial relationships are of primary importance". This definition does declare that in every map there's a process of selection present (and in addition - symbolization, abstraction and generalization), but also keeps the aura of scientific accuracy of a map. But, we should remember, that "a map shows us the world as we know it, and what we know, is a very complex subject, that is comprised of:
The limits of matter, technology and our measurement tools, what we believe that exists, what we think to be important, and what we want and aspire to"

Thus, a map is a subjective, for we always decide what to put on it, and how to represent it. A Remote Sensing image in contrast, is an objective recording of the Electromagnetic reaching the sensor.

Another important difference is that a map is a projection of the earth on paper, without any relief displacements, while in a Remote Sensing image both relief displacements and geometrical distortions.

REMOTE SENSING VS GIS:
GIS (Geographic Information System) is a kind of software that enables:
The collection of spatial data from different sources (Remote Sensing being one of them).
Relating spatial and tabular data. Performing tabular and spatial analysis. Symbolize and design the layout of a map.

A GIS software can handle both vector and raster data. Remote Sensing data belongs to the raster type, and usually requires special data manipulation procedures that regular GIS do not offer. However, after a Remote Sensing analysis has been done, its results are usually combined within a GIS or into database of an area, for further analysis (overlaying with other layers, etc).

REMOTE SENSING VS AERIAL PHOTOGRAPHY / PHOTOGRAMMETRY:
Both systems gather data about the upper surface of the

Earth, by measuring the Electromagnetic radiation, from airborne systems. The following major differences can be given Aerial photos are taken by an analog instrument: a film of a (photogrammetric) camera then scanned to be transformed to digital media. Remote Sensing data is usually gathered by a digital CCD camera.

The advantage of a film is its high resolution (granularity), while the advantage of the CCD is that we measure quantitatively the radiation reaching the sensor (radiance values, instead of a gray-value scale bar). Thus, Remote Sensing data can be integrated into physical equations of energy-balance for example.

An Aerial photograph is a central projection, with the whole picture taken at one instance. A Remote Sensing image is created line after line; therefor, the geometrical correction is much more complex, with each line (or even pixel) needing to be treated as a central projection.

Aerial photos usually gather data only in the visible spectrum (there are also special films sensitive to near infrared radiation), while Remote Sensing sensors can be designed to measure radiation all along the Electromagnetic spectrum.

Aerial photos are usually taken from planes, Remote Sensing images also from satellites.

Both systems are affected by atmospheric disturbances. Aerial photos mainly from haze (that is, the scattering of light – the process which makes the sky blue), Remote Sensing images are also from processes of absorption. Atmospheric corrections to Aerial photos can be made while taking the picture (using a filter), or in post-processing. Thermal Remote Sensing sensors can operate also at night time and Radar data is almost weather independent.

• In Photogrammetry the main efforts are dedicated for the accurate creation of a 3d model, in order to plot with high accuracy the location and boundaries of objects, and to create a Digital Elevation Model, by applying sophisticated geometric corrections. In Remote Sensing the main efforts are dedicated for the analysis of the incoming Electromagnetic spectrum, using atmospheric corrections, sophisticated statistical methods for classification of the pixels to different categories, and analysing the data according to known physical processes that affect the light as it moves in space and interacts with objects.
• Remote Sensing images are very useful for tracking phenomena on regional, continental and even global scale, using the fact that satellites cover in each image a wide area, and taking images all the time (whether fixed above a certain point, or "revisiting" the same place every 15 days (for example).
• Remote Sensing images are available since the early 1970's. Aerial photos, provide a longer time span for landscape change detection (the regular coverage of Israel by Aerial photos started in 1944/5, for example, with many Aerial photos taken also during World War 1).
• Remote Sensing images are more difficult to process, and require trained personnel, while aerial photographs can be interpreted more easily.

REMOTE SENSING VS SONAR:
The SONAR can also be considered as Remote Sensing – that is, studying the surfaces of the sea (bathymetry and sea bed features) from a distance. The SONAR is an active type of Remote Sensing (like Radar; Not depending on an external source of waves, measuring the time between the transmission and reception of waves produced by our instruments, and their intensity), but using sound waves, and not Electromagnetic radiation.

Both systems transmit waves through an interfering medium (water, air), that adds noise to the data we are looking for, and there for corrections must be applied to the raw data collected. In Remote Sensing however, Radar is considered to be almost weather independent, and atmospheric disturbances affect mainly passive Remote Sensing). To make these necessary corrections, both systems depend on calibration from field data.

Sonar's are mainly used to produce the bathymetry of the sea, while Remote Sensing techniques are focusing more on identification of the material's properties than on its height.
Echo-sounders (single or multi-beam) can be compared to Airborne Laser Scanning – both of them create point (vector) data containing X,Y,Z, that needs to be further post processed in order to remove noise (spikes). An added complexity when dealing with bathymetry (as opposed to topography) is the need for tide corrections.

Side Scan SONAR can be compared to Side Looking Aperture RADAR, both of them creating images (raster) analyzing the surface.

Another major difference is that in Remote Sensing the results of the analysis can be compared easily to the field (aerial photos, maps, field measurements), while in SONAR the underlying bottom of the sea is hidden from us, and we depend totally on the data gathered.

APPLICATIONS IN GENERAL:
Each one tool is designed with a specific purpose. With optical sensors, the design focuses on the spectral bands to be collected. With radar imaging, the incidence angle and microwave band used plays an important role in defining which applications the sensor is best suited for. Each application itself has specific demands, for spectral resolution, spatial resolution, and temporal resolution. There can be many applications for Remote Sensing, in different fields, as described below.

AGRICULTURE:
Agriculture plays a dominant role in economies of both de-

veloped and undeveloped countries. Satellite and airborne images are used as mapping tools to classify crops, examine their health and viability, and monitor farming practices. Agricultural applications of remote sensing include the following: crop type classification crop condition assessment crop yield estimation mapping of soil characteristics mapping of soil management practices compliance monitoring (farming practices)

FORESTRY:
Forests are a valuable resource providing food, shelter, wildlife habitat, fuel, and daily supplies such as medicinal ingredients and paper. Forests play an important role in balancing the Earth's CO2 supply and exchange, acting as a key link between the atmosphere, geosphere, and hydrosphere.

Forestry applications of remote sensing include the following:
• Reconnaissance mapping: include forest cover updating, depletion monitoring, and measuring biophysical properties of forest stands.
• Commercial forestry: Of importance to commercial forestry companies and to resource management agencies are inventory and mapping applications: collecting harvest information, updating of inventory information for timber supply, broad forest type, vegetation density, and biomass measurements.
• Environmental monitoring: Conservation authorities are concerned with monitoring the quantity, health, and diversity of the Earth's forests.

GEOLOGY:
Geology involves the study of landforms, structures, and the subsurface, to understand physical processes creating and modifying the earth's crust. It is most commonly understood as the exploration and exploitation of mineral and hydrocarbon resources, generally to improve the conditions and standard of living in society.
Geological applications of remote sensing include the following: surficial deposit / bedrock mapping lithological mapping structural mapping sand and gravel (aggregate) exploration/ exploitation mineral exploration hydrocarbon exploration environmental geology Geobotany baseline infrastructure sedimentation mapping and monitoring event mapping and monitoring geo-hazard mappingplanetary mapping

HYDROLOGY:
Hydrology is the study of water on the Earth's surface, whether flowing above ground, frozen in ice or snow, or retained by soil
Examples of hydrological applications include: wetlands mapping and monitoring, soil moisture estimation, snow pack monitoring / delineation of extent, measuring snow thickness, determining snow-water equivalent, river and lake ice monitoring, flood mapping and monitoring, glacier dynamics monitoring (surges, ablation)
river /delta change detection, drainage basin mapping and watershed modelling, irrigation canal leakage detection irrigation scheduling

SEA ICE:
Ice covers a substantial part of the Earth's surface and is a major factor in commercial shipping and fishing industries, Coast Guard and construction operations, and global climate change studies.
Examples of sea ice information and applications include:
ice concentration, ice type / age /motion, iceberg detection and tracking, surface topography, tactical identification of leads: navigation: safe shipping routes/rescue, ice condition (state of decay), historical ice and iceberg conditions and dynamics for planning purposes, wildlife habitat, pollution monitoring, meteorological / global change research

LAND COVER AND LAND USE:
Although the terms land cover and land use are often used interchangeably, their actual meanings are quite distinct. Land cover refers to the surface cover on the ground, while Land use refers to the purpose the land serves. The properties measured with remote sensing techniques relate to land cover, from which land use can be inferred, particularly with ancillary data or a priori knowledge.

Land is a very important asset and a means to sustain livelihood. In the face of a rapidly growing global population, increase in technological capacity, and affluence, the earth's land cover has been transformed especially in developing countries. At the same time, social organization, attitudes, and values have also undergone profound changes. In contemporary times, issues of sustainable development, pollution prevention, global environmental change and related issues of human-environment interaction have been a major concern globally. This concern has largely been sparked by the phenomenon of global warming and its consequences, which are threatening the very existence of humans on the surface of the earth. Remotely sensed data (mainly from aerial photographs and satellite images) in combination with Geographical Information Systems (GIS) have been observed to have potential scientific value for the study of population environment interaction.

It is the key and finite resource for most human activities including agriculture, industry, forestry, energy production, settlement, recreation, and water catchments and storage. Land is a fundamental factor of production, and through much of the course of human history, it has been tightly linked to economic growth. It comprises biophysical qualities such as soil, topography, climate, geology, hydrology, biodiversity and political divisions. Land is also defined as consisting of such socio-economic factors as technology and management. Land use has been defined as the way in which, and the purposes for which, humans employ the land and its resources (Meyer, 1995). Land cover on the other hand has also been

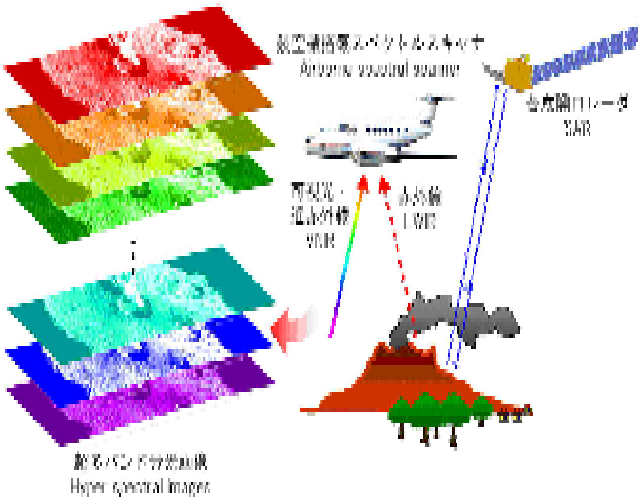
defined as that which overlays or currently covers the ground, especially vegetation; permanent snow and ice fields; water bodies or structures (USDA Forest Service, 1989).
Land use applications of remote sensing include the following: natural resource management, wildlife habitat protection baseline mapping for GIS input, urban expansion / encroachment, routing and logistics planning for seismic / exploration/ resource extraction activities, damage delineation (tornadoes, flooding, volcanic, seismic, fire), legal boundaries for tax and property evaluation, target detection - identification of landing strips, roads, clearings, bridges, land/water interface

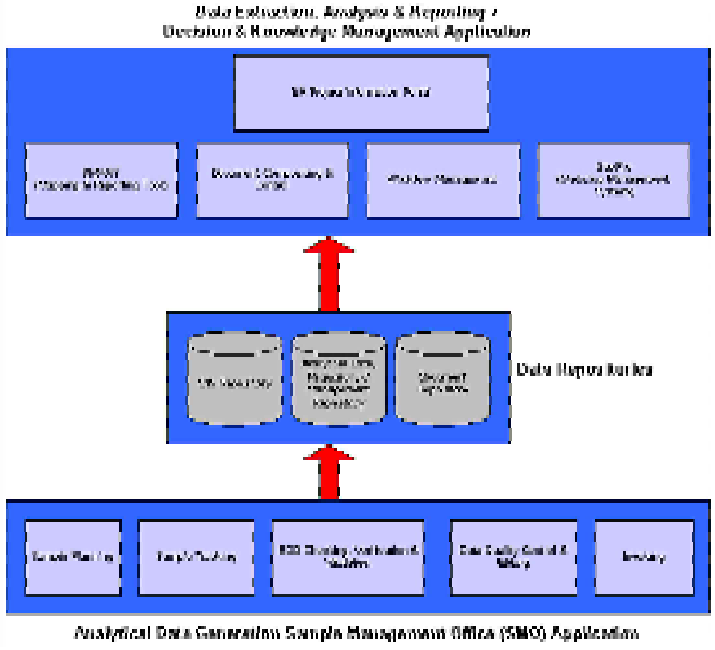
Mapping
Mapping constitutes an integral component of the process of managing land resources, and mapped information is the common product of analysis of remotely sensed data.
Mapping applications of remote sensing include the following:

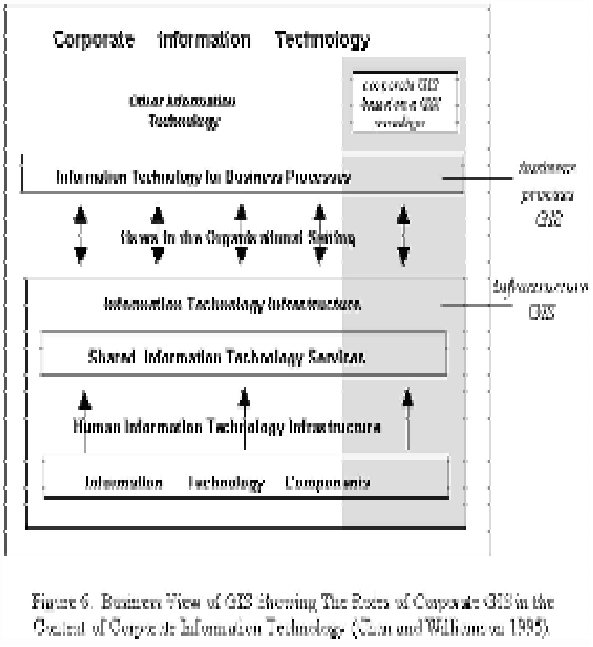
• Planimetry:
Land surveying techniques accompanied by the use of a GPS can be used to meet high accuracy requirements, but limitations include cost effectiveness, and difficulties in attempting to map large, or remote areas. Remote sensing provides a means of identifying and presenting planimetric data in convenient media and efficient manner. Imagery is available in varying scales to meet the requirements of many different users. Defence applications typify the scope of planimetry applications - extracting transportation route information, building and facilities locations, urban infrastructure, and general land cover.
• digital elevation models (DEM's):
Generating DEMs from remotely sensed data can be cost effective and efficient. A variety of sensors and methodologies to generate such models are available and proven for mapping applications. Two primary methods if generating elevation data are
1. Stereogrammetry techniques using airphotos (photogrammetry), VIR imagery, or radar data(radargrammetry), and
2. Radar interferometry.
• Baseline thematic mapping / topographic mapping:
As a base map, imagery provides ancillary information to the extracted planimetric or thematic detail. Sensitivity to surface expression makes radar a useful tool for creating base maps and providing reconnaissance abilities for hydrocarbon and mineralogical companies involved in exploration activities. This is particularly true in remote northern regions, where vegetation cover does not mask the microtopography and generally, information may be sparse.
Multispectral imagery is excellent for providing ancillary land cover information, such as forest cover. Supplementing the optical data with the topographic relief and textural nuance inherent in radar imagery can create an extremely useful image composite product for interpretation.

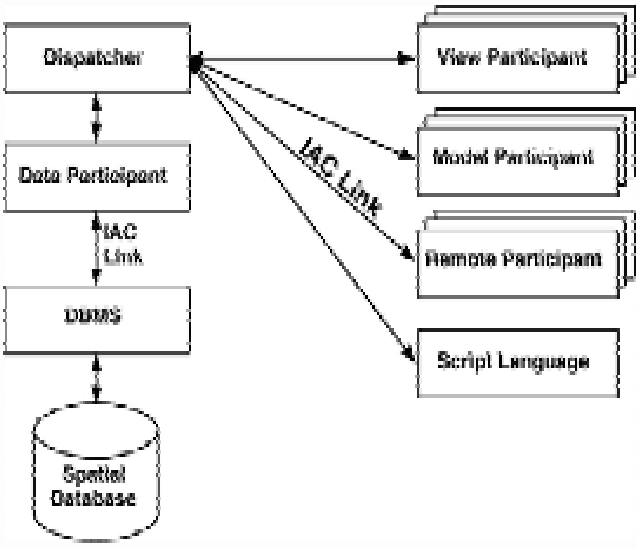
Oceans & Coastal Monitoring:
The oceans not only provide valuable food and biophysical resources, they also serve as transportation routes, are crucially important in weather system formation and CO2 storage, and are an important link in the earth's hydrological balance. Coastlines are environmentally sensitive interfaces between the ocean and land and respond to changes brought about by economic development and changing land-use patterns.
Often coastlines are also biologically diverse inter-tidal zones, and can also be highly urbanize .
Ocean applications of remote sensing include the following: Ocean pattern identification: currents, regional circulation patterns, shears frontal zones, internal waves, gravity waves, eddies, upwelling zones, shallow water bathymetry , Storm forecasting wind and wave retrieval Fish stock and marine mammal assessment water temperature monitoring water quality ocean productivity, phytoplankton concentration and drift aquaculture inventory and monitoring Oil spill mapping and predicting oilspill extent and drift strategic support for oil spill emergency response decisions identification of natural oil seepage areas for exploration Shipping navigation routing traffic density studies operational fisheries surveillance near-shore bathymetry mapping Intertidal zone tidal and storm effects delineation of the land /water interface mapping shoreline features / beach dynamics coastal vegetation mapping human activity / impact

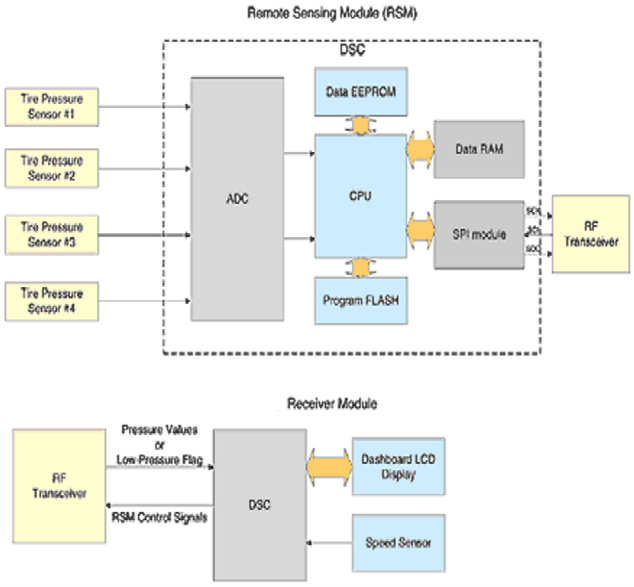
Conclusions:
It is suggested t It is It is suggested that
It is suggested that for realising true applications of RS, GIS and GPS technologies, the availability, accessibility, reliability, homogeneity, and continuity of wetlands-related geo-information, enabling environment, policies and standards, and funding are needed.











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C. G. G. A. E. S. E. B. E:-03

VARSHA GCM- A MODEL TO PREDICT INDIAN SUMMER MONSOON

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Abstract: Varsha, a hydrostatic spectral general circulation model developed at Flosolver, NAL is used for forecasting the monsoon from the year 2005 using initial conditions from Final analysis data (1 degree x 1 degree) of NCEP. The model can be run at different spectral truncation, horizontal grid resolutions and vertical layers. Prognostic variables and boundary conditions are supplied to the model as input. Persistent anomaly method is adopted for prescription of Sea Surface Temperature (SST) into the model.

The Varsha forecasts are compared with observations from India Meteorological Department and it is found that the forecasts are well correlated with observations. Its worth to mention the trends in rainfall for the monsoon months were captured well by the model.

Flosolver

The Flosolver project was started in 1986, to fulfill the requirements of the large-scale flow calculations in NAL as the country was starved of large scale computing power. The giant supercomputers of the west like Cray, etc were simply not offered for sale to INDIA for strategic reasons and were in any case too expensive. The alternate solution proposed by Flosolver and its successors was to put 4, 8 or 16 easily available computer processors together and there by attain super computing power. Since 1986, six generations of Flosolver machines have been evolved namely Flosolver MK-1, MK-2, MK-3, MK-4, MK-5 and MK-6. MK-7 is a small unit of MK-6. MK-8 is under development.

Flosolver was the first parallel computer in the country to simulate turbulence, make flow calculations for aircraft configurations (including NAL's own HANSA) and parallelize the T-80 weather prediction code that is operational at the National Center for medium range weather forecasting in New Delhi. Flosolver also has the distinction of being the most cost-effective among all the parallel processing projects in India; it has solved several real-life problems in aerospace technology and eliminated the country's vulnerability in a critical technology area at a fraction of the investment made in other parallel computer projects, in India and elsewhere.

Currently the objectives are to develop a ten Teraflop parallel computing hardware customized for meteorological applications and an enhanced version of the Varsha GCM for better forecasts of the Indian monsoon, which is important to the country.

Figure 1. Flosolver Mk8 with 32 processors

Varsha GCM

Varsha is a hydrostatic spectral general circulation model which has its roots in the NCMRWF's GCM T-80 code which was parallelized by NAL in 1993 (Sinha et al, 1994). It was subsequently reengineered using FORTRAN 90 (Nanjundiah and Sinha, 1999) and, as part of the NMITLI project, new radiation and boundary layer modules were added. The model can be run at different spectral truncation as well as physical

grid resolutions. The number of vertical layers is 18 and the physical parameterizations include the Kuo-Anthes cumulus scheme and Alpert gravity wave drag parameterization. The shortwave radiation is computed as described in Sinha et al (1994), while there are two options for the long wave radiation computation: (i) The Fels-Schwarzkoff scheme and (ii) a new scheme devised for Varsha based on Varghese et al (2003). For the boundary layer the options are (i) the Monin- Obukhov scaling along with a gustiness parameter, and (ii) a new boundary layer scheme based on the scaling arguments of Rao and Narasimha (2005). The initial conditions are taken from NCEP's Reanalysis or Final Analysis data. More details about the model can be found in Basu and Bhagyalakshmi (2010).

Varsha requires the variables given in table 1 to make successful forecast.

Prognostic Varaibles	Boundary Conditions
Surface pressure	Land-Sea specification
Virtual air temperature	Orography
Divergence	Surface Roughness Length
Vorticity	Subsurface Soil Temperature
Specific Humidity	Surface Albedo
	Sea Ice Distribution
	Soil Moisture
	Snow Depth
	Sea Surface Temperature
	High Cloud Fraction
	Middle Cloud Fraction
	Low Cloud Fraction
	Mountain Variance

Table 1.Prognostic variables and boundary conditions for Varsha GCM

South west Monsoon

The summer or south-west monsoon comes in from the direction of Africa, and brings heavy rain to the west coast and large areas of northern India between June and September. Winds from the Indian Ocean carry moisture-laden air across the subcontinent, causing heavy rainfall and often considerable flooding during this period. Usually about three-fourths of the country's total annual precipitation falls during those months. Monsoons play a pivotal role in Indian agriculture, and the substantial year-to-year variability of rainfall, in both timing and quantity, introduces much uncertainty in the country's crop yield.

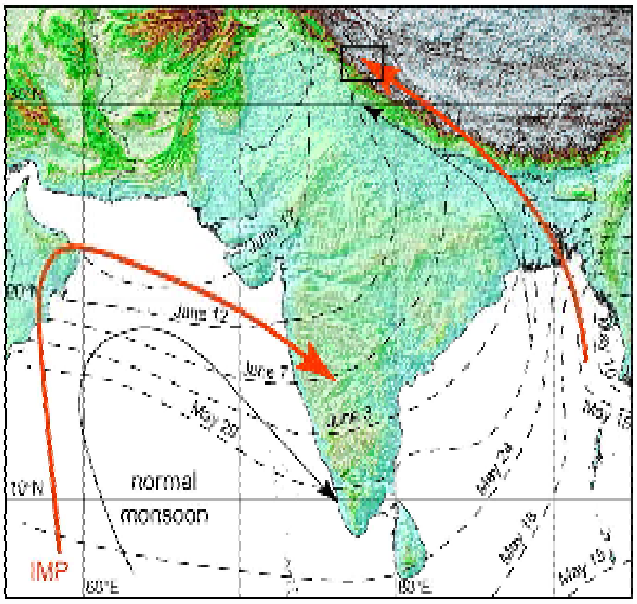

Figure 2. Pictorial representation of South West monsoon

The key to understanding the basic monsoon mechanism lies in the fact that land heats up and cools more quickly than the sea; the latter holding its temperature more or less steady. As the sun moves north bringing our summer heat, the land steadily gets hotter and hotter, while the temperature of the ocean lags far behind. The effect on a huge land mass like Asia as the hot air rises over the land, leaving below a vast area of low pressure, is to draw in massive amounts of air from over the ocean, where higher pressures are maintained. This is the south-west monsoon pattern (it is the wind, and not the resulting rain, which is defined as the monsoon).

Varsha GCM and Monsoon

The Flosolver unit has been making monsoon forecast in real time basis using the Varsha GCM since 2005. The forecasts are made everyday for next 31 days with initial conditions from Final Analysis data of National Centre for environmental Prediction (NCEP).The model is integrated everyday for a forecast length of 31/36 days and monthly forecast of rainfall is prepared by averaging forecasts made from initial conditions of last five days of the previous month. This 5-member ensemble forecast is sent, by the first day of every month, to the DGM of India Meteorological Department (IMD) during the monsoon months. For the year 2010, the forecasts were sent to the Cabinet secretariat, Ministry of Science and Technology and DG, Council of Scientific and Industrial Research (CSIR) during the monsoon months. Some of the forecasts were also sent to Prime minister's office and the Agricultural Secretary to the Government of India upon their request.

The model's performance in predicting the All India average Rainfall during the month of June, 2009 and also several other years were reported by Sinha (2010). It was found that Varsha code picked up the deficit rainfall 3–4 weeks in advance and captured its severity three weeks in advance June 2009 and 3

other years in which the rainfall deficit was more than 20%.

Long term trends in forecast

Different types of analysis have been carried out to validate the Varsha forecasts during monsoon months. As the initial conditions before 2000 are from NCEP, a pentad correlation analysis have been carried out using the older version of Varsha GCM and reported by Dhanya et al (2008). It was found that both wind and rainfall forecast were good for more than 10 days.

The present version of the model used for the daily forecasts is Varsha 1.3. The boundary conditions are modified in this present model with a slight change in the large-scale precipitation parameterization. In order to include the recent changes occurred and the daily variation in the sea surface temperature, a different method, persistent anomaly method, was adopted for prescribing SST into the GCM since monsoon 2008.

A validation of forecasts for the years 2000 -2009 is carried out using the initial conditions from FNL. The Pearson correlation coefficient (CC) between the predicted and observed All India Rainfall (from 0.5 x 0.5 degree gridded data of India Meteorological Department) is computed and presented in table 2.

Month	1 Month	2 weeks	3 weeks
June	0.83	0.93	0.93
July	0.63	0.74	0.70
August	0.56	0.71	0.69
September	0.33	0.34	0.20

Table 2. Correlation analysis for Monsoon 2000-2009

It can be seen from the table that except for September, the model forecasts are quite good even for a month's prediction also. The model performs extremely well for the month of June with a high correlation of around 0.9 with the observations. Efforts are underway to examine the possible causes of poor performance in September.

Forecasts for Monsoon 2009

India has suffered its worst drought since 1972, as per the official reports with rains 23% below its long period average (LPA) at the end of the southwest monsoon season, which is the highest rain giving season for the country. The severity of drought was felt most in the northwest and northeast India with the seasonal rainfall being 64% and 73% of its LPA.

Figure 3 shows daily and monthly averages of forecast and observed rainfall in 2 panels for the monsoon months with their respective normals (long term mean). Varsha normal is average over 20 years while IMD normal is average over 50 years. Varsha could predict the drought conditions for the year 2009, four weeks in advance.

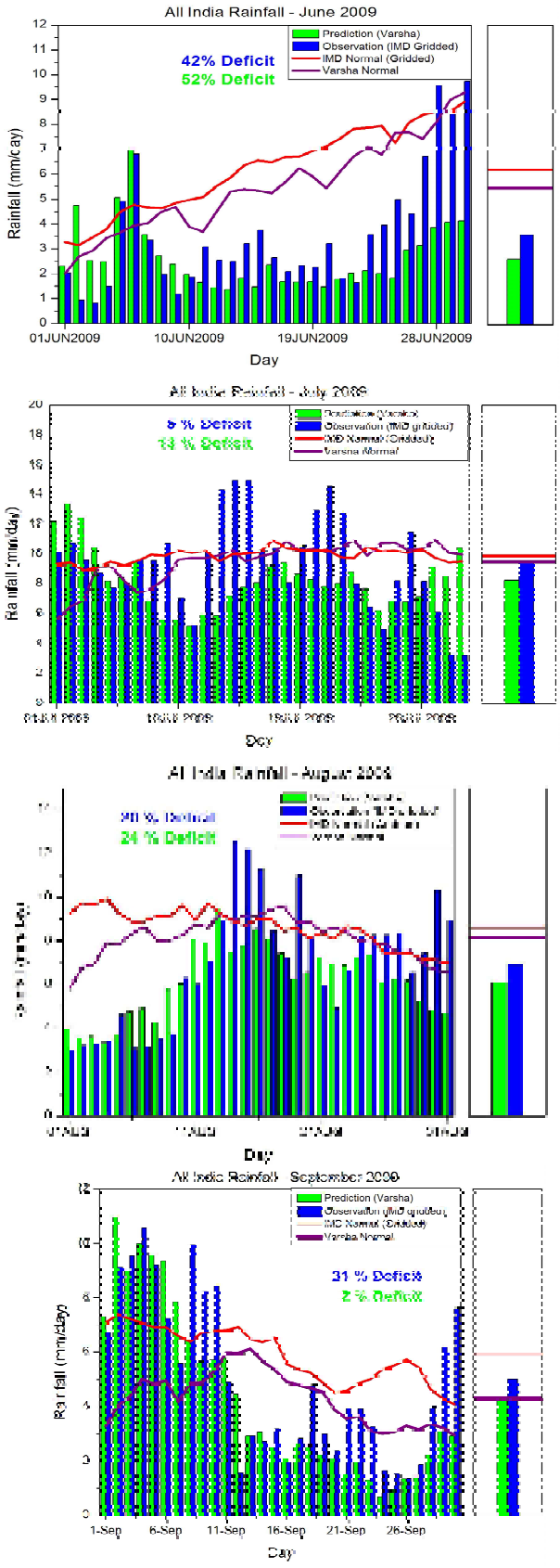

Figure 3. Varsha forecast for 2009 Monsoon

Varsha's monthly predictions for the monsoon months (June, July, August and September) showed deficit for all the monsoon months, with the prediction matching extremely well with the observations in June and August. It was also observed that the trends in rainfall were picked up by the model well in advance.

Monsoon 2010

The rainfall for the season (June- September) was 102% of its long period average (LPA) for the southwest monsoon season of 2010. Most parts of India experienced normal to excess rainfall while deficit rainfall was observed in the states of Uttar Pradesh, Bihar, West Bengal, Jharkand, Assam and Meghalaya. An excess in rainfall by more than 100% was observed in Gujarat.

The monthly ensemble rainfall forecasts valid for June, July, August and September of the year 2010 using the initial conditions taken from the last week of previous month along with the observations, as computed from IMD's 0.5 x 0.5 daily gridded data, are presented in figure 4.

The monthly averages and the percentage departure of predicted and observed rainfall for the monsoon months are listed in table 3. The deviation of observed and forecast monthly rainfall from respective long term averages in terms of three classes, namely excess (E) when deviation is > 10% of long term average, normal (N) when deviation is within ±10% of long term average and deficient (D) when deviation is <-10% of the long term average, as followed by IMD is also provided in the table. It can be understood from the table the except for the month of September, the forecast were accurate.

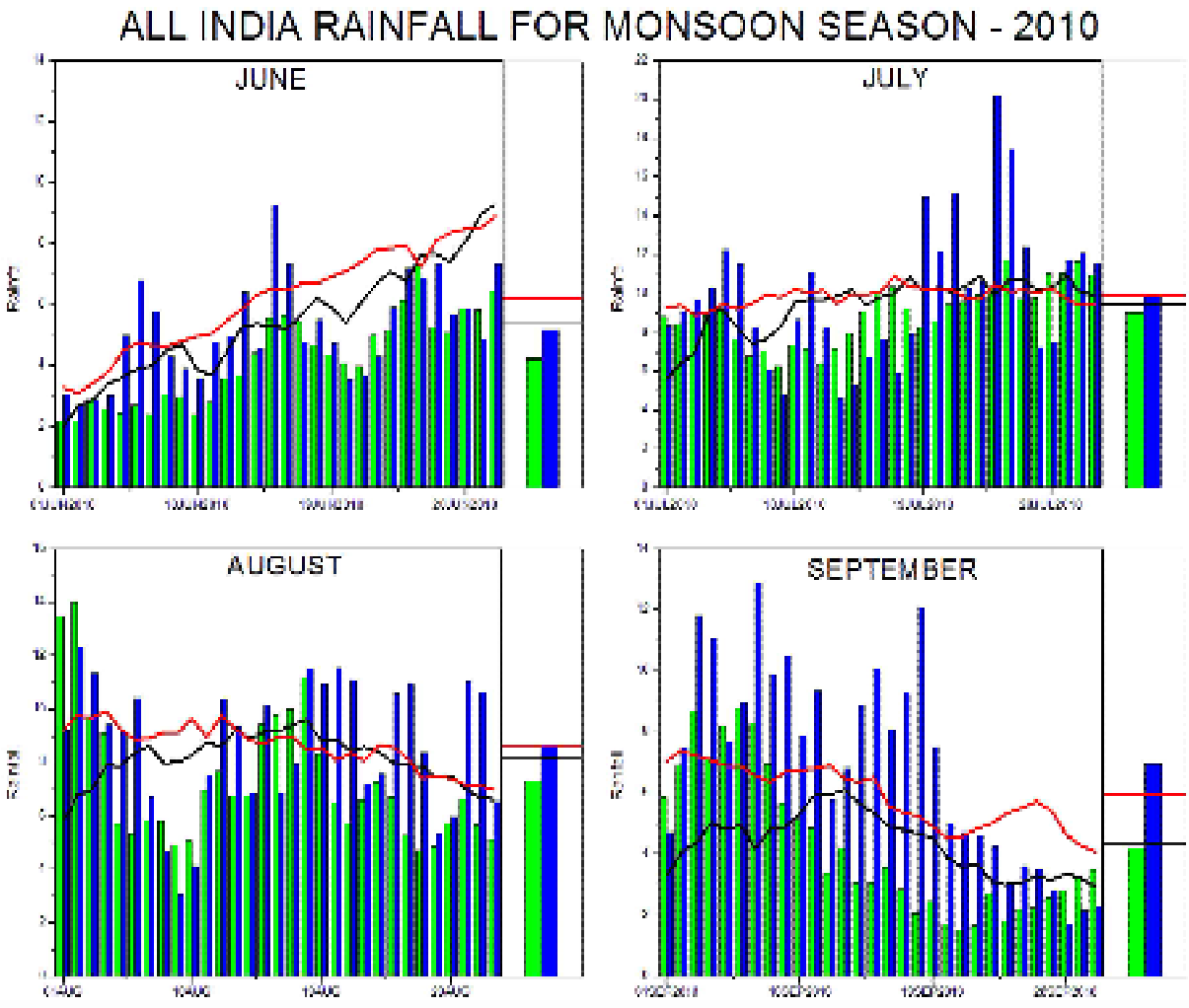

Figure 4. Forecasts for 2010 monsoon

MONTH	MONTHLY AVERAGE RAINFALL (MM)		% DEPARTURE		EXCESS (E) / DEFICIT (D) / NORMAL (N)	
	Forecast	Observed	Forecast	Observed	Forecast	Observed
June	4.22	5.21	-22.9%	-16.0%	D	D
July	9.03	10.02	-4.5%	1.4%	N	N
August	7.31	8.68	-10.0%	-0.6%	N	N
September	4.24	6.96	-2.0%	17.8%	N	E

Table 3. Comparison of monthly rainfall for 2010

Conclusion

Varsha GCM, the model developed at Flosolver has been used for forecasting rainfall for the summer monsoon seasons since 2005. Hindcasts are also dine for the years prior to 2005. The analysis shows promising results towards adopting Varsha as a model for monsoon prediction. It is seen that Varsha's monthly predictions are highly correlated for all the monsoon months except September. Varsha could capture the drought in the year 2009, where all other models failed. The trends in the rainfall and the category-wise rainfall are picked up by the model very well.

Acknowledgements

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C. G. G. A. E. S. E. B. E:-04

INTEGRATED ECO-FRIENDLY TEXTILE WASTE MANAGEMENT

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SYNOPSIS

Textiles have always been considered as an essential Prerequisite of the innovative, rapidly evolving, socio-economical mankind. Safety, Protection & Comfort invokes the helm of technology to impart an inevitable material waste due to variable nature of raw materials (fibres), processing & finishing of end products (apparels, military clothing or accessories). Climatic changes & environmental issues are the major concern in the present scenario & a growing awareness to sustain, survive the available material resources to cater to the growing consumer demands, the market & economy. Consumer polarisation, stiff competition deliberates the urge of research & development with innovative total quality management to cater to the encompassing environment – societal issues & thereby be adept to suit the ever-growing economy, market & consumer needs. Encompassing minimalist processes & to pursue & capitalize claustrophobic inherent natural fabrics to complement & cater the need of research arenas, thereby conserving energy to conceive a greener environment.

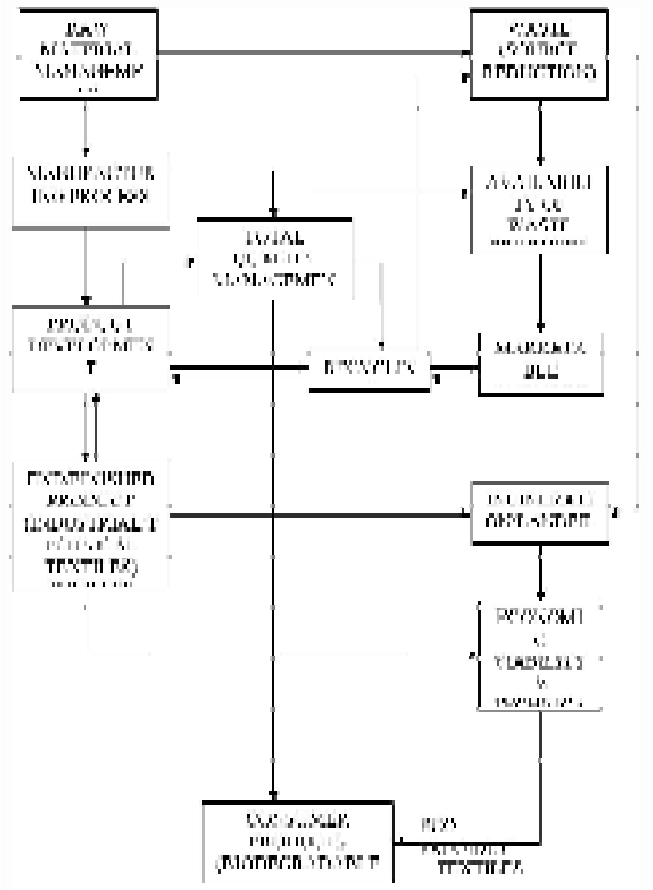
INTRODUCTION

- The requisite of eco-friendly, technically competent & countenance is the basic inkling to employ a genre of innate textiles & blends for smart protective clothing.
- Textile wastes are,
  - Pre-consumer – By product materials from the fibre & textile industries.
  - Post-consumer – Products discarded due to damage.

OBJECTIVES

- Creating awareness among the public, manufacturing sectors regarding environmental concerns with respect to waste disposal.
- Re-process technical textiles & fibres by-products by waste (source) reduction.
- To create new markets & avenues for waste (natural) textile products.
- To encourage recycling & re-use of old products.
- To avoid producing waste, possibly & amicably re-use internally as 'First Quality Product' (same product originally

produced).
• Sister products sold in various production avenues.
• Promoting & creating the need for innate fibres/fabrics with enhanced finishing parameters to suit & be on par with artificial/synthetic fibres/fabrics to cater for sustenance, durability & survivability.
• To extract combustible matter to be used as an alternative fuel.
• To advocate the necessity of bio-degradable waste such as innate natural fibres (cotton, silk, jute, hemp, flax or ramie) as bio-degradable matrix materials.
• To accentuate research & development to develop 'HIGH PERFORMANCE BIO-DEGRADABLE FIBERS'.
• To satiate the ergonomic concerns by initiating innovative management tools to suit the physical-climatic environment & thereby ensure safety & protection of mankind in all conditions.
• The requisite of eco-friendly, technically competent & countenance is the basic inkling to employ a genre of innate textiles & blends for smart protective clothing.



FLOW CHART

NEED FOR BIO-DEGRADABLE TEXTILES

• Recycling/disposal of industrial textile waste are more difficult comparatively to natural textiles, since they are to be durable, high performance products.
• Engineered textile products (synthetics) are difficult to disassemble & re-use.
• Improper disposal/re-use can be hazardous.
• Replacement can lead to diminished landfills.

SCOPE OF TEXTILE WASTE MANAGEMENT SYSTEM

• Innate textile, are abundant in resources & when employed to cater for sustenance, comfort, durability when properly given surface treatment to increase its functional characteristics.
• They are bio-degradable & eliminate cost of treatment.
• Minimizes capital investment, collection & handling costs.
• 'Zero' source (waste) reduction when innate raw-materials are efficiently employed.
• Improvised product quality reduces textile wastes.
• Modify existing process to employ effective 'TOTAL QUALITY MANAGEMENT' to minimize waste.

CONCLUSION

• Environmental issues is a major thrust arena & research, innovation & development of 'HIGH PERFORMANCE BIO-DEGRADABLE TEXTILES' employing abundantly available natural/innate textiles to be technically feasible, eco-friendly & economically viable.
• The prime objective of this proposal lies in effective reduction of,
- Capital investments
- Collection & handling costs
- Treatment operation costs
- Complete elimination of recycling investments

• To effectuate effective sustenance, persistence, treatability, reduced toxicity & efficient, cheap & easy disposability of wastes.
• To convert natural textile waste as excellent fertilizer in agriculture, textile materials have good energy values & thus could be used as fertiliser in agriculture.
• The requisite of eco-friendly, technically competent countenance is the basic inkling to employ a genre of innate textiles & blends for efficient eco-friendly industrial textile products.

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C. G. G. A. E. S. E. B. E:-05

PROSPECTS OF MEDICINALLY IMPORTANT INDIGENOUS SPECIES OF WESTERN GHATS IN UTTAR KANNADA

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Western Ghats are the range of high hills that run along the west coast of peninsular India from the river Tapti in the north to Kanyakumari in the south. Western Ghats of Karnataka run about 1000 km along the western border over seven districts . The Uttar Kannada district covers about 5% forest area of western ghats.The forest cover that exists in this important land mass has vast flora and fauna of the direct and indirect uses on livelihood.

Till recent past, there has been no specific and systematic efforts to promote cultivation of lesser known fruit and spice trees like *Garcinia indica*, *Garcinia combogia* , *Syzygium cuminii , Zyzyphus rugosa, Artocarpus lakoocha* ,etc. These vast range of economically important, but neglected fruits, medicinal and spice flora is becoming extinct day by day due to deforestation, lack of knowledge , etc. Hence ,it is necessary to educate the rural folk dwelling in that region to conserve such medicinally important species.

Objectives of the study

The species which have commercial, medicinal value like *Garcinia indica, Garcinia combogia , Syzygium cuminii , Zyzyphus rugosa, Artocarpus lakoocha* were studied with the following objectives.

* To find out usage of plant parts in day to day life
* To study the medicinal and culinary usage of these species by rural folk
* To review the research findings with respect to medicinal and commercial importance.

Material and methods

The information presented in this paper is the outcome of intensive studies and interviews conducted with the local tribes and farmers living in the forest areas of Sirsi , Siddapur , Yellapur ,Joida , Kumta and Honnavar taluks of Uttar Kannada district for a period of one year from July 2009 to June 2010. Also the scientific research papers were reviewed on the medicinal and commercial importance of the said species.

I.Garcinia indica

Garcinia indica is commonly known as Kokum in vernacular language, which is gaining commercial value in recent years.

Commercial part of the plant used

Whole fresh fruit and dried fruit rind

Traditional and culinary usage

* Traditionally the dried fruit rind is used as flavouring agent while preparing fish and beef curry in lieu of tamarind or lime.
* Fresh fruits and rind is used to prepare syrup , juice and squash
* The Kokum seeds contains edible oil which is known as **kokum butter** which is used to treat skin ailments such as rashes allergies , burns , scalds and chaffed skin.

Nutritive/Chemical values of *Garcinia indica*

The composition of fruit rind in percentage is as follows.

Proteins(1.92), Crude fibre (14.28), Carbohydrates (35), HCA (22.8), Ascorbic acid(0.06) Garcinol (2-3), Tannin(2.85), Pectin(5.71), Moisture(87.5), TSS (degree brix) (16.44)

Medicinal Value

* Kokum rasam /juice is used as a digestive tonic as well as acidity, flatulence, constipation and indigestion.
* To treat paralysis decoction of the bark is used to wash the affected parts 2-3 times a day.
* Juice is very effective against allergies due to insect bites and sun exposure. It is popular in scorching summer as it has cooling effect on the body and shields against dehydration and sunstroke.
* The fruit contains antioxidants that bind with free radicals and prevent damage to body cells.
* It is known to strengthen cardio vascular system and stabilise liver function
* HCA present helps the body to use existing body fat for energy during prolonged exercise. It also has effect on fatty acid synthesis , lipogenesis , apetite and weight loss. It fights cholesterol and curbs lipogenesis aiding to weight loss(Mishra et .al., 2006, Tamil selvi et al., 2003, Saiato et.,al 2005, Stevens et al., 2005)
* Benzophenone derivatives- The fruit rind contains 2-3% garcinol , a poly isoprenylate Benzophenone derivative , a yellow pigment by weight . It has some antibiotic properties and considered as a potential anti cancer agent(Yamaguchi et al., 2000)

Some useful non- traditional products

Kokum wine – The kokum juice contains 4% sugars which on fermentation with baker's yeast produce wine.

Kokum honey – If apiculture units are established in Kokum orchards then Kokum honey can be obtained with excellent medicinal properties.

Industrial Uses

* Kokum has 23-26% Kokum butter (Heymsfield et.al., 1998) which remains at solid state in room temperature is a major constituent in confectionery, medicines and cosmetics. Commonly used as a skin moisturiser over coco butter.
* The juice contains pigments which absorb DNA damaging ultraviolet rays and hence is used in preparing sunscreen

lotions.
* The kokum butter contains stearic and oleic acids which are commercially exploited.
* Increasing alkaline conditions affect the colour of the fresh juice. This can be utilised to develop pH indicators and pH sensitive biosensors for pH range of 3-13.

II. Garcinia cambogia (Syn, G.gummigatta)
It is popularly known as Uppage in vernacular language. When cut the bark of the tree exudes yellowish gummy substance called "Camboge".

Commercial part of the plant used
* Dried and powdered fruit rind
* Extract of fruit rind

Chemical constituents
Hydroxy citric acid (HCA) / Hydroxy citrate- 20-30 % , Vitamin- C, Camboginol and cambogin.

Traditional and culinary usage
* Traditionally the dried fruit rind is used as flavouring agent while preparing fish and beef curry in lieu of tamarind or lime.
* Fruit rinds are used in preparation of vinegar (FAO, 1989)
* The seeds contain 30% butter which is used for edible as well as confectionaries
* In Ayurvedic system of medicine some flavours are said to activate digestion and are used as purgative in the treatment of worms and parasites, tumours and dysentery.
* A decoction of the fruit is used in reducing rheumatism and bowel complaints. It is used against problems like piles,cancer,cardiac problems,oedema,constipation and delayed menstruation.

Medicinal Usage
* HCA has the same properties as in *Garcinia indica* and is used in anti obesity formulations.(Heymshield et.al.1998,). It inhibits lipogenesis, lowers the production of cholesterol and fatty acids increases the production of glycogen in the liver thus sparing the conversion of glucose to fat.
* It acts on Central Nervous System raising the levels of Serotonin (brain neurotransmitters) that has role in regulation of appetite.
* *Garcinia cambogia* extract is found to increase the mucosal defensive mechanism there by acts as protective agent against gastric ulcers.
* The vitamin-c present act as a heart tonic
* It lowers the formation of low density lipids and triglycerides.

Industrial uses
* *Garcinia gummigatta* dried fruit rind contains HCA as high as 30 % of which 90% is non volatile and possess antiseptic properties (Dara et.al., 2008, Stevens etal.,2005)). HCA is available in many forms including capsules, powders and snack bars.
* Several pharmaceutical companies have developed oral spray which needs to be administered before taking food to check the accumulation of fat.

III. Syzygium cumini
Syzygium cumini or Jamun is a evergreen tropical tree widely found in western ghats. The fruits are oblong, ovoid and green which turns to crimson black as it matures.

Plant Parts of importance
Ripe fruits and freshly extracted seeds , Bark and leaves

Nutritive value
The fruit contains protein(0.7 g),Fat(0.3 g), minerals(0.4 g), carbohydrates(14g),calcium(15 mg),Phosphorous(15 mg) , fibre(0.9 g), vitamin-C(18 mg) per every 100 gram. It also contains glucose and sucrose as principle sugars, minerals such as manganese, Zinc,iron,sodium(25.2 mg),Potassium(55 mg),Carotene(48 mg). The presence of oxalic acid (89 mg) and certain alkaloids make to feel astringency in taste.

Traditional and Culinary Uses
* Fruits are processed to jams , jellies and squashes
* Wine is prepared from ripe and fermented fruits
* Juice of fresh fruits is used to fabricate vinegar
* Juice of ripe fruit is used to prepare sauces as well as beverages
* Bark of jamun has astringent, carminative, diueretic, digestive properties .It is used for sore throat, bronchitis, asthama, dysentery ,blood impurities and ulcers.

Medicinal uses
* Ripe jamun fruit is recognised as a liver stimulant, digestive, carminative and coolant. Hypoglycaemic property is well recognised in Ayurveda and Siddha system of medicine in India.
* The fruit is a good source of iron used as an effective medicine against diabêtes , heart and liver problems which prevents excessive urination and sweating., thirst retardant and blood purifier.
* The decoction of the fruit/vinegar can be administered in case of enlarged spleen, chronic diarrhoea and urine retention.

Industrial Uses
Jamun vinegar is prepared from fruits and widely used in diabetic patients. Also dried seed powder and dried pulp of fruit is commercially exploited by industrialists.

IV. *Artocarpus lakoocha*
It is popularly known as ***Vate Huli*** . The tree grows to height of 20-25 mts and bears fruits having orange coloured pulp with tiny white seeds.

Plant parts of commercial importance
Fresh fruits and dried fruit rind powder , root bark.

Nutritive value
The fruits are rich source of carbohydrates , proteins and minerals (Fe).

Traditional/ Culinary Uses
* It is used to treat acidity.
* The paste prepared from the bark is used in healing skin

disorders.
* The fruit rind powder is widely used as an alternative to tamarind in preparation of dishes as it does not induce acidity.
* Fruits are used in preparation of pickles.

Medicinal and Industrial Use
* Fruits are known to combat acidity problems in human beings
* On consumption fruits are known to induce blood synthesis and purification
* In dyeing industry the bark and roots are used in extraction of dyes.

V. *Zizyphus rugosa*
It is a shrub found in deciduous forest, commonly known as ***Bili Mullannu*** in vernacular(Kannada) language.

Plant parts of commercial importance
The fruit and the fruit bark extracts.

Chemical constituents
The root bark extracts contain cyclopeptide alkaloids and six flavones glycosides and one saponine.

Nutritive value
The fruits contain considerable amount of carbohydrates , proteins and minerals(Fe,Ca &P)

Traditional/Culinary Uses
* The pulp of the fruit is used in preparation of Dosas.
* Ripe fruits are used for table purpose
* The dried powder of leaves and fruits are applied topically in the treatment of boils.
* Flowers of this plant are used to treat excessive bleeding during menstruation.

Medicinal importance
The aqueous and methonolic root barks extracts are found to have anti inflammatory and analgesic properties (Yadav and singh,2010)

Conclusions
The study shows that the non traditional fruits such as *Garcinia spp, Syzygium cuminii , Zyzyphus rugosa, Artocarpus lakoocha* are biochemically most creative plant species. Appropriate utilisation of non traditional biochemical compounds obtained from these species like HCA, garcinol, comboginol, ascorbic acid, alkaloids, pigments, flavonoids , etc will create domestic and international demand. These species have potential to attract international market and expect to benefit from R&D wings. The medicinal properties can be utilised to treat many ailments including carcinogenic and cardio vascular diseases. Also the culinary benefits are so high that they can be used as appetisers and alternatives to tamarind and lime without any side effects. It was also found that these species had wide usage in cosmetic industry.

It was observed during the study that most of these produce(70-80%) is wasted . Also very few research has been conducted with respect to *Zyzyphus rugosa, Artocarpus lakoocha* and *Syzygium cuminii* compared to Garcinia spp. So it is necessary to conduct studies on medicinal and culinary properties to exploit them commercially in near future.

Future Strategies and Thrust Areas
* Concentrated efforts have to be made in identifying plus trees of these species for higher yield, regular bearing and good quality produce.
* Farmers should be encouraged to utilise the waste and Betta lands available for scientific cultivation and conservation of these neglected species.
* Development of post harvest technology and value added products
* Awareness creation among farmers, processors and consumers about their economic and medicinal value.
* Processing and biochemical constituent extract units need to established by government
* More systemic and scientific research is to be taken up to document the medicinal and culinary uses of these species.
* Chemical and biotechnological aspects need to thoroughly explored by scientific community.

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C. G. G. A. E. S. E. B. E:-06

WOMEN PARTICIPATION IN PERIODIC MARKET OF DHARWAD CITY

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INTRODUCTION:

Marketing Geography is emerging as one of the fast growing branches in the discipline. It has its own importance in the economy of the region. Today, the markets are playing an important role not only in transacting the goods and services / commodities, but also as the centre of the magnet to attract the people from the hinterland. The spatial movements are the out come from the such arrangements and also paved the way for spatial interaction. The spatial interaction is the mechanism of the effective economic activities. These economic activities have not only carried out by the men but also from women. Recently, the women are come forward and engaged themselves in the different types of economic activities and marketing is also one among them. The role of women in the market is to be appreciated due to their active participation in the sale transactions.

The participation of women in the field of marketing is increasing day by day and opened up the new avenues with the effect of Liberalization, Privatization and Globalization. They are performing the effective role in the marketing activities. Particularly, the rural women have participating not only in marketing activities but also as a labour in agricultural field rest of the days. The dynamic activities have been ensured by them along with their domestic work. With the experiences in the marketing activities she will be learning the skills and has got the courage for transacting the goods and services. This type of encouragement in environment of the market she will be expecting maximum profit with the psychology of the consumers. The profit motto is directly associated with the empowerment. This has paved the way for social recoganization and also enhances the economic status, which leads the empowerment.

The present study covers the Dharwad city which extends from 15° 20' to 15° 28' Northern latitude and 75° 00' to 75° 9' Eastern longitude. The city is extended along the National Highway No. 4. According to 2001 Census, the total population of the Dharwad taluk is 218961 out of which Male population is 112239 and Female population is 106722. The total rural population is 202671 which comprises the Male -103941 and Female-98730 and the total urban population is 16290. in which the Male constitute 8298 and Female constitute 7992. The literacy rate of the taluk is 59.2 percent out of which women comprises only 47.5 percent and 70.4 percent comprises by men literates. The hinterland of the periodic market is quite insignificant as per the present study is concerned. Only 13 villages and city itself has been considered on the day of the field work.

REVIEW OF LITERATURE

Large number of studies has been carried out in the field of Marketing Geography by different foreign as well as Indian scholars/geographers. For the first time in the year 1954 William Applebaum floated the concept of marketing geography and takes up effective measures to study the branch and succeeded to make it as a distinctive field of study. Due to an out standing efforts, is widely regarded as the Chief Architect of marketing geography. Subsequently, Murphy (1961), Hoddar (1965), Johnson E.A.J (1965), Berry (1967), Smith (1971), Bromely (1971) etc and in India Tamaskar (1966), Saxena (1972), Sami (1974), Shrivastava (1975), Dixit (1981), Wanamali (1981), Hugar (2000) and Mulimani (2002) etc., were carried out the further research. But as per the women role in the markets are rarely focused by the few, among them Venu Trivedi (1996) from Indore, highlighted the women role in marketing activities. Therefore, this topic has chosen and the attempt has been made in the present paper to asses the role of women participants in periodic market of Dharwad city. Accordingly, the field work is conducted on the market day of the study region to carry out the take up task.

CONCEPTS

Marketing Geography: Marketing Geography is a concerned with the delimitation and measurement of markets and with the channels of distribution through which goods move from producer to consumer (**W. Applebaum - 1954**).

Market: Market is an authorized public gathering of buyers and sellers of commodities meeting at an approved place at regular intervals (**Hodder- 1965**).

Market place: Market place is a geographical space, which attracts the buyers and sellers to exchange their required goods and services in a given time. Or it is an area of demand for exchanging the goods and services within clearly defined geographical limits (**Dixit- 1979**).

Marketing: Marketing is a common every day activity which involves the exchange of goods and services from producer to consumer (**Yeung - 1973**).

OBJECTIVES

1. To study the function of the Periodic Market.
2. To know the different participants in the Periodic Market.
3. To identify the women participants and their role in the Market.

HYPOTHESIS

1. Is hypothised that, the participation of women is not only earning for their livelihood, but also empowered in the society.

DATA BASE

The present study is based on both Primary and Secondary data. The secondary data related to the market day of the periodic market has been collected from the toposheet. The basic information of the different location of the villages and distance to the periodic market is also collected from the same source. The population of all the villages and city population is collected from the district census of 2001. The market attendance, different participants, consumers and exchange commodities /goods and services etc, all information has been collected from the field work on a market day at Dharwad. The 40 women participants have been interviewed and gathered the information with different aspects through a questionnaire.

METHODOLOGY

The present study has employed an analytical method and delineated the market area based on the information collected on the field. The hypothesis is also tested with a reality in the market.

Periodic Markets is a social assembly at a particular place at least once a week in order to buy and sell the products. They operate in a weekly cycle and serve the villages/ city in which it is located and also the surrounding villages (Wanamali 1981). The market place is a public assembly where buyers and sellers are meeting to each other and exchange required goods and services in a specific day and in a given interval of time (Mulimani 2002). The periodic market at Dharwad city is held on every Tuesday from 10.30am to 7.00pm. Shops (permanent / temporary) are located on either side of the road. The total number of sellers attend the market on market day is 537 out of which 155 were men sellers and 382 were women sellers. This shows the dominance of women sellers in periodic market place as compare to men sellers.

MARKET MORPHOLOGY

It is observed that, the sellers of different goods / items occupy the different zones in a market place. This arrangement facilitates both buyers to buy and as well as local Grahm-Panchayat to collect market cess. The cess is varies from 5/- daily to 500/- monthly for different permanent shops and open space of market place. The pot sellers occupy the one side periphery of the market because the earthenwares are breakable and need more space. The Grains and Dry Chilly merchants were occupy the other side of the periphery of the market place because they generally need more space and grains are bulky too, while vegetables and fruit dealers occupy the heart of the market place.

CHARECTERISTICS OF WOMEN SELLERS

It is observed in the study regions that, most of the women sellers are illiterate and from poor family background. The percentage of women sellers are more than men sellers in the market. The total number of seller on a market day are 537 out of which women sellers are 382 (71%) and men sellers are 155(29%). But on a market day only 40 sellers were interviewed and accordingly the data is collected. Large percentage of women are buyer-cum-sellers and use to come from different nearby villages on daily market and their number increases on market day. It is also noticed that most of the women are vegetable vendors and apart from this they also deals in such articles like Grains, Fruits, Dry Chilly, Pottery, Broomsticks, Ropes, Salt, Bangles, Toys, Butter and Flowers etc. Table: 1.1

Table: 1.1 - Product Wise composition of Women Sellers in Periodic Market:

Sl. No.	Name of the Villages	Number of Women Vendors	Products			
			Vegetables	Fruits	Grains/Spices	Others
1.	Amlikoppa	1	1			
2.	Amminbhavi	1		1		
3.	Baad	2	2			
4.	Dharwad City	16	5	6	3+1	1
5.	Garag	1	1			
6.	Hebballi	1				1
7.	Hosayallapur	2	2			
8.	Kalghatgi	1	1			
9.	Kurubgatti	3	3			
10.	Lakmapur	1	1			
11.	Mudmutle	1				1
12.	Mummigatti	3	2	1		
13.	Narendra	4	2		2	
14.	Nigdi	3	2		1	
	Total	**40**	**22**	**8**	**7**	**3**

Source: Field survey on Tuesday market, 2010

It is also interesting to note that, women with the help of their family members are capable to manage the canteen/small tea stalls and earn more profit on market day. This kind of environment created themselves and enhances their business and improve their empowerment.

Mostly, the women sellers are illiterate and only a few of them have obtained the primary education, but with their experience and skills in a business transactions have made them fairly successful in these activities.

The table 1.2, it is evident from the fact that, women sellers in the age group of 40-49 records the highest percentage in business dealings and most of them are vegetable vendors. The women in the age group of 50 and above mostly engaged in selling grains and dry chilly.

Table: 1. 2 - Age Group of Women Sellers:

Sl. No.	Age Group	Number of Women Sellers	Percentage of Women Sellers
1.	< - 19	-	-
2.	20 - 29	-	-
3.	30 - 39	11	27.5
4.	40 – 49	17	42.5
5.	50 - >	12	30.0

Source: Field survey on Tuesday market, 2010.

MOBILE TRADERS

As compared to men sellers the women sellers are not mobile traders. But a very few of them attend the nearby periodic market centres including Dharwad city market such as Amminbhavi, Betgeri, Haliyal, Hebballi, Hubli keshapur, Kaighatgi, Kittur, Sanadatti and Unkal. During remaining days of the week they use to work in agricultural field with domestic activities and stay with their families.

Table-3: Mobile Women Traders:

Sl. No.	Number of Market attending	Market Place	Native Village of the Women
1.	2	Dharwad, Kalghatgi	Kalghatgi
2.	4	Dharwad, Hebballi,	
		Amminbhavi, Unkal	Lakmapur
3.	3	Dharwad, Betgeri,	
		Hebballi	Mudmutle
4.	2	Dharwad, Kittur	Dharwad
5.	5	Dharwad, Hubli, Halyal, Savadatti, Kittur	Dharwad

Source: Field survey on Tuesday market, 2010.

WOMEN BUYERS

In the periodic market of the study region the characteristics of the women buyers are also taken in to consideration by interviewing some of them by the random sampling method. Basically, the woman from middle class and also from the poor family use to come to the market in large numbers in the evening time. Because, the working women before going to their house come to the market and buy the necessary goods and the poor woman are come to the market in the evening thinking that, she will get the goods in a cheap rate(if the goods are perishable then the sellers sell it in a cheap rate). Most of the buyers are illiterate but good at bargaining.

It is observed that, the women sellers and their active participation in market place reveals the fact that, they are willingly doing the business or due to their unhappy wedlock, alcoholic and gambling habits of their life partner forced her to take up the family responsibilities.

CONCLUSION

It is concluded in the light of the present study that, the participation of women in the periodic markets are not a recent one, but also an evident that in the old age traditional system also. It has been observed that women are good in transaction and bargaining activities even though they are illiterate. They are capable to manage to attend the market from different villages. They also sit and sell their goods and items in different environment. Some time the market site is not comfort for them, but even though they perform their transactions. The women traders are facing lot of problems in a market, related to space, market cess and competition in the market with the fluctuations of prices of the commodities.

With a limited investment they are making their efforts to maximize their profit and enhance their trading activities. If the government could have provide any facilities and help them, then they could have enhance their business like any thing and feel great empowered in the society and business environment.

PROBLEMS IDENTIFIED:

1) Space problem in the market, because the permanent space is not allotted to any participants.
2) The collection of cess does not have any yardstick to fix.
3) The middlemen are not cordially behaving with the women participants.
4) There is no required information provided by the authorities.
5) The basic amenities have not extend to them.
6) The marketing activities are dominated by the middlemen.

Suggestions:

1) The authorities should have to provide the sufficient space and fix the cess.
2) The authorities should have to supervise the market with certain norms which are suits to the market environment.
3) The role of middlemen have to curtail.
4) The basic amenities should have to provide.
5) The uniform weight and measurement should be followed by the sellers.

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THEME:-08

SOCIO-ECONOMIC SCIENCES INCLUDING ECONOMICS, POLITICS, HISTORY, COMMERCE & MANAGEMETN

S.E.S.E.P.H.C.M:-01

THE PERFORMANCE OF REGIONAL RURAL BANKS -A CASE STUDY OF RAMNAGARA DISTRICT IN KARNATAKA

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The establishment of institutions is necessary to promote developmental activities. In this context, financial institutions have been established which are playing an important role in promoting income generating activities and productive activities through pumping money to the economy. There are several financial institutions in India, Regional Rural Banks(RRBs) are one of its kind. These were created and setup to do banking activities like collection of deposits, lending money, and other banking services to increase economic development and economic welfare in the rural areas.

The Government of India promulgated the RRBs ordinance on September 26, 1975, which was subsequently replaced by the RRBs Act in 1976. On October 2, 1975, five RRBs were established in four states namely Uttar Pradesh at Moradabad by the Syndicate Bank and Gorakhpur by the State Bank of India, Rajasthan by United Commercial Bank, Haryana by the Punjab National Bank, and West Bengal by United Bank of India. The RRBs are a type of commercial banks in India. These are the primary banking institutions to penetrate every corner of the country and extend a helping hand in the growth process of the country in the form of working as a co-operative or as a subsidiary bank of commercial banks, functioning in the rural areas as the purpose of providing banking and credit facilities (RBI).

These banks have been started with the coordination of sponsor bank, central Government, and related state Government. The main objectives and functions of the RRBs are to mobilize financial resources from rural, semi-urban areas by granting loans and advances to the small and marginal farmers, agriculture laborers, rural artisans, and small entrepreneurs so as to develop agriculture, trade, commerce industry, and other productive activities in the rural area.

In the recent years, the Government of India has been adopting several developmental programs; the concept of inclusive growth, decentralizing planning, Panchayat Raj System, etc., to improve financial and economical condition of rural people and to eliminate poverty, inequality, unemployment, and underemployment. In this context, the RRBs are the helpful instruments to achieve the goal.

The main objectives of this research paper is to analyze the role and performance of Regional Rural Bank namely Cauvery Kalpatharu grameena Bank in Ramangaram .

The Ramanagara District was established as 29th district of Karnataka state in 2007. Before the existence of Ramanagara District, the RRBs were working in several places of Ramanagar district.

The Kalpatharu Grameena Bank was the 6th RRB in the state, sponsored by the State Bank of Mysore with head office at Tumkur in March 1992 under the RRB Act, 1976, and has covered 3 districts namely Tumkur, Bangalore Urban, and Bangalore Rural.The first branch of the bank was opened in the district at Sollur (Magadi Taluk) in March 1983. At that time, the district Ramanagara was a taluk in Bangalore Rural District. Over the next years, the bank has opened its 2 new branches in Singarajapura and Hosadurga at Kanakapura Taluk, the CD ratio was 233% at that time (district gazette or of Bangalore Rural District).

At the end of March 2005, the Kalpatharu Grameena Bank had 10 branches. In latter days, the amalgamation process took place sponsor bank wise throughout India, so the Kalpatharu Grameena Bank was amalgamated with the Cauvery Grameena Bank (also sponsored by State Bank of Mysore with the head office at Mysore), and renamed as Cauvery Kalpatharu Grameena Bank, the head office located at Mysore and is sponsored by State Bank of Mysore.

By August 2010, the Cauvery Kalpatharu Grameena Bank has 14 branches in 4 taluks as Ramanagara District.Out of 14 branches, 10 branches were established before amalgamation (i.e. Kalpatharu Grameena Bank Branches) and 4 branches established after amalgamation, they are Byramangala Branch, Ramanagara Branch, Kanakapura Branch, and Hosadurga . Out of 14 branches, 10 branches have been working in rural areas, and 4 branches have been working in semi-urban areas.

Per Year Average Parameter's of the different Branches

Sl. No.	Particulars (amount in lack)	Byramangala	Channapatna	Dasavara	Jakkasandra	Kailancha	Kolliganahalli	Lakshmipura	Magadi	Sollur	Thimmasandra
1	Total										
	Deposits	331.92	687.76	335.52	314.50	387.14	215.38	382.40	690.31	431.55	234.01
2	Total										
	Advances	511.96	554.11	640.07	381.44	522.7	365.57	370.93	709.93	554.89	367.14
3	Total										
	Business	843.88	1241.86	975.59	675.95	909.84	580.96	753.34	1399.74	986.04	601.16
4	Income	69.35	127.96	79.89	39.01	56.60	42.408	48.95	125.12	73.42	53.33
5	Expendi										
	ture	51.87	74.52	40.51	20.12	30.92	19.52	35.10	82.15	36.09	33.97
6	Net Profit	17.47	53.04	39.30	17.48	27.42	22.87	19.08	43.18	35.51	19.35
7	Crop loan	28.82	77.286	156.114	130.02	186.98	140.07	101.464	142.03	154.71	158.55
8	Term loan	21.13	135.04	295.56	177.18	181.294	154.34	126.04	204.6	171.07	84.43
9	Saving deposits	88.45	445.96	119.96	152.59	197.76	85.385	132.40	331.092	222.85	162.94

Chart :4.2 Average per year total deposits, Advances and Business of branches.

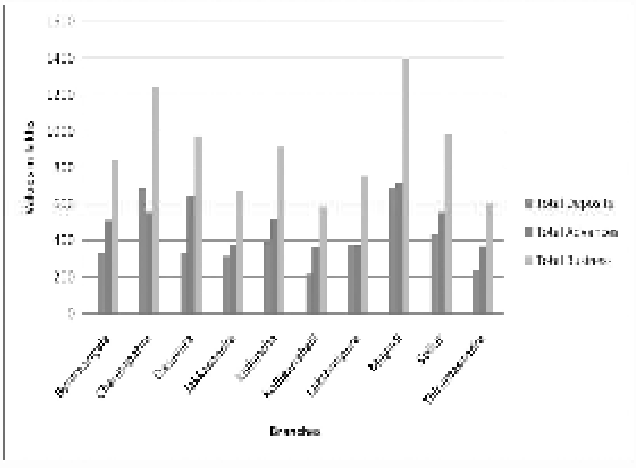


Chart : Branchwise average net profit per year

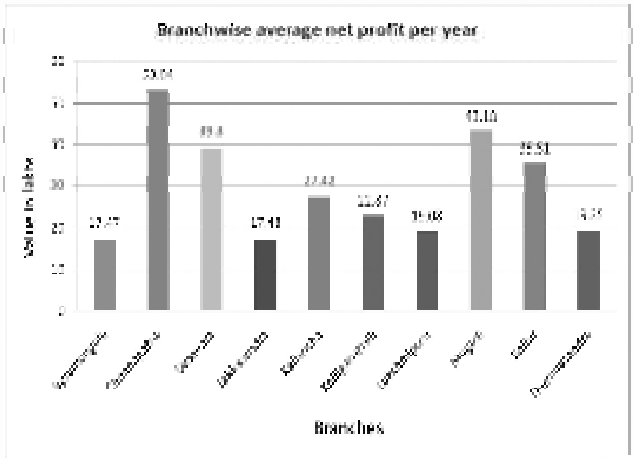


Chart : Average Income and Expenditure of branches.

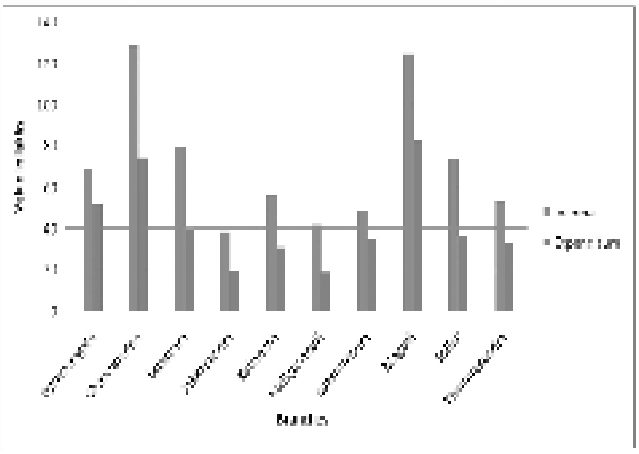


Chart : Average Crop and term loan of Branches.

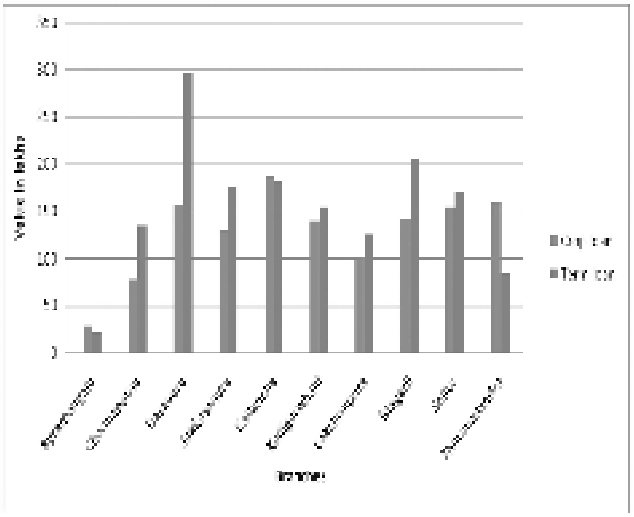
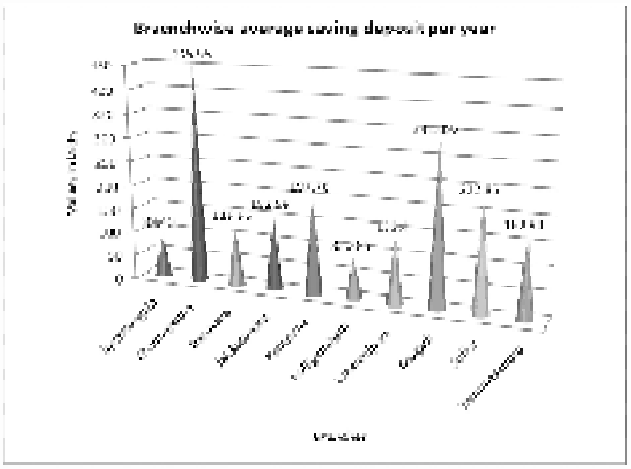
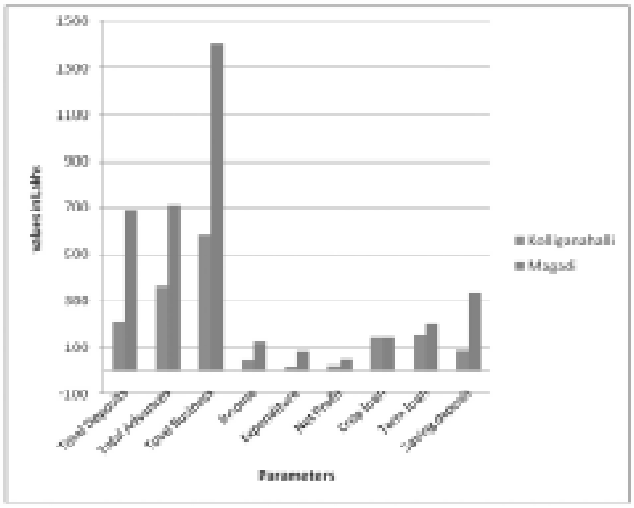


Chart : Branchwise average saving deposit per year





A Comparative Analysis between the Branches.

For comparative analysis between the branches , financial parameters for the five years of 2006-2010, the average financial parameters are used for this purpose i.e., average deposits per year, average advances per year, average businesses per year etc., for this analysis here we used both table and graphs, the average equation is given below.

$$\text{Average per year} = \frac{\text{Total parameters summed up of 5 years}}{5 \text{ years.}}$$

It used for all the branches except the Byramangala branch, because it is opened just 3 and half year back,

1. **Average Deposits**

The deposits are the major resources for lending advances to borrowers, this is included all types of deposits that is collected by banks from the people.The Magadi branch and the Channapatna branch got 1st and 2nd places of Rs. 690.31 and 687.76 lakhs respectively, last places taken by Kolliganahalli and Thimmasandra Rs. 215.38 and 234.01 lakhs respectively. This has been shown in the graph .

2. **Average per year advances:**

The advances includs all types of advances. According to the table , Magadi and Dasavara branch have got 1st and 2nd places with amount of Rs. 709.45 and 640.07 lakhs respectively, the last 2 places taken by Kolliganahalli and Thimmasandra with Rs. 365.57 and Rs. 367.14 lakhs.

3. **Average total Business per year:**

Total business is the combination of both total deposits and total advances. The Magadi and Channapatna got the 1st and 2nd stages in average total business per year and the Kolliganahalli and Thimmasandra branches got last two places.

4. **Average Income per year:**

The average income per year is calculated for all branches. According to that the Channapatna and Magadi branches got high income average per year i.e., Rs. 127.96 and 125.12 lakhs, the Jakkasandra and Kolliganahalli branches have last two stages Rs. 39.01 and 42.408 lakhs respectively.

5. **Average expenditure per year:**

The average expenditure per year of all the branches is given in the table. According to that the Magadi and the Channapatna branch got 1st and 2nd places with Rs. 82.15 and 74.52 lakhs respectively and the last 2 stages taken by Kolliganahalli and Jakkasandra branches with respect of Rs. 19.52 and 20.12 lakhs.

6. **Average net profit per year:**

The average net profit per year of all the branches for five years have given in the table. According to the table, the average net profit per year is high in Channapatna branch i.e., Rs. 53.04 lakhs and 2nd place taken by Magadi branch with Rs. 43.18 per year, the Jakkasandra and Lakshmipura branches got last 2 places with respect of Rs. 17.48 and 19.68 lakhs.

7. **Average crop loans:**

According to the average financial parameters of crop loans given in the table, the Kailancha and the Thimmasandra branches taken first two places with amount of Rs. 186.98 and 158.65 lakhs respectively and the last two stages by Channapatna and Lakshmipura branches with amount of Rs. 77.286 and 101.464 lakhs respectively. The branch Channapatna lies in semi-urban area and the branch Lakshmipura lies in dry and hill land area and the area faces draughts a few years back.

8. **Average term loan:**

The average term loan per year is high in the Dasavara and Magadi branches. Both have 1st and 2nd places with respect of Rs. 295.56 and Rs. 204.6 lakhs respectively and on the other hand Thimmasandra and the Lakshmipura branches lending low amount of average per year term loan with respect of Rs. 84.43 and Rs. 126.04 lakhs respectively.

9. **Average savings per year:**

Average savings per year for the five years of the branches is given in table. According to that, the branches of Channapatna and the Magadi have first and second places

with amount of Rs. 445.96 and Rs. 331.092 lakhs respectively and last two places got by Kolliganahalli Dasavara with amount of Rs. 85.385 and Rs. 119.96 lakhs of average savings per year respectively.

we can conclude that the branches of CKGB in Magadi and Channapatna are good in per year average financial parameters and at the same time the branches of CKGB at Kolliganahalli, Thimmasandra and Lakshmipura are in last stages in this analysis, but all the branches are accruing profits. We can see that in the graphical representation.

As per the observations made in this study (shown in the graph) the semi –urban branch of Magadi shows better performances then the rural branch of Koliganahalli in terms of per years average values of total deposits, total advances, total business, total income, total expenditure, total net profit, total crop loan, total term loan, and total savings deposits, higher then the rural Koliganahalli branch.

This difference may be due to several reasons; those are increase in banking awareness in urban people, increasing women participation in economic activity, increase in participation of young generation in banking activities than the rural young population and increase in general awareness the semi-urban area than in rural areas.

We can conclude by saying that Regional Rural Banks will perform better if the rural people are more educated ,aware of banking services provided by these banks not only that it is the responsibility of these banks to make rural people aware of their presence.They they can successfully contribute towards rural development

S.E.S.E.P.H.C.M:-02

AN ANALYSIS OF DOMESTIC WORKERS DEMAND FOR SOCIAL SECURITY COVER - A CASE STUDY OF BANGALORE

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INTRODUCTION

The perpetuation of traditional female roles and responsibilities within and outside the household, and the perception of domestic service as part of a woman's apprenticeship for adulthood and marriage, also contribute to the low recognition of domestic work as a form of economic activity.

The root causes of domestic labour are multiple and multifaceted. Poverty and its feminisation, social exclusion, lack of education, gender and ethnic discrimination, domestic violence, displacement, rural-urban migration and loss of parents and spouse due to conflicts and diseases, are just some of the multiple "push factors" for domestic workers worldwide. Increasing social and economic disparities, debt bondage, the perception that the employer is simply an extended "family" and protected environment, the increasing need for the women of the household to have a "replacement" at home that will enable more and more of them to enter the labour market, and the illusion that domestic service gives the worker an opportunity for education, are some of its "pull factors".

Exclusion of domestic workers from the social security scheme has led to protests in the city. The state government completely excluded domestic workers from the scheme, though they represented a significant segment of the unorganized sector. The scheme framed is only applicable to darjis, dhobhis, hamals, drivers (auto, taxi, bus, and lorry), hotel workers, and also those working in workshops. However, three neighbouring states like Maharashtra, Kerala and Tamil Nadu have included domestic workers within the purview of the scheme.

Domestic workers, who do the cleaning chores, are at the lowest end of the spectrum of home care workers; those who cook are placed a little higher while the patient or baby care workers at the top. The corresponding wages and status of the three also varies depending on the type of work, geographical location of employment, and experience, or are simply driven by market necessities.

In some areas, the cleaning job (dusting, sweeping and mopping) gets around Rs 200 per month, in others the same work will fetch Rs 500 per month. Then there are other jobs like washing dishes or clothes (with or without a washing machine). There's no question of security of tenure. A worker can quit or get fired or replaced if she falls sick and doesn't turn up for work for more than three days.

DWU is investigating ways to get the government to hold employers accountable even in the informal economy. Can that be done by legislation or regulation, if not by collective bargaining? It's a critical question for all workers' centers, and for all law makers.

It's also becoming a more broadly relevant question every day. As our economy continues shifting toward service and information industries, more and more formerly middle-class and white workers have seen their jobs similarly "contingentised" as domestic workers and day labourers. As employers load up on temporary, subcontracted and part-

time workers rather than full-time employees, they avoid paying into Social Security and providing unemployment insurance**,** health coverage, and workers' compensation. They can even avoid providing vacation or sick days**.** Labour Laws are failed to protect the interests of the workers, because the economy has changed so much.

There is an urgent need for devising social protection mechanisms for domestic workers in India. The reasons for this are several. First, domestic service is the largest sector for female employment in urban India. Around 3.05 million women in urban India are employed by private households. Thus, the working conditions and social protection needs in this form of work, with respect to women's work and welfare, are of concern. Second, informality is a dominant feature of domestic work. Practically 99.9 per cent of workers engaged in private households are informal workers and, thus, with very little social protection. Third, it is a fast growing sector-the number of women engaged by the' sector has increased by 222 per cent since 1999-2000. Growing urbanisation, feminisation of labour and increasing numbers of nuclear families are some of the primary reasons for the exponential growth of this sector. Fourth, women form the dominant share of workers in the sector. This is a result of a long-striding perception that domestic work is 'woman's work', requiring no skills or training and is, thus, severely undervalued. And, finally, most domestic workers are from 'backward' communities, tribal villages or scheduled caste communities, carrying the combined burden of caste, class and gender hierarchies.

A recent study on women's workforce participation, supported by the I.L.O in Delhi, suggests those care-related roles and responsibilities Influence women's decisions to join the labour market. In this context, services provided by Domestic workers are important In this context, services provided by Domestic workers are important in allowing greater degree of female labour force engagement. However, domestic workers often provide care services to households by sacrificing quality care in their own homes. There is a need to recognise their contribution to the economy and bring 'value' to their work so that it is not merely written off as 'something that women do, in the homes of others to 'help out'.

Domestic work is also often not considered to be 'real'work, and domestic workers are not real workers. They are considered to be 'one of the family'. There is need to provide social protection and legal rights that treat workers at par with other wage workers. There is need for policy to acknowledge that domestic work is carried out in conditions similar to wage work but within the confines of the private household.

Domestic work is often undervalued and poorly regulated and, thus, domestic workers remain overworked, underpaid and unprotected. Live-in work, in particular, occurs in an isolated, largely non-regulated and privatised environment. Mobility is heavily restricted and these workers do not have extended families or community based support. They are most vulnerable to physical and sexual abuse, excessively long working hours and deprivation, often working in isolation almost like bonded labour, for the live-out workers, the multiple employers, the informal nature of work arrangements and wage fixation, and lack of grievance-redressal mechanisms pose acute problems. Besides security of work and income, women domestic workers need grievance-redressal mechanisms, skill up gradation, old-age pension and child-care facilities, at the least.

There is no doubt that social security is an urgent need for domestic workers. The main issue is how this can be achieved, ensuring appropriate, efficient and quality services. Extending social security to the workers in the informal economy, particularly for women workers, is not merely a matter of extending existing formal sector schemes to new groups. The fragmented tasks and the multiple employers pose serious challenges for designing social security for domestic workers. Besides, domestic workers are commonly subject to different local labour market engagements. The existence of various layers of recruitment agents, the system of advance payments and the lack of regulation of employment agencies add to the complexities in delivering required social and legal protection to such workers.

In India, domestic workers are largely absent from state policy-be it labour laws or social policy. They are not therefore, not entitled to maternity benefits and other social security nor are their working conditions or hours of work regulated. However, some efforts have been made. The most recent Unorganized Workers Social Security Act 2008 does cover domestic workers. In certain states, minimum wages have been, notified for domestic work. There have been efforts to legislate for the protection of domestic workers, including a Bill drafted by the National Commission for Women in 2008. At the state level, the Maharashtra Domestic Workers Welfare Board Act 2008 and the Tamilnadu Manual Workers (Regulation of Employment and Conditions of Work) Act 1982 envisage welfare and protection for domestic workers through the welfare board models.

The experience of welfare boards has been very positive in India, particularly for reaching social security to workers without a clear employer employee relationship. The advantages of a welfare fund are many. First, the financing for the funds does not depend on government budgets but on the surpluses in the particular sector or trade; it is financed directly from revenue generated from the sector. Second, it has a logic that is acceptable to all in that the benefits of the trade accrue to the workers of the trade. Third, it has strong stakeholder participation. However, one major shortcoming of the existing funds is that they have not been very effective for women workers.

Innovative amendments to the existing welfare model struc-

ture will have to be introduced to make it appropriate for delivering social security to the domestic workers. Due to the person-and locale specific ways in which wage and working conditions are negotiated by workers, there is urgent need to decentralise this process and factor in varying geographic and socio-economic profiles of the areas while setting wage fixation and working condition norms. At the very least, the welfare model will need to be changed to make it more decentralised, deliver more benefits and become more efficient. Some of the proposed bills assign a large gamut of activities for the welfare boards. Boards are to supervise the design of norms and programmes for workers as well as be responsible for facilitating the registration of workers while monitoring and allocating funds for the benefit of the workers. These are the' large gamut of activities, and the capacity of any institution to manage such a combination of tasks needs to be evaluated.

There is also urgent need to look into other innovative practices that can be piloted at the locality level, in collaboration with other local institutions. Resident Welfare Associations (RWAs), private registered agencies, workers cooperatives and state programme units can play critical roles. For instance, the Gender Resource Centres (GRCs) designed by the Delhi government can become 'local, single-window facilities for registration and delivery of benefits. (The GRCs in the slums of Delhi are envisaged as instruments that bring social, economic and legal empowerment of women, particularly those belonging to the underprivileged sections of society). Residential area based mechanisms for social security and dispute settlements can also be piloted. Local migration centres, linked to RWAs or neighbourhood services bureaus, are some other alternatives. Similar exercises can be made through out the country for the betterment of D.W's.Reconceptualising the legal framework so as to cover the domestic workers is imperative. The national labour laws need to extend recognition to domestic work as 'work' through its inclusion within the ambit of minimum wage laws, dispute settlement laws and social security laws.

The invisibility of domestic workers manifests itself in several ways. Not included in the wider notion of a 'worker' category, they lack the right to claim certain benefits such as social security or welfare claims, working at home. These workers have less voice vis-a-vis employers or public authorities than other workers. Organising at the grass roots is fundamental to finding solutions to the various problems faced by domestic workers and addressing the myriad vulnerabilities that they face. Organising domestic workers, like other informal workers-for personal. Social and economic empowerment; to raise their visibility as a group; and to provide a mechanism for effectively representing their interests or giving them 'voice' in their struggles around immediate issues is the key to their empowerment. There is need to sustain and support organisations for domestic workers in order to improve their bargaining power, wages and voice. Furthermore, organising workers and providing information on basic entitlements at the local level will boost the ability of the workforce to negotiate and achieve improved wages and working conditions.

STEPS TAKEN BY THE GOVERNMENT

The government is considering a slew of welfare schemes, including health insurance, for domestic workers in the country, Labour and Employment Minister Mallikarjun Kharge announced in the Lok Sabha on 27th of July. The minister said the government was considering the recommendations made by the task force on domestic workers, which also includes a provision for providing health insurance to the workers under the Rashtriya Swasthya Bima Yojana (RSBY).

The Government has enacted the 'Unorganised Workers' Social Security Act, 2008 for the social security and welfare of unorganised workers which includes domestic workers. The National Social Security Board constituted under the Act has constituted a Sub-Committee of the Board to explore the extension of Social Security Schemes for unorganized workers. The said Sub-Committee recommended domestic workers as one of the categories to be considered for social security. Accordingly, the Government has set-up a Task Force to evolve a policy frame work for domestic workers in the context of regulatory mechanism and providing social security. The Task Force has been examining various issues such as extending coverage of Rashtriya Swasthya Bima Yojana (RSBY), health and maternity benefits, life and disability benefit, old age pension, etc., to domestic workers. It has held three meetings on 13th January, 2010, 1st February, 2010 and 25th February, 2010. The Task Force is likely to submit its Report soon.

This information was given by Shri Mallikarjun Kharge, Minister of Labour and Employment in a written reply to a question in the Rajya Sabha today. Extension of the welfare schemes to the domestic workers including Health and Maternity benefit RSBY was started on April 1, 2008 to provide health insurance coverage to Below Poverty Line (BPL) families. It provides hospitalization coverage of up to Rs.30, 000 to its beneficiaries based on a system of smart cards. Currently there are 17,280,964 RSBY smart card holders across the country.

On the whole the government should have come up with stringent Acts on domestic workers and full implementation of programmes at the grassroots level which tends to pull more children as labourers due to poverty. Will a day come when these children will be celebrating on children's day November 14th.

The Government is considering extending the benefits of the Rashtriya Swasthya Bima Yojana (RSBY) to the domestic

workers in the country. In their first report, the Task Force on Domestic Workers has, inter-alia, made following recommendations:
(i) Extension of the welfare schemes to the domestic workers including Health and Maternity benefit, Death and Disability benefit and old age benefits.
(ii) Rashtriya Swasthya Bima Yojana (RSBY) should be the first welfare scheme to be extended to the domestic workers. The smart cards used under RSBY can later be used to load other welfare schemes rolled out for domestic workers.
(iii) Domestic workers should be identified and registered by the State Labour Department.
(iv) The domestic work should be included in the Central List of scheduled employment vide a notification under the Minimum Wages Act, 1948 for fixation and enforcement of minimum wages in respect of domestic workers. The State Governments which have not fixed minimum wages for domestic work should fix minimum rates of wages for domestic workers.
(v) Mandatory registration of all placement agencies and individuals providing placement, sourcing and recruitment service relating to domestic work under Shops and Establishment Act.
(vi) Formulation of National Policy for the Domestic Workers.
(Vii) scaling up of the skill and re-skill training program initiated by International Labour Organization.

The proposal to extend RSBY to domestic workers is under consideration of the Government. One of the recommendations of the Task Force relates to mandatory registration of all placement agencies and individuals providing placement, sourcing and recruitment service relating to domestic work under Shops and Establishment Act. The recommendations of the Task Force are being examined.

The Minister of Labour and Employment Shri Mallikarjun Charge gave this information in reply to a question in the Lok Sabha. On 27th of July 2010.

Services of maid servants won't come cheap in future. Besides paying them minimum wages fixed by the government, you may have to fund their welfare schemes, provide facilities and rights similar to workers in other sectors.

You may also have to pay them overtime, define their weekly rest periods, fix work time for live-in maids and make additional payments and arrangements for night work. Chucking them out won't be easy, either — you may have to give a notice before terminating a domestic help.

A task force set up by the ministry of labour and employment has recommended a 'code of practice' to protect rights of domestic workers. The code covers working conditions, contract of employment, probationary periods, remuneration, employer-provided accommodation, living conditions, work time for live-in maids, night work time, weekly rest periods, termination of employment, notice periods, etc.

The task force also recommended that women domestic workers be brought under the ambit of sexual harassment and other gender-related laws by treating households as workplaces. Sources said the recommendations were being considered by the government for follow-up at appropriate levels. The government is also discussing issues relating to state governments as most of the action will be in the states Rights, regulated working conditions, wages and conditions of employment available to workers in other sectors under various labour laws are at present not available to domestic helps, mainly because they work in homes.

Rights, regulated working conditions, wages and conditions of employment available to workers in other sectors under various labour laws are at present not available to domestic helps, mainly because they work in homes. "We were getting several complaints of exploitation and poor working conditions of domestic workers, besides malpractices by placement agencies. The loopholes need to be plugged for welfare of domestic workers. They need to be provided social security cover," Anil Swarup, director general of labour welfare who heads the task force, said.

This could mean employers would also have to pay for the social security benefits the government may extend to domestic workers."Till the time domestic workers are provided legislative protection there is a need for a code of practice and a national policy for their welfare and to regulate their conditions of employment. The government can extend its social security schemes, but it is felt that employers and beneficiaries should also make some contribution," Swarup said. The task force has recommended that domestic workers be identified and registered by state labour departments and included under state minimum wages notifications.

It suggested that the first target should be to extend the Rashtriya Swasthya Bima Yojana coverage. The task force suggested regulating placement agencies by making it mandatory for them to register, maintain records of domestic workers placed, including details of employers, wages, working hours, etc.

Their other demands:
1. Domestic workers should be registered under the state board.
2. They should be given medical insurance, pension, maternity benefit and children's education.
3. The board should convene an emergency meeting to review the issue of provision of social security to vulnerable domestic workers.

DWU is investigating ways to get the government to hold employers accountable even in the informal economy. Can that be done by legislation or regulation, if not by collective

bargaining? It's a critical question for all workers' centers, and for all lawmakers.

It's also becoming a more broadly relevant question every day. As our economy continues shifting toward service and information industries, more and more formerly middle-class and white workers have seen their jobs similarly "contingentized" as domestic workers and day laborers. As employers load up on temporary, subcontracted and part-time workers rather than full-time employees, they avoid paying into Social Security and providing unemployment insurance, health coverage, and workers' compensation. The can even avoid providing vacation or sick days.

CONCLUSIONS AND SUGGESTIONS

1. Workers engaged in the urban informal sector form the bulk of the urban poor.
2. Workers in this sector get low wages or if they are self-employed, their income is meagre. This implies that their living conditions are low and, if employed, their wages are less than the stipulated minimum wages. There are hardly any regulations on their working conditions and social security is virtually non-existent.
3. A large section of this population consists of low-skilled rural migrants or migrants from smaller towns. Hence, for these people, right from the time of their entry to the city they become a part of the informal sector as they have neither the skills nor the opportunities to enter better-paid and more secure formal sector jobs.
4. They thus move from one level of poverty, at their place of origin, to another level of poverty, at their destination. At the same time there is a growing section of workers in the formal sector who have lost their jobs and are compelled to work in the informal sector. For these people and their families this change means a reduction in their standard of living and insecure, unregulated employment.
5. Ultimately, things can and will change only if those who employ domestics accept that these workers are first of all workers and not "servants". That they are individuals with rights like any other person. That they should be paid a fair wage. That they deserve time off. That they too have families to care for. That they should not lose wages when they fall sick. That they are valued human beings without whom our lives would be impossible. Such a change of attitude cannot be legislated.

On the whole the government should have come up with stringent Acts on domestic workers and full implementation of programmes at the grassroots level which tends to pull more children as labourers due to poverty. Will a day come when these children will be celebrating Children's day on November 14? There is urgent need for devising social protection mechanisms for domestic workers in India. The reasons for this are several. First, domestic service is the largest sector for female employment in urban India. Around 3.05 million women in urban India are employed by private households. Thus, the working conditions and social protection needs in this form of work, with respect to women's work and welfare, are of concern. Second, informality is a dominant feature of domestic work. Practically 99.9 per cent of workers engaged in private households are informal workers and, thus, with very little social protection. Third, it is a fast growing sector-the number of women engaged by the' sector has increased by 222 per cent since 1999-2000. Growing urbanisation, feminisation of labour and increasing numbers of nuclear families are some of the primary reasons for the exponential growth of this sector. Fourth, women form the dominant share of workers in the sector. This is a result of a long-striding perception that domestic work is 'woman's work', requiring no skills or training and is, thus, severely undervalued. And, finally, most domestic workers are from 'backward' communities, tribal villages or scheduled caste communities, carrying the combined burden of caste, class and gender hierarchies.

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S.E.S.E.P.H.C.M:-03

STATUS OF STRESSFUL LIFE EVENTS AMONG FEMALE STUDENTS OF PRE-UNIVERSITY COURSES

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Introduction

In recent years the amount of research on physiological and psychological consequences of environmental stimuli perceived to be stressful has increased but, research on the problems of adolescent period has been modest. Today, PUC students are experiencing complexities of fast growing era and their pressures. Thus PUC students are constantly pressurized to accomplish more and more in less and less time, where students' capacities are severely taxed. When this happens the students perceive that they are in endangering their physical or psychological well being. These events are nothing but stressful life events.

Stress is universal human experience. Both pleasant and unpleasant experiences can have stressful components. Stress forms an unseparable part of life and upto a degree may be essential for adequate personality development. However, if these stressors become too sever or too numerous they may affect the psychological equilibrium, producing maladaptive patterns of behaviour and possibly psychological disorders. Stress refers to a state of imbalance within an organism that is elicited by an actual or perceived disparity between environmental demands and the organisms capacity to cope with these demands and is manifested through variety of psychological, emotional and behavioural responses. The response syndrome occurs as a result of organisms exposure to environmental demands or stressors. The conditions of the social and physical environment operate as stressors to the extent that they exceed on organisms adaptive resources (Lazarus, 1966; Salye, 1956). These annoying conditions and unpleasant events are often said to be stressful life events.

Empirical evidences suggest that cumulative life stressors increases risk for emotional and behavioural problems. These cumulative stressors may occur in the life of students of PUC at different contexts (Aneshensel, 1992; Cohen and Gordon, 1995; Kesseler *et al.*, 1997; Jackson and Warren, 2000). This subjective perspective focuses on the student's perception of his or her experience related to his/her environmental demands. The majority of the stressors identified in sophomore period were related to new responsibilities, feeling over loaded with too many things to do and learn (Abousiere, 1994; Lipore *et al.*, 1997, Sarafino and Ewing, 1999, Misra and McKean, 2000) and social relations (Ross *et al.*, 1999). Although these survey researches provide a global context that they do not identify specific everyday circumstances where subjective stress is most likely to be experienced and therefore do not pin point areas for intervention.

Review of literature mean that there is a need to study stressful life events among sophomores, because in industrialized societies, adolescence, includes a lengthy interval of education, career training and adult role acquisition. Increasing independence from parents during this interval provides adolescents with increasing opportunities to explore behaviours, roles, attitudes and values (Erikson, 1968). Due to this sophomores may experience stressors by getting confused in making use of the increasing opportunities. Hence there is a need to guide PUC students to manage the stressors. Therefore the present study was designed to study the stressful life events among female students of pre university courses.

Methodology

Size of the Sample

This is an ex-post facto research design study. The sample comprising of 217 female students of both PUC I (N=112) and II (N=105) year within the age group of 16 to 19 years was taken from five colleges of Bidar city. Twenty per cent of the total female students present at the time of testing were selected randomly.

Material Used

***Stressful life events schedule*:** The schedule (Biradar, 2007) consisted of 100 life events. The events were related to family, peer, academic, physical health and psychological aspects. For each event four alternative answers such as always stressful, sometimes stressful, rarely stressful and never stressful with the scoring 4, 3, 2 and 1 respectively were given to assess the level of stress created by each event. The schedule was pre-tested on 45 PUC II year students. The test-retest reliability of the schedule was 0.867 and it was significant at 0.01 level.

Procedure

The data collection was carried out with the prior permission from the principal and the class teacher to get the responses from the selected female students of PUC I and II year of arts, science and commerce of each college. The selected students of each class and course were made to sit in one hall and rapport was established with them. They were also informed that the information given by them would be kept under strict confidence. The students were instructed very clearly about the pattern of answering to each item of the questionnaire. The necessary clarifications were provided to the students as and when they raised doubts while answering the statements. The data were subjected to 't'test and rank analysis.

Results and Discussion

Feeling "stressed" is pervasive for college age students

(Rawson *et al.* 2001), it means that as the adolescents enter from high school life to college life there is every possibility of increasing stress. Because during PUC, students have to adjust with the college environment., with the various aspects of development such as physical, psychological, emotional, adjusting with the peer group, and also there is a need to develop commitment and high exploration to meet the expectation and demands of the society. In this process of developmental adjustment, some times students experience failure in meeting these demands, as a result there is possibility of perceiving these experiences as stressful. Therefore in the present study an attempt was made to study the stressful life events among female students of pre-university courses.

The results of Table 1 revealed that there was no significant difference between female students of PUC I and II year on stressors of family relations (t=1.122NS), peer relations (t=1.027NS), academic aspects (t=0.540NS), physical health (t=1.182NS), psychological aspects (t=0.481NS) and stress (t=0.698NS). From these results it was found that female students of both PUC I and II year had experienced more or less similar level of stressors in family relations, peer relations, academic aspects, physical health, psychological aspects and stress. This may be due to the fact that period of PUC includes demanding of high percentage in performance, career choice and adolescent role acquisition. During this period, increasing independence from parents provides adolescents with increasing opportunities to explore behaviour roles, attitudes and values. Due to this both PUC I and II year female students might have experienced same level of stress. These results support to the study of Erikson (1968).

Stressors of family relations

In family relations, father related stressors, such as expectation of father to follow strict schedule in day to day activities by the student (18.40%) was the first order stressor and too much pressure by father to do best in all the subjects (17.10%) was the second order stressor experienced by the female students of PUC. Followed by argument between father and mother (7.80%) and also father and student (6.00%), father living away from family (5.10%) as the third order stressors. The least contributors to stress always were negligence of father (2.80%) and strictness of father (2.80%), criticism of father (1.40%), and father's objection to friendship (1.40%). The stressors related to mother (Table 2) like, expectation of mother to follow strict schedule in day to day activities by the student (16.10%) was the first order stressor experienced by the students. Too much pressure by mother to do the best in all the subjects (6.90%), and objection of mother about friendship (6.00%) were second order stressors. And argument of mother with father (5.50%), strictness of mother (5.50%), mother living away from family(5.50%), argument between the mother and student (5.10%), were third order stressors. The last stressor experienced was loosing temper by mother (3.20%).

From this study it is very clear that the stressors related to father and mother had contributed about 18 per cent and 16 per cent of the students respectively, but remaining 82 per cent and 84 per cent of the students had not been influenced by the father and mother related stressors always. This may be because the competition in educational area is increasing day by day and all the parents expect their children to score good marks in PUC examination, so that their children can get admission into good professional courses or admission in the reputed institution for further education. Therefore they make their children to fallow strict schedule in day to day activities and put pressure on them to do the best in all the subjects, so that they should not waste their time in other activities instead of reading.

Among brother related events (Table 2), criticism of brother (5.50%), the argument of student with brother (5.10%), were always experienced by the students as first order stressors. Followed by death of brother (3.20%), expectation of brother to do everything for him (2.30%), short temperedness of brother (2.30%), superiority of brother (2.30%), and non-affectionate talking by brother (2.30%) were second order stressors. The last order stressor experienced by the female students of PUC were, getting angry by brother (1.80%), brother had left home (1.40%), brother would not give his materials to the student (1.40%). The fact is very clear that brother had also contributed about 6 per cent of the students in developing stressors always but remaining 94 per cent of the students were not experiencing always stress by the other related stressors.

The sister related stressors (Table 2) like, getting angry by sister (7.40%) was experienced by female students as first order stressor. Followed by superiority of sister (4.10%), talking against by sister (3.20%), expectation of sister to do everything for her (3.20%), and non-affectionate talking by sister (3.20%) as second order stressors. And non co-operation of sister (2.80%), argument between the sisters (2.30%), sister would not give her materials (1.80%), and criticism of sister (1.80%), were the last order stressors experienced by the female students of PUC.

The present study makes it clear that sisters also contributed about 7 per cent of the students in developing stress always and remaining 93 per cent of the students had not been always influenced by sister related stressors always. The brother related stressors and sister related stressors (Table 1) clarified that the brother and sister were the main contributors to the stressful life events among female students of PUC. This may be due to the fact that children try to develop their own identity and separate emotions from siblings and parents and showing interest in peers and friends. This development may lead to the decrease in interaction between the siblings and this inturn may lead to the less intensive relationship between siblings. These results support to the studies of Dunn et al. (1994), Buhrmester and Furman (1990).

The results of other events (Table 2) revealed that financial problem was experienced by the students (14.10%) as first order stressor, followed by problem created by relatives (5.10%)) as second order stressors. The least contributor to stress always among female students of PUC was death of a close relative (1.80%).

The fact is very clear that the other family events had also contributed upto 14 per cent of the students in developing stress always but remaining 86 per cent of the students had not been influenced by the other family events related stressors always. This may be because sophomores have some extra financial commitments. Sometimes they yield to the peer pressure, which results in extravagant behaviour and dependence on parents. This stress is the result of dependence on the parents and demands of the peer acceptance (Clare and Mark, 1998).

Stressors of peer relations

To most sophomores, popularity means having a large number of friends. As they grow older, the kind of friends they have becomes more important than the number. However, values regarding the "right" kind of friends tend to change from one year to another, depending on the values of the group with which they are identified at the time. Sometime if these sophomores are not accepted by the peer group, or if they are not popular in their peer group then it acts as a stressful life event in the life of sophomores.

The results of Table 3 revealed that the stressor of peer relations such as student was in love with friend was experienced by the students (23.00%) as first order stressor. Followed by argument with friend (12.00%) and joining of the friend to a new group of friends (10.10%) as second order stressor. Moving away of friend (7.80%) and too much expectation of friend were (7.40%) third order stressors and death of a best friend (4.60%), getting angry by friend (4.60%), broke up of friendship with boy (4.10%) were fourth order stressors. The last order stressors experienced by female students of PUC were broke up of friendship with a girl (2.80%), criticism of friend (2.30%), student's friendship was denied by a group of friends (1.80%).

The present study makes it clear that peers had also contributed to stress always among 23 per cent of the students but remaining 77 per cent of the students had not been experienced stress always by the stressors of the peer relations. This may be because of the forming a new and mature relationship with members of the opposite sex and playing an approved role for their own sex is important during the period of sophomore. Thus they have to develop new attitudes towards members of opposite sex and they have to adjust with the new peers, acceptance and rejection by the peer group all these leads to the development of stress among students. The results supports to the study conducted by McCreary *et al.* (1996).

Academic stressors

Another important source of stress among sophomores is academic experiences. The vocational interests of adolescents generally influence their attitude towards education. Academic stress has emerged as a significant mental health problem in adolescents in recent years. Anxiety about examination and competitiveness in college cause stress and tension in students. Consequently they feel worried and frustrated (Bhattacharji, 1989). The results of academic stressors (Table 4) evidenced that problem of English language (21.20%) was the first order stressor experienced by the students. Followed by not punctual in studies (13.80%) as second order stressor and postponing the studies (10.60%) getting low marks in the examination (9.70%) were the third order stressors. The student was not selected in the team of college (5.50%), and not able to adjust with the college environment (5.10%) were the fourth order stressors. The last order stressors experienced by the students of PUC were student failed in the previous year (3.20%), getting into trouble in the class (2.80%), partiality done by the teacher (2.80%), and argument of the student with the teacher (1.80%). The fact is very clear that academic stressors had contributed to stress always among 21 per cent of the students but remaining 89 per cent of the students had not been influenced by the academic stressors always. This may be due to the language problem and no involvement in the studies regularly and habits of the students. These results supports to the studies conducted by Mischel (1974) and Elder (1979).

Stressors of physical health

The period of adolescence results in variations in physical changes and many adolescents experience Body Cathexis or satisfaction with their bodies. However, sometimes they do experience more dissatisfaction with some parts of their bodies than with other parts. This failure to experience Body-Cathexis is one of the causes of unfavourable self-concept, which may be a potential source of stress. The results of Table 5 showed that the stressors related to physical health such as, feeling tiered (6.50%), developing the problem of pimples (5.50%), and experiencing headache (5.50%) were the first order stressors .Followed by developing the problem of physical appearance (3.70%) menstruation (3.70%) and backache (3.20%) as second order stressors. Having the problem of vision (2.80%), under weight (1.80%), bodily pains (1.80%), and mouth ulcer (1.80%) were the last order stressors experienced by the female students of PUC.

About 7 per cent of the students had experienced stress always due to physical health stressors but remaining 93 per cent of the students had not been experienced the stressors of physical health. This might be because of the fact that many adolescents experience satisfaction with the variations in physical changes. However, sometimes they do experience more dissatisfaction with some parts of their bodies than with other parts. This failure to experience body cathe-

xis may be potential source of stressor. These results support to the study conducted by McGrath and Patrick (1999).

Psychological stressors

Adolescence is an age where these adolescent female students have to develop new social relationships and play different social roles in the society and thus the adolescents experience psychological stressors. In the present study results of Table 6 showed that, experiencing unnecessary fear (7.80%) was the first order stressor experienced by the students of PUC. Followed by experiencing unnecessary tension (2.50%) as the last order stressor. This study clearly express that the psychological stressors had contributed to stress always among 8per cent of the students remaining 92 per cent of the students had not been influenced by the psychological stressors always. This may be because some students of PUC might have been experiencing frustration, depression and more tension. These results supports to the studies conducted by Anand *et al.* (2001) and Patric and Melanie (1999).

Conclusions

* The female students of PUC I and II year had experienced more or less similar level of family relation stressors, peer relation stressors, academic stressors, physical health stressors, psychological stressors and overall stress.
* About 14 per cent of the female students had experienced family related stressors always but remaining 86 per cent of the students had not been experienced the family related stressors always.
* 23 per cent of the female students had experienced peer related stressors always, but remaining 77 per cent of the students had not experienced the peer related stressors always.
* About 21 per cent of the female students were experienced academic stressors always but remaining 89 per cent of them had not been experienced academic stressors always.
* The stressors related to physical health had contributed to stress always among 7 per cent of the students but remaining 83per cent of the female students had not experienced the physical health stressors always.
* Whereas psychological stressors had contributed to stress always among 8per cent of the female students but remaining 92 per cent of them had not been experienced psychological stressors always.

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Table 1. Comparison between female students of PUC I and II year on stressful life events

Sl. No.	Component of stressful life events	PUC I (N=112)		PUC II (N=105)		't' value
		Mean	SD	Mean	SD	
1	Family relations	66.40	11.50	64.76	9.90	1.122NS
2	Peer relations	20.28	3.96	19.77	3.36	1.027NS
3	Academic aspects	18.61	3.54	18.32	4.41	0.540NS
4	Physical health	31.50	4.34	32.20	4.62	1.182NS
5	Psychological aspects	5.19	1.35	5.29	1.66	0.481NS
	Stress	143.64	26.46	144.65	23.95	0.698NS

NS-Not significant

Table 2. Status of the female students of PUC on stressors of family relations

Sl. No.	Stressful life events	Stress always
		Girls N=217
	Father	
1	My father expects me to follow strict schedule in day to day activities	40 (18.40)
2	My father puts too much pressure on me to do the best in all the subjects	37 (17.10)
3	My father argues with my mother	17 (7.80)
4	I argue with my father	13 (6.00)
5	My father looses temper with me	-
6	My father is too strict with me	6 (2.80)
7	My father objects about my friendship	3 (1.40)
8	My father is living away from me	11 (5.10)
9	My father criticizes me	3 (1.40)
10	My father neglects me	6 (2.80)
11	My father is separated from us	-
	Mother	
12	I argue with my mother	11 (5.10)
13	My mother expects me to follow strict schedule in day to day activities	35 (16.10)
14	My mother puts too much pressure on me to do the best in all the subjects	15 (6.90)
15	My mother looses temper with me	7 (3.20)
16	My mother argues with my father	12 (5.50)
17	My mother is too strict with me	12 (5.50)
18	My mother is living away from me	12 (5.50)
19	My mother objects about my friendship	13 (6.00)
20	My mother neglects me	-
	Brother	
21	I argue with my brother	11 (5.10)
22	My brother criticizes me	12 (5.50)
23	My brother expects me to de everything for him	5 (2.30)
24	My brother talks against me	-
25	My brother is short tempered with me	5 (2.30)
26	My brother has left home	3 (1.40)

27	My brother gets angry with me	4 (1.80)
28	My brother acts superior to me	5 (2.30)
29	My brother will not give his materials to me	3 (1.40)
30	My brother will not share any experiences with me	-
31	My brother is no more	7 (3.20)
32	My brother will no talk to me affectionately	5 (2.30)
	Sister	
33	I argue with my sister	5 (2.30)
34	My sister gets angry with me	16 (7.40)
35	My sister talks against me	7 (3.20)
36	My sister expects me to do everything for her	7 (3.20)
37	My sister will not share any experiences with me	-
38	My sister will not give her materials to me	4 (1.80)
39	My sister has left home	-
40	My sister criticizes me	4 (1.80)
41	My sister is short tempered with me	-
42	My sister acts superior to me	9 (4.10)
43	My sister will not cooperate with me	6 (2.80)
44	My sister will not talk to me affectionately	7 (3.20)
	Other family events	
45	I experience financial problem	32 (14.10)
46	Our relative creates problem	11 (5.10)
47	My close relative is expired	4 (1.80)
48	My family member met with an accident	-

Note : Figures in the parentheses indicate percentage

Table 3. Status of the female students of PUC on stressors of peer relations

Sl. No.	Stressful life event	Stress always
		Girls N=217
1	I am in love with a friend	50 (23.00)
2	My friend has joined new group of friends	22 (10.10)
3	I argue with my friends	26 (12.00)
4	A girl has broke up friendship with me	6 (2.80)
5	My best friend is no more	10 (4.60)
6	My friend has moved away	17 (7.80)
7	My friend expect too much from me	16 (7.40)
8	My friend/friends criticizes me	5 (2.30)
9	My friend pressurize me to smoke	-
10	My friend/friends get angry with me	10 (4.60)
11	A group of friends deny friendship with me	4 (1.80)
12	A boy has broke up friendship with me	9 (4.10)
13	My friend pressurize me to take drug	-
14	My friend pressurize me to drink alcohol	-

Note : Figures in the parentheses indicate percentage

Table 4. Status of the female students of PUC on academic stressors

Sl. No.	Stressful life event	Stress always
		Girls N=217
1	I have the problem of English language	46 (21.20)
2	I am not punctual in studies	30 (13.80)
3	I post pone my studies	23 (10.60)
4	I get low marks in the examination	21 (9.70)
5	I am not able to adjust with the college environment	11 (5.10)
6	I miss classes	3 (1.40)

7	I get into trouble in the class	6 (2.80)
8	Teacher has done partiality with me	6 (2.80)
9	I am not selected in the team of the college	12 (5.50)
10	I argue with teacher/teachers	4 (1.80)
11	I am criticized by the teacher/teachers	-
12	I am sent out of the class	-
13	I failed in the previous year	7 (3.20)

Note : Figures in the parentheses indicate percentage

Table 5.Status of the female students of PUC on stressors of physical health

Sl. No.	Stressful life event	Stress always Girls N=217
1	I have developed the problem of pimples	12 (5.50)
2	I am under weight	4 (1.80)
3	My physical appearance is not good	8 (3.70)
4	I experience dizziness	-
5	I feel tired	14 (6.50)
6	I am anemic	-
7	I feel sleepy in class	-
8	I experience headache	12 (5.50)
9	I have the problem of sleeplessness	3 (1.40)
10	I experience back ache	7 (3.20)
11	I have the problem of vision	6 (2.80)
12	I have the problem of bodily pains	4 (1.80)
13	I have the problem of sneezing	-
14	I have the problem of kidney	-
15	I met with an accident	-
16	I have developed the problem of mouth ulcer	4 (1.80)
17	I have the problem of respiratory system	-
18	I have the problem of hearing	-
19	I have developed the smoking habit	-
20	I have the problem of digestive system	-
21	I have developed the menstrual problem	8 (3.70)

Note : Figures in the parentheses indicate percentage

Table 6. Status of the female students of PUC on psychological stressors

Sl. No.	Stressful life event	Stress always Girls N=217
1	I experience unnecessary tension	5 (2.50)
2	I experience unnecessary fear	17 (7.80)
3	I have developed the eating disorder	-
4	I have attraction of opposite gender	-

Note : Figures in the parentheses indicate percentage

S.E.S.E.P.H.C.M:-04

EMPOWERMENT OF SELF HELP GROUPS THROUGH VALUE ADDITION OF FINGER MILLETS

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Introduction: Empowering women needs a holistic approach to participate in decision making in the household, community and local domestic sector to take up leadership position in agricultural activities. SHGs in rural India are causing a silent revolution not only in terms of providing access to micro credit to communities but also in contributing towards

a greater sustainability in agriculture in various ways, including through a better use of marginalized local agro biodiversity. In this backdrop, the present work aims at empowering SHGs through processing and value addition activities.

Methodology:

The methodology involved quantitative as well as qualitative assessment conducted in Tubagere Hobli of Doddabalapur taluk, Bengaluru rural 2005-2010 in the frame work of the project funded by DBT-RBRC project by covering 272 SHGs, each group comprising of 19-20 women. The quantitative data was collected with the help of semi-structured interviews. The format covering questions relating to the family income, savings and loan schemes available. Secondary information was collected from books, ledger and registers maintained by SHGs. The data on socioeconomic status included the age, literacy level of women, family size, occupation, land holdings and family income. Dietary pattern was assessed by 24 hour recall method. Sets of pre-standard vessels were used to obtain estimates of raw and cooked foods consumed by the subjects. Subsequently, the individual consumption of nutrients like energy, protein, fat, iron and calcium were calculated using food consumption table and compared with the recommended dietary allowance (NIN 2010) and the adequacy of nutrients was calculated as per the method by Thimmayamma *et al.,* (1987) for the food stuffs and nutrients.

Results and Discussion:

Table 1.Socio-demographic profile of women of SHGs (N=4050)

Variables	Category	Respondents	
		Number	Percentage
Age (Years)	21-25	2900	72
	26-35	745	18
	36-40	405	10
Education	Illiterate	1836	45.33
	Primary	955	23.58
	Middle	658	16.24
	High School	578	14.27
	Pre-University	15	0.37
	Degree	8	0.19
	Post Graduate	-	-
Occupation	Housewife	1810	45
	Laborer	2240	55
Type of Family	Nuclear	3610	89
	Joint	440	11
Family size	<5	3530	87
	6-10	517	13
	>10	3	0.07

The socio-demographic profile of the members of SHGs is presented in table 1. The age profile indicated that the SHG members belonging to the age group of 21-25 years formed the largest class (72%) followed by that of 26-35 years (18%). With regard to literacy, 45.33% of members were illiterate, 23.58 % having primary school level literacy,16.24% having middle school,14..27% of members were high school, only 0.37 to 0.21% of the members were Pre-university and degree respectively. Occupation pattern indicated that majority of them were laborers (55% and 45%) of them are housewives and the family size was less than 5 members in 87 % of the samples. The results also showed that 87% of families were nuclear. Out of 4050 farm women 1713 women were registered members of SHGs.

The training programmes focused on processing and value addition of ragi, maize, baby corn, tomato and jack fruit products. Altogether 1713 SHGs members were trained of which 150 were selected for detailed skill development in processing, value addition and marketing of value added products. Secondly intensive training on value added product both on and off the campus were conducted to select the suitable products having commercial potential for income generation activities and to facilitate enterprise building by the SHG women. Further training was also imparted to these women on nutrition education, importance of value addition in food products, Hazard Analysis and Critical Control Point (HACCP), handling of milling equipments, labeling, branding and marketing of the product. The impact of the training programme on the empowerment of women was also assessed.

Dietary pattern of SHG families

Table 2.Mean nutrient intake of rural women in comparison with RDA

Nutrients	***RDA****	***Nutrient Intake***			
		Bench mark year Mean	***% Adeq uacy***	*End of the project* ***Mean***	***% Adeq uacy***
Energy (kcal)	2225	1858	83.50	1940	87
Protein (g)	50	44.5	89.00	52	104
Fat (g)	20	15.5	77.50	17	85
Calcium (mg)	400	680	120	696	174
Iron (mg)	30	15	50	22	73

(*Gopalan *et al*.,1996)

Table 2 shows that the mean intake of nutrients by SHG women after the intervention viz. energy, fat and iron were increased compared to bench mark year and on par with the recommended dietary allowances RDA (Gopalan *et al.,* 1996), this may be due to knowledge of nutrition imparted during intervention period.

Table 3.Training Programmes conducted both at G.K.V.K and project area during 2005-2010

Sl No.	Year	Name of Training Programme/Field day/Field Visits	No. of Participants
1	2005-2006	Value added products in from ragi	85
2	2006-2007	Improved functioning of SHGs. Ragi malt preparation in each village covering five panchayaths	369
3	2007-2008	Interaction meetings, Improved functioning of SHGs. Ragi malt preparation in each village covering five panchayaths	684
4	2008-2009	Ragi malt preparation in each village covering five panchayaths, and follow-ups	313
5	2009-2010	Ragi malt preparation in each village covering five panchayaths, follow-ups. Establishment of Sales outlet including bakery and agro processing centre	262
		Total	1713

Table 3 shows the number of participants participated in the training programmes and meetings. Totally 1713 SHG women participated in the meetings and trainings programmes conducted by the RBRC project.

Preparation of Nutri Drink:

Ragi + wheat + green gram
60% 15% 15%

↓

Washing and Soaking

↓

Ragi & Wheat 24 hours — Green gram 8 hours

↓

Germination

↓

Ragi & Wheat 48 hours — Green Gram 24 hours

↓

Drying
(60° C for 8 hrs)

↓

Roasting

↓

Powdering (Milling)

↓

Mixing of Defatted soy flour (5%) and SMP (5%)

↓

Addition of flavour
(Cardamom powder 10g/kg malt)

↓

Sieving

↓

Packing

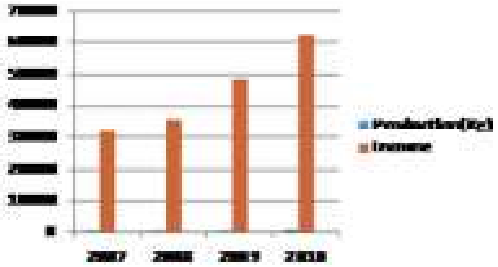

Fig1. Income generated from the sale of ragi malt

Fig 1. shows the production of ragi malt increased from 400 kg to 630 kg for the period 2007-2010.Earlier the fixation of rate was Rs 60-80/kg and later it was fixed to Rs.100/kg(2008). In the year 2010 there is a tremendous increase in production and sale due to opening of bakery, publicity, consumer awareness and easy accessibility.

Aspects	Response on awareness (%)						Enhancement	
	Bench mark year		End of the project					
	Mean	SD	Mean	SD			Mean	SD
General nutrition	32.0	17.7	77.4	17.1			45.5	10.0
Health and hygiene	54.0	21.3	84.0	16.0			30.0	11.2
Nutritional deficiency diseases	35.0	20.8	59.6	13.2			24.6	13.9
Breast milk and infant feeding	44.6	23.1	75.8	16.6			31.3	14.8
Anganwadi/midday meal benefits	49.4	20.0	79.5	17.7			30.1	11.6
Awareness about ragi products								
a) Processing	15	6.5	98				83	18.5
b) Quality control practices	10	6	80				70	17.0
c) Packing,branding and labeling	15	6.9	95				80	18.3
d) Marketing	-	-	75				75	16.7

Table 5 shows the general awareness of the subjects with respect to nutrition, health and awareness of marketing of ragi products was assessed with the help of schedule. The table ravels that majority of the women were not aware of balanced food and micronutrients deficiencies. However post education session showed increase per cent of knowledge (32% to 84%) with an enhancement from 24.6 to 83 per cent on above aspects. Hence nutritional education to the rural women is important in the dissemination of knowledge and for creating awareness about the trends in marketing.

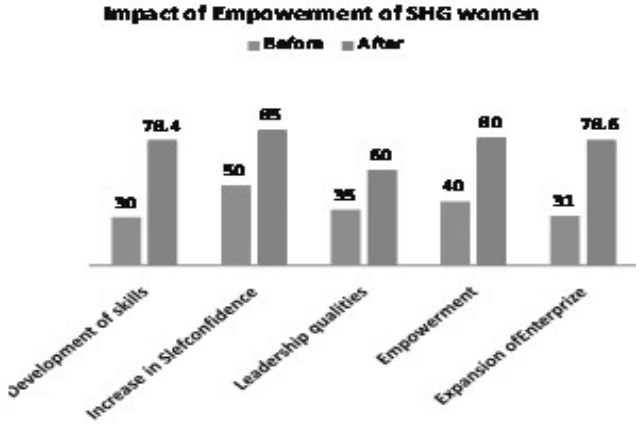

Fig.2 Impact of Empowerment of SHG women

From fig2, it is evident that the results of the intervention introduced by RBRC had an impact on the development of skills, increase in self confidence, leadership qualities, empowerment and attitude in expansion of the enterprise played an important role in boosting the income generating activities pursued by the women

Employment generation:

Presently it has created employment to SHG women**,** and they are selling 12 value added products such as Nutridrink, Ready to drink ragi malt, Chakkuli, Mixture (Hot mix), Kodubale, Biscuits, Chat-pat, Halva, Vermicelli, Murukku, Pie, Pedha, Sandige and bakery products under the brand name UTHAM through an sales outlet named "Bhumika Bakery & Sweets" which was opened by the SHG women with the support of project at Hadonahalli, Doddabalpur taluk, Bengaluru Rural District.

Conclusion:

From the study the it is reavealed that SHG women were able to generate substantial income used towards their own family welfare. The training interventions by the RBRC project played a stetergic role by increasing self confidence of SHGs in undertaking small scale food processing of value added products of ragi and capacity building of women at the village level and also changed in their nutrient intake.

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S.E.S.E.P.H.C.M:-05

ROLE OF CULTURAL SENSITIVITY IN PRIMARY EDUCATION

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INTRODUCTION

"Life style is not a fixed role or part an individual plays in life, but rather a style of living that is formed after the individual has made choices based on a wide range of options…"

- The distinguishing feature of a life style is based on the question of "choice," because during the assessment of a choice or the process of forming a decision, there is no single organization or institution that aims at individual choice making in life to suit his fascination & compete the world.
- Philosophy of modern sciences is usually divided into branches of "natural science" and "social science," each representing "objective/ subjective" paths in the search for truth, and having obvious differences in terms of epistemology and methodology.
- Individuals are conditioned by society in terms of how they perceive and interpret the world, and how they feel about certain people and things.
- Knowledge is often seen as gleaned from ways by which people interact with the world, the way people perceive wisdom filtered and interpreted by larger social forces.
- Sociologists have observed that the combination of specific symbols and meanings – a hierarchy and identification behind our behavior empowers the all round development of the persona…
- Under such ambiguous and unstable social environments, the boundaries between nature and culture, certainty and risk have increasingly blurred, and people are forced to make choices about their lives without any clear guidelines.
- Aesthetic education within its social and historical context, explores background with factors moulding globalized cultural economy, globally bound mankind.
- Economy and culture are the two closest matters related to human beings in the social world.
- Cultural economy has gradually taken shape under the influence and interaction of the two forces.
- "Culture industry" is not only a mainstream concept, but

has become an economic strategy and goal - seethe, pursued by many countries, nations globally.

• The traditional binary oppositions of culture/ commodity, popular/refined, cognitive/aesthetic, rational/emotional define the unexplored terrains of cultural education.

• In addition, traditional opposing binary modes such as border/ central, developed/ undeveloped are inadequate to describe the complex, overlapping, and dispersed political, economic and cultural phenomena around the globe.

• The combination of culture and economy has given consumption more meanings than consumption itself.

• The overlapping interactions between culture and economical society development and human beings desirous crave of aesthetics; the two arenas are undergoing subtle changes.

• The relationship between cultural production and consumption, and its momentum on culture and arts institutions highlights the thin line between reality & individual potentates' everlasting dynamic impressions.

• A scholastic persona is attributed on the bias of traits of ethnicity & legacy of a genre of Passover traditions, Zen and liberal motivated rationalism.

PRIMARY EDUCATION

The main objectives of primary education are the following,

• To equip pupils with knowledge, skills, values and attitudes to enable them to be literate and able to count,

• To be equipped with requisite competencies for successful secondary education;

• To foster social, emotional, spiritual, cultural, physical and intellectual development of every individuals;

• To provide experiences that enable pupils to function at their maximum potential;

• To foster individuals ability to think critically for the society and the nation;

• To develop an appreciation for democratic system of government;

• To help individuals to become responsible citizens and productive members of society;

• To develop national pride & awareness;

• To teach individuals skills of adaptation to cope for the demands of a changing world;

• To lay a foundation for further education and lifelong learning;

SECONDARY EDUCATION

Secondary education aims at,

• Providing individuals with knowledge, skills, attitude and values which will develop their employment skills thus preparing them for the competitive world ;

• Preparing individuals to function as responsible citizens in a democratic society;

• Inculcating in each individual a positive vibe of healthy work attitudes ,and a deep sense of national pride;

• Providing the basis for further informal inculcated education and lifelong learning;

• Providing the skills, ability required to function in the world of science and technology.

OBJECTIVES : DOMAINS OF CONCERN

• Effective long-term solutions need an integrated approach which includes social economic, regulatory and ecological aspects.

• Resolving environmental issues requires active participation by the whole community.

• The following objectives, to be realized in individual, growth and development, are pursued,

• Appreciation and understanding of historical, cultural, economic, political and social background of the nation.

• Appreciation and commitment to rights, privileges and responsibilities of citizens in a democratic society, with particular reference to respect for self and others;

• Ability to think creatively and rationally, through clear articulation of speech and writing;

• Pursuit of excellence in education and industry;

• Basic literacy and numeric skills and a yearn for lifelong learning;

• Appreciation and utilization of principles of science and technology;

• Profound appreciation of environment - both natural and social;

• Ability to apply principles for sound, physical, mental, emotional and spiritual health.

• Low level of professionally trained principals at both primary and secondary levels;

• Insufficiency of secondary and tertiary education opportunities;

• Influence of cultural penetration resulting in the erosion of traditional values and the concomitant increase in socially deviant behaviour of students;

• Widening gender disparities in local and external examination performance.

MAIN PRIORITIES TO EFFECTUATE PRIMARY EDUCATION PROCESS

• Access to and improved quality of basic education & vocabulary

• Increased internal efficiency of the education system

• Teacher ICI training

• Technical and vocational education training (TVET);

• Computer education and legislative reforms.

• Concomitantly, the main goals of education are the following:

• Promotion of justice and equality - as gender, geographic location, social ,class, age, ability - and a harmonious, democratic, national, critical and creative approach to life;

• Development in individuals of intellectual skills / excellence necessary for civic competence;

• Enhancement of individual capacity for independent thought and critical analysis;

• Expansion of knowledge through research and scholarship;

• Development of the productive capacity of individuals to meet manpower needs of the economy;
• Development of appropriate values and behaviours that is consistent with the ethos of the nation.
• Development of appreciation of the country's cultural heritage and an awareness and understanding of the culture of other societies;
• Ability to select and prepare for occupational activities.

INITIATIVES TO AFFIRM LITERACY IN THE RURAL FRONTIERS

• Restructure management of the Ministry of Education and training of senior management staff;
• Enhance the quality of teachers and learning through upgrading basic teacher training and strengthening in-service training for teachers;
• Provide a better supply of instructional materials;
• Establish educational testing and measurement capacity to monitor students performance;
• Instituting nationwide standardized tests in maths and English in primary & secondary education
• Develop educational materials production capacity in the Ministry of Education;
• Provide additional places at secondary level
• Upgrade infrastructure in selected primary and secondary institutions.

NON-FORMAL / INFORMAL EDUCATION

• The non-formal / informal education is intended for priority individuals embittered of primary and/or secondary education – to be a class inferior with regard to social and employable skills attained from Formal education.
• A cultural sensitized primary and secondary education embarks to be a benchmark in a globalized education system to empower the talented rural sect.
• This component of the education service is critical, & bridging the overall human resource development and thus national development.
• The mission of pre-school education is to promote the all-round development of 3–4 year olds.
• The main goals of pre-primary education (early childhood education and development, ECED) are as follows:
• To provide environment that stimulates social, emotional, intellectual, spiritual and creative development of children aged 3-4;
• To educate parents and the community in general as to the developmental needs of the young and the importance of proper training during the formative years;
• To involve parents and the community in ECED, establishing the principle of partnership among providers, parents and the community.
• Non-governmental organizations (NGOs) & Voluntary organizations involved in imparting non-formal education (some with support from the government) carry out similar programmes resulting in either recognized certification or personal development skills.
• Non-governmental organizations (NGOs) and the private sector participate in the formulation of educational policy via the consultative approach employed from time to time for the purposes of educational planning.
• Besides the academic programmes delivered, vocational and skills training programmes in areas such as sewing, home economics, typing, small business development, and health and family life education, among others are presented inculcated.
• They focus on vocational skills training for the youth, many of whom are school dropouts and desire to be skilled in a trade or craft, arts, literary forms.

REQUISITES TO REFORM EDUCATION

• India a diversified nation has arenas which divulges and diversifies in areas, terrains but cumulates to be a diversified nation.
• Thus varied apart all individuals secular and contrary in perceptions, skill, talents reveals to be part of development of the nation
• Though contrary and perceived every persona contributes to emphasize a major role in a socially sound economic nation.
• An informal educated persona has mystic skills; talents empower to be on par with formal oriented educated individuals.
• The ongoing trends of educative systems limits to suit the competitive world yet ebbs away obscure talents and skills of individuals.
• A persona embodies cultural ethics, morale' socially sound portrayed to suit the changing trends and era.
• Education systems must confine, redefine its analyzed methods of principles, measures & means of curriculum oriented formal education, revitalize the modes of imparting education to socially challenged & talented individuals to recreate, rejuvenate as per the competitive scenario.
• One effective way is to imbibe informal / orientated gurukul mode of effectual learning to ascertain all mediums which justifies the individual interests , talents to Surface encored ethics, socially, economically – inert active personnel's for a inbuilt nation.

CONCLUSION

• India, a rich culturally diversified heritage has no bounds, terrains in glorifying a legacy of traditions, customs at scholastic levels.
• Each region and ethnic group contributes different aspects to respective folk culture.
• Culturally bound primary education empowers the totality of the persona to be talented & multi-faceted & embarked with intuitions to face the global scenario.
• The study inculcates a wide spectrum of up-bringing challenges,& NEEDS
• Acquired information about the environmental knowledge,

attitudes, values, skills and behaviors of NSW school age children contributing to the total personality development.

- Explore influences on the development of environmental awareness of young people specifically in relation to ESL students, youth sub-cultures, gender and socio-economic, rural and urban factors, and family influences;
- Data will provide a benchmark for tracking social dimensions of environmental protection;
- To explore and develop a conceptual framework on the environmental awareness of young people which would underpin policies and programs for young people to be a RESPONSIBLE CITIZEN OF FUTURE WORLD.

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THEME:-09

SOCIO-CULTURAL SCIENCES INCLUDING ARTS & MUSIC

S.C. A. M:-1

INFLUENCE OF ECLECTIC OUTLOOK ON EDUCATION

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If we want to change the nation we should change the minds of that nation. In other words education is the only means to change the mentality of the people of who constitute the nation. Therefore if we you wish to achieve emotional integration in India, we should re-organize our system of education keeping into consideration the high ideal of emotional integration. For this, our education should inculcate national and human values forming attitudes of respect of national culture, national history, national tradition, national language and international understanding. Our people should be moulded based on sociological, psychological and philosophical tendencies which are an integral part of aims of education curriculum and methodology. The synthesis of these tendencies is the Eclectic tendency is that which seeks the harmonization of principles underlying various tendencies and rationalization of educational practices. The advance of science and indulgence of modern world needs a harmonious unification of ideals and beliefs to leave wide the differences and conflicts.

Conflicts between interests and efforts in education, controversies between freedom and discipline have to be solved through self-reliance, obedience, self-confidence which have to be inculated in children. Modern progressive education contains all the essential merits of all the philosophies and tendencies of education. The credit of this synthesis and unified integration goes to eclectic tendency.

S.C. A. M:-2

UTSAVA SAMPRADAAYA KEERTANA-S OF SAINT TYAGARAJA

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India is the largest secular country, with many languages, varied cultures and traditions existing in it. “Unity in Diversity can be seen in this country”. Spirituality is an integral part of our Indian culture. The uniqueness of our Culture lies in worshipping every object and every creature as a form of God. It is our speciality to offer everything, whatever we do, to the Divine. Many sages and saints who followed this path of Dharma, sanctified their lives and attained liberation (Moksha). Saint Tyagaraja was one among those saints. He took the Sangeetha and Saahitya as two instruments, and through them, he became the recipient of Divine bliss.

He composed thousands of compositions and dedicated them, to his favorite Deity, Lord Sri Rama. Tyagaraja has a significant place in the field of Carnatic Music. His compositions can be broadly categorized into four types. They are, 1).Music Oriented Kriti-s, 2). Divya naama keertana-s, 3). Utsava Sampradaaya keertana-s and 4). Geya Nataka-s. Among these, the present paper discusses the significance of Utsava Sampradaaya Keertana-s of Tyagaraja.

THEME:-10

PSYCHO-SPIRITUAL & PHILOSOPHICAL SCIENCES

P.S.P.S:-01

TO ATTAIN COOLNESS WITHIN— A PATH INSTRUCTED IN YOGA VASISHTHA

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It is a common statement we here in the society that ' we are not happy; no peace of mind; we are always tensed, etc. How to be happy? How to get out of tension in this competitive era ? How to have the peace of mind, if one or other situation keep disturbing us in the society? Really this a challenge to the modern man. He has to keep pace with the society; as well as he has to maintain his cool temper. Is this possible? is a big question. But Yoga Vasishtha says **yes.** It shows the path to maintain coolness within us, probably the solution to all the questions raised above.

I think India is the only country, which tells the aim of education , i,e ***self reliance*** where as other countries, as we know opt physical pleasures, which are temporary.
Yogavasishtha is the conversation between **Sri Rama** and the great sage **Vasishtha.** He teaches ***atmavidya*** to his disciple Rama through the way of Yoga. Yoga takes us to the state of ***samadhi by deep concentration.*** Here Rama is asking his preceptor, Vasishthsa, who is a better person-is he the one in whom the ***samadhi*** has arisen in the regular course or some one resorted to solitude is stead fast in the observation of ***samadhi.***

The preceptor is performing his duty promptly; i.e. clarifying his doubts. To one who is seeing this aggregate of ingredients constituting nature as Non-Self, or mere appearances in the Self, which is pure Being Consciousness, the inner coolness or tranquility which manifests is declared as ***samadhi***. If one thinks that the visible objects are no way connected to him, remain cool established in work and some one else is settled in meditation. Both of them are happy, as they are cool within. Both of them are perfectly equal. says Vasishtha. Here we can recall this shloka of Mohamudagara of Sri Adi Shankara-

योगरतो वा भोगरतो वा सङ्गरतो वा सङ्गविहीनः ।
यस्य ब्रह्मणि रमते चित्तं नन्दति नन्दति नन्दत्येव ॥

A man can choose any path in life he likes. He may practice yoga; he may have the pleasures of worldly life. He may be alone or he may be accompanied with any one. Only thing he has to do is to concentrate his mind on **The Ultimate.**, then he will certainly be happy always. All of us practice every thing as quoted in this verse except the last part and be denied of real happiness or tranquility.

To attain this one's mind should be of thin mental impressions. It is considered as a non doer even though it is doing. Here the sage gives the comparison of a man with his mind gone far away, does not register in hearing a story. The mind with extremely dense impressions is considered as a doer, even though not doing. Here he compares this with a situation of fall into a hole in a dream, even when the limbs are without movement. he is said to be calm, who delights in the Self within, performing works with the organs of action, not influenced by joys or sorrows. He perceives rightly who looks upon all beings as himself, and the possessions of others as a lump of mud, merely by inherent nature and not by fear.

This supplemented with the story of Suraghu.. Long back there was a king by name Suraghu of Kiratas. He performed the duties of administration of the kingdom by the methods of punishment and rewards. his mind became restless by the pleasures and pains caused by the administration.

Once great sage Mandavya came there. He treated him and honored him with due devotion and put forth his question to him thus - Master, please clarify this to me. The punishments and rewards in my administration have risen on the person of my subjects have greatly injured me. How shall equanimity **समता** rise in me?

The reply of the great sage Mandavya to Suraghu applies to every human being. He said it can be possible only by Self or own investigation. By this the anxiety of the mind within is extinguished quickly. How to investigate our selves is the question. we have to put these questions to ourselves- ***Who am I? How did this world come into existence? What possibly is this existence? How do the cycle of birth and death take place?***

The same idea is reflected in this verse of Sri Shankara Bhagavatpada-

का ते कान्ता कस्ते पुत्रः संसारोयमतीव विचित्रः ।
कस्त्वं कोऽहं कुत आयातः तत्त्वं चिन्तय तदिह भ्रातः ॥

He continues- having well understood your nature, having reflected thus attains tranquility, free from anxiety. Until everything is completely renounced, the pure Self is not obtained or perceived.

यावत् सर्वं न सन्त्यक्तं तावदात्मा न लभ्यते ।

Having said thus the sage left the place. The king started to reflect with in him self.

देहमात्रम् अहं नास्मि हस्तपादाद्यचेतनम् ।
कर्मेन्द्रियाणि नैवाहं न च कर्मेन्द्रियाणि मे ॥
जडान्यतत्स्वरूपाणि न च बुद्धीन्द्रियाण्यहम् ।

नाहम् एव शरीरादि शिष्टम् आलोकयाम्यहम् ।
शेषो विकल्पहीनो हि विशुद्धा चित अहं ततः ।

सर्वभावगता सूक्ष्मा भावाभावविवर्जिता ।
स एव भगवान् आत्मा तन्तुर्मुक्तास्विव स्थितः ।

I am not the body, which consists of insentient hands and feet. **I** am also not the organs of action(mouth, hands, legs , generative and the excretory organs) nor do the organs of actions belonging to me. **I** am also not the organs of perception (sense organs) which are insentient and of unreal nature. **I** am thus not the body and like. **I** shall consider what is left. The remainder is indeed a variety of doubt. Therefore **I** the pure consciousness contained in all thoughts, subtle and destitute of existence and non- existence. He alone, the Self and the God, exists just as a thread exists in a row of pearls.

Thus having known, the king Suraghu obtained the highest abode.

This is further supported by conversation with **Parigha.**

Parigha was a Persian King.. He was a great friend of Suraghu. Once a great famine occurred in Parigha's kingdom. He left the kingdom and went to forest. He used to live upon dry leaves there. and was remembered as Leaf - eater. Once Parigha came to the palace of Saraghu with joy. There the two old friends spoke this to one another-

Parigha: This knowledge has been acquired by me as you have obtained formerly. I hope that you do only the actions which have a blessed motive with equal vision which is clear and deep. I also hope that you are not attached to enjoyments which are pleasant ,only until they cause your down fall. Further I hope that you practice ***Samadhi*** which is tranquility and supreme felicity.

Suraghu : On account of an ever awakened intellect ,even though performing worldly activities ,those who are resting on one true principle of Self, are only profoundly absorbed in ***Samadhi***. Perception of truth or the ultimate reality is the fire, that destroys the straw of desires is spoken of by the word ***Samadhi,*** and not remaining in silence. That state of mind is described thus -

अक्षुब्धा निरहङ्कारा द्वन्द्वेष्वननुपातिनी ।
निश्रान्ता विगताभीष्ट हेयोपादेयवर्जिता ।
प्रोक्ता समाधिशब्देन परिपूर्णा मनोगतिः ॥

The state of mind which is contented, not agitated, free from egotism, not alighting upon the pairs of opposites such as pleasure and pain in succession, free from anxiety, devoid of object desire, destitute of fit to be abandoned or fit to be acquired, is meant by the word ***Samadhi***.

Parigha: Oh, king, you are certainly enlightened. You have reached the abode of That reality, with your mind completely cool devoid of the affliction of egotism.

Thus both the friends, having investigated delusion of the worldly existence, were gratified and honoured one another.

Many things are discussed in this conversation. The definition of ***Samadhi*** is given. Both the friends are Self -Reliant here. Both of them have investigated them selves by internal journey. They have reached the stage of ***Samadhi*** according to the definition given. Both of them are devoid of mental impressions. Here not only the way of attaining ***Samadhi*** is discussed, but also the qualities of the achiever are also explained. To remain in that state always, elevation of one's Self is the mort important.

यो ह्यध्यात्ममयो नित्यं नित्यम् अन्तर्मुखः सुखी ।
नित्यं चिदनुसन्धानः स न शोकेन बाध्यते ॥

न धनानि न मित्राणि न शास्त्राणि न बान्धवाः ।
नराणाम् उपकुर्वन्ति मग्नस्वात्मसमुद्धृतौ ॥

मनोऽहङ्कारविलये सर्वभावान्तरस्थिता ।
समुदेति परानन्दा या तनुः पारमेश्वरी ॥

सा स्वयं योगसंसिद्धा परमा विगतोपमा ।
न गम्या वचसां राम ह्यथेवेहानुभूयते ॥

One who is always engaged in meditation of the Self, who always looks within, who always contemplates on the pure consciousness is never oppressed by sorrows and experiences the ***supreme bliss.*** Neither the riches, nor the friends, nor scriptures, nor relatives, help men in the lifting up of one's own Self that is sunk.

On the dissolution of mind and egotism, there arises that greatest delight, which is the manifestation of ***Supreme Being.*** existing within all the living beings. Rama, that most excellent state, devoid of comparison it self is fully accomplished by yoga. It is not approachable by words. It is only experienced in the innermost being of a person.

Here it is clearly mentioned that ***the Coolness*** is not found externally. It should be practiced by yoga only. It is beyond the reach of human words. We can recollect the Upanishadic saying यतो वाचो निवर्तन्ते अप्राप्य मनसा सह It should only be experienced. It is the ***Supreme Being or the Ultimate*** to be achieved. Sri Adi shankara says thus-

गुरुचरणाम्बुजनिभरभक्तः संसारादचिराद्भवमुक्तः ।
सेन्द्रियमानसनियामादेवं द्रक्ष्यसि निजहृदयस्थं देवम् ॥

A man who is a real devotee of a guru,can be released from the bondage of thois world, having control over his mind and senses , can see the God in ***himself***. This is the message of the great sage Vasishtha to the world that the coolness within can only be experienced through yoga. To practice

this one should have self control. By practicing this may the whole society experience the divine bliss.

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P.S.P.S:-02

AN INQUIRY INTO SYADVADA – THE INSIGNIA OF JAINA PHILOSOPHY

Dr. B.S. Shamala Rathna Kumari

"Sreematparama gambhira Syadvadamogha lanchanam jiyat
Trailokanathasya sasanam jinasasanam"

Syadvada (Logical Relativism), the Insignia of the Jaina philosophy is the logical expression of Anekantavada, the unique philosophical doctrine of the Jaina creed. Jaina philosophy is a philosophy of philosophies. All philosophical systems seek truth. Truth in Jaina view is Real cum unreal i.e., Sadasat, which strikes a golden philosophical mean between the extremes of the Sankhya view that everything is real (sarvamsat) and the Buddhist view that everything is unreal (sarvvamasat). Truth i.e., Right Vision (Samyakdarshan) is Jaina perspective is the Thing-as-it-is-as-a-whole in all its related facets and relative aspects each of which is real (sat) from a selected point of view but unreal (asat) from another. Thus, Jainism put forward the philosophical device of Anekantavada that could successfully synthesize all ideological opposition and discords and alchemise them into philosophical harmony and concord. The appeal of Jainism is a drift from the subjectivity of ideas (vichara prapancha) to objectivity of the world of things (vastu prapancha). The arguments of Jainism is that if the world of things is big enough to hold all sorts and conditions of objects in their contradictory natures, the world of ideas too should be wide enough to reflect all shades of thoughts and variety of viewpoints, however opposed to each other and contradictory to one another they might appear to be.

According to the Jain epistemological treatises, the philosophical views are principally two – Dravyarthika – naya (substance view) and Paryayartika – naya (modal view). Each view, carried to the extreme, denies the reality of the other. One emphasizes the universal and the continuous to the exclusion of the changing and the different and the other the opposite view. The Vedanta is cited as the exponent of the extreme form of the Substance view and Buddhism represents the exclusive modal view. But Jainism reconciles these two opposed views by according equal reality to substance and its modes, for, there is no substance without modes nor are there modes without substance. Reality is manifold (Anekantatmaka); it is not of one nature. It is unity and difference, universal and particular, and also permanent and changing. The Jain philosophy shaped its epistemology on this pattern and formulated the logic of the disjunction of the real, i.e., Syadvada. This view may be considered as the midway between the two extremes of Atmavada and Anatmavada. Thus, the Jain Anekantatmaka with its logical expression of Syadvada is said to be the third stream of Indian philosophy. There are two kinds of natures found in all substances. Any real, concrete, existing thing or being can be looked upon in a general way or in a particular way, i.e., it has natures in common with other things (Samanya svabhava), and at the same time it has natures particular to itself (Visesa svabhava). For instance, this pot is matter and it compares well with other material objects and at the same time it is a particular matter, namely, clay. According to Jainism there is no such thing as matter (Pudgala) or any substance (Dravya) only in general, wherever there is no matter it is matter of a particular kind, or wherever there is substance it is substance of a particular kind. Of the general nature of substance, one is existence (astitva); another is knowableness (prameyatva). According to Jainism things are knowable.

The general natures are always everlasting. Other natures common to all substance are the fact of being in one sense permanent, uncreated, indestructible (nitya, samanya svabhava); and the fact of being in another sense perishable (anitya, samanya svabhava). For instance gold in a ring is perishable, but gold exists in some other things. Other common natures are the fact of being one or a unit (eka), the fact of being many (aneka), the fact of being separate (bheda), and the fact of being non-separate (abheda). From the point of view of omniscience the general natures of a thing are infinite.

Of the particular nature of substance consciousness (chetana) is one, and belongs only to living substances (jiva). Another particular nature is the fact of having form, and is peculiar to matter (pudgala). Another is the fact of containing, which is peculiar to space. From the point of view of omniscience the particular natures of a thing are like the general natures, infinite.

So, everything, then, has the natures, both those peculiar to itself, and those in common with other things.

The next important point in connection with the substances is the ways of knowing it, or the aspects it has i.e., Nayas. The main function of philosophy is to find out truth proceed-

ing from the known to the unknown. The Jain procedure follows the three stages of Synstatis, Analysis, and Synthesis.

Synstatis is the stage prior to analysis which is the indefinite cognition of a thing or an idea as an isolated object. Next is the stage of Analysis which is the resolving, separating, or differentiating the parts, elements, properties, or aspects of the object of cognition. The last is the stage of Synthesis which is the putting together of the first vague indefinite cognition with the subsequent analysis to form a correlated unity of a variety of aspects.

The final synthesis of the nature of a substance, to achieve the correlated unity of a variety of aspects of substance leads us to the consideration of the logical seven fold expression of Anekanta i.e., Syadvada or the Saptabhangi Naya.

The seven modes of expression of the Syadvada are interrelated and each pre-supposes the other and each implies the others. These modes pertain to the expression of the 'is or is not' of a thing. The Jain parable of six blind men inclined to learn about the elephant went to see it. At the end of their investigation each one of them reported their findings in terms of their observation by touch of the different organs of elephant. The report of each person is correct factually but is not the whole truth. The Jain perspective of Right Vision (Samyagdarshan) is the 'Thing-as-it-is-as-a-whole' (tatva). The truth in the Jain view is Real-cum-Unreal (sadasat). This is denoted by the word 'Syat' (sambhavam – possibility). The word Syat is used in this context not as a verb (kriyapada) but as an immute (avyaya-everlasting), in philosophical sense of skepticism. The seven modes of Syadvada are as follows:

Syadasti – that which exists in all its possibility.
Syannasti – that which does not exist in all its possibility.
Syadastinasti ca – that which exists and non-exists in all possibility.
Avaktavyam – that which is inexplicable.
Syadasti avaktavyam – that exists inexplicable in all its possibility.
Syannasti avaktavyam – that non-exist inexplicable in all probability.
Syadasti nasti avaktavyam – that exist and non-exist inexplicable in all probability.
Syadvada concept can well be understood with the help of the following illustration of the soul (Atma).
Soul is eternal in all probability (Syannityah) i.e., sould is eternal as mere consciousness (atma kevala chaitanatvena nityah).
Soul is non-eternal in all probability (Syadanityah) i.e., soul is non-eternal as it is concealed in human body (manushyasariravacchinnatvena anityah).
Soul is both eternal and non-eternal in all its probability (syannityah anityah ca) i.e., soul is both consciousness and concealed in human body.
Soul is inexplicable in all its probability (Syadavaktavyah) i.e., soul existing simultaneously as mere consciousness and soul concealed in human body is inexplicable.
Soul eternal in all probability is also inexplicable (Syannityah avaktavyasca).
Soul non-eternal in all probability is also inexplicable (Syadanityah avaktavyasca).
Soul is eternal, non-eternal and also inexplicable (Syannityah anityasca avaktavyasca).

'Svadvada establishes the existence of the Soul as Knowledge and the non-existance of the Soul as Knowable'.

Thus, Syadvada examines a thing in all its facets, in its entirety, at all times by following the procedure of logical agreement and disagreement (anvaya vyatireka) applying the principle of universal relativity.

Syadvada is advocated as the sure evidence of the manifold nature of the matter by Acarya Kundakunda in his work 'Samayasara' in the following verse

Atra Syadvada suddhyartham vastutattva vyavasthithih |
Upayopeyabhavasca managbhuyopi chintyate ||

Anekanta analyses the fourteen modes of reality viz. specific-nonspecific; single –manifold; existence – nonexistence of substance, state, place, time; permanence – non permanence which are different and contrary to each other and proves useful in enlivening all the modes of reality present in the matter. Thus, Anekanta, establishes itself as the unviolable Jaina doctrine of right vision i.e. Samyagdarshana which is reflected in the verse quoted below:

Evam tattvavyavasthitya svam vyavasthapayan svayam |
Alanghya sasanam Jainamanekanto vyavasthitah ||

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P.S.P.S:-03

ಯೋಗ ಮತ್ತು ಶಿವಯೋಗ

ಪ್ರೊ॥ ಬನುದೇವಿ ಎಂ. ಸಂಕಣನವರ್
ಎಸ್. ಬಿ. ಕಲಾ ಮತ್ತು ಕೆ. ಸಿ. ಪಿ. ವಿಜ್ಞಾನ ಕಾಲೇಜು, ಬಿಜಾಪುರ

ಪ್ರಸ್ತಾವನೆ: ಭರತಖಂಡವು ಧರ್ಮಗಳ ತೊಟ್ಟಿಲು ಎಂದು ಹೆಸರು ಪಡೆದಿದೆ. ಆ ಧರ್ಮ ದರ್ಶನಗಳಿಲ್ಲ ಪರಮ ಸತ್ಯವನ್ನು ದರ್ಶಿಸಲು ಕಂಡುಕೊಂಡ ಸಾಧನಾಮಾರ್ಗಗಳು. ಹೀಗಾಗಿ ಭರತಭೂಮಿ ಸಾಧುಸಂತರ ತವರುಮನೆಯೆಂದೂ, ಧರ್ಮದರ್ಶನಗಳ ನೆಲೆಬೀಡೆಂದೂ ಪ್ರಸಿದ್ಧಿ ಪಡೆದಿದೆ. ದರ್ಶನೇತಿಹಾಸದಲ್ಲಿ ಷಡ್‌ದರ್ಶನಗಳು ಅತೀ ಮಹತ್ವದ ಸ್ಥಾನವನ್ನಲಂಕರಿಸಿವೆ. ಅವು ಯಾವುವೆಂದರೆ :

೧) ಸಾಂಖ್ಯ ೨) ಯೋಗ
೩) ನ್ಯಾಯ ೪) ವೈಶೇಷಿಕ
೫) ಪೂರ್ವಮೀಮಾಂಸ ೬) ಉತ್ತಾರಮೀಮಾಂಸ (ವೇದಾಂತ).

ತಾತ್ವಿಕದೃಷ್ಟಿಯಿಂದ ನೋಡುವುದಾದರೆ, ಸಾಂಖ್ಯದರ್ಶನ ಎಲ್ಲಿ ನಿಂತಿತೋ ಅಲ್ಲಿಂದ ಮುಂದೆ ಯೋಗದರ್ಶನ ಬೆಳೆದಿದೆ ಎನ್ನಬಹುದು. ಒಂದಾಗಿದ್ದುದು ಅನೇಕವಾದ ಬಗೆಯನ್ನು ವಿವರಿಸುವುದು ಸಾಂಖ್ಯದರ್ಶನದ ಗುರಿಯಾದರೆ, ಈ ಅನಂತರೂಪವಾದ ಸೃಷ್ಟಿಯೆಲ್ಲವೂ ಒಂದು ವಸ್ತುವಿನಲ್ಲಿ ಕೂಡುವುದೆಂಬುದನ್ನು ಪರಾಮರ್ಶಿಸುವುದು ಯೋಗದ ಗುರಿ[1] ಯೋಗದರ್ಶನದಲ್ಲಿಯ ಸಿದ್ಧಾಂತ, ಸಾಧನೆ, ಸಿದ್ಧಿಗಳ ಕ್ರಮಬದ್ಧವಾದ ವಿವೇಚನೆಯ ಮೂಲಕ ಯೋಗದರ್ಶನಕ್ಕೆ ವಿಶಿಷ್ಟ ಸ್ಥಾನ ಲಭಿಸಿದೆ. ಪತಂಜಲಿ ಮಹರ್ಷಿಯ ಯೋಗಸೂತ್ರಗಳಿಂದಾಗಿ ಈ ದರ್ಶನಕ್ಕೆ ಆತನೇ ಮೂಲಪುರಷನೆಂದು ತಿಳಿದು ಬರುವುದಾದರೂ, ಹಿರಣ್ಯಗರ್ಭನು ಯೋಗಶಾಸ್ತ್ರದ ಆದ್ಯ ಪ್ರವರ್ತಕನಾಗಿದ್ದನೆಂಬ ಪ್ರತೀತಿ ಇದೆ. ಈ ಯೋಗಶಾಸ್ತ್ರದ ವಿಚಾರಗಳು, ಉಪನಿಷತ್ತು, ಆಗಮ, ಇತಿಹಾಸ, ಪುರಾಣ, ಶಾಸ್ತ್ರ ಮುಂತಾದ ಗ್ರಂಥಗಳಲ್ಲಿ ಅಲ್ಲಲ್ಲಿ ಕಂಡುಬರುತ್ತವೆ. ಶೈವಾಗಮ ಪುರಾಣೋಪನಿಷತ್ತುಗಳಲ್ಲಿ ಮತ್ತು ಶಾಕ್ತ ಪಂಚರಾತ್ರಾಗಮಗಳಲ್ಲಿ ಯೋಗದ ಅಮೂಲ್ಯವಾದ ತತ್ವಗಳ ಉಲ್ಲೇಖವಿರುತ್ತದೆ. ಭಗವದ್ಗೀತೆಯಲ್ಲಿ 'ಯೋಗ'ಪದಕ್ಕೆ ವ್ಯಾಪಕವಾದ ಅರ್ಥವನ್ನು ನೀಡಿ, ಮುಖ್ಯವಾಗಿ ಕರ್ಮಯೋಗ, ಜ್ಞಾನಯೋಗ, ಭಕ್ತಿಯೋಗ ಎಂಬ ತಿವಿಧ ಯೋಗದ ಪ್ರತಿಪಾದನೆ ಕಂಡುಬರುತ್ತದೆ. ಯೋಗನಿರೂಪಣೆಯೇ ಪ್ರಮುಖ ವಿಷಯವಾಗಿರುವ ಯೋಗೋಪನಿಷತ್ತುಗಳಲ್ಲಿ ಯೋಗಶಾಸ್ತ್ರದ ಕೂಲಂಕುಷವಾದ ವಿವೇಚನೆ ಇರುತ್ತದೆ.

ಯೋಗದ ಬಗೆಗಿರುವ ಜ್ಞಾನ–ವಿಜ್ಞಾನದಲ್ಲಿ ವಿಕಾಸ ಉಂಟಾಗುತ್ತ ನಡೆದಂತೆ ಯೋಗತತ್ವೋಪನಿಷತ್ತಿನ ಪ್ರಕಾರ ಇದರಲ್ಲಿ ಮುಖ್ಯವಾಗಿ ಚತುರ್ವಿಧ ಯೋಗಗಳನ್ನು ಮಾನ್ಯಮಾಡಲಾಗಿದೆ.

ಯೋಗದ ಪ್ರಕಾರಗಳು : ೧) ಮಂತ್ರಯೋಗ ೨) ಲಯಯೋಗ ೩) ಹಠಯೋಗ ೪) ರಾಜಯೋಗ

ಶೈವಪರವಾದ ಗ್ರಂಥಗಳಲ್ಲಿ ನಿರೂಪಿತವಾಗಿರುವ ಯೋಗದ ವಿವರಣೆಯಿಂದ ಶಿವಯೋಗ ಎಂಬ ಇನ್ನೊಂದು ವಿಧವಾದ ಯೋಗವೂ ಸೇರಿಕೊಂಡು 'ಯೋಗವು ಐದು ತೆರನಾಗಿರುತ್ತದೆ'[2] ಎಂಬ ಪ್ರತೀತಿಯು ಬೆಳೆಯಿತು.

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೨. ಲೇ. ಡಾ. ಆರ್. ಸಿ. ಹಿರೇಮಠ. 'ಷಟ್‌ಸ್ಥಲಪ್ರಭೆ' ಪ್ರ .ಶ್ರೀ ಎಸ್. ಎಸ್. ಒಡೆಯರ.ರಿಜಿಸ್ಟ್ರಾರ. ಕ.ವಿ.ವಿ.ಧಾರವಾಡ .೧೯೬೬ ಪುಟ. ೧೫೩.

ಯೋಗಾಭ್ಯಾಸದ ಅವಶ್ಯಕತೆ: ಜೀವನದಲ್ಲಿ ಯೋಗಾಭ್ಯಾಸವು ಅತ್ಯಂತ ಮಹತ್ವದ್ದಾಗಿದ್ದು, ಆಧ್ಯಾತ್ಮಿಕತೆಗೆ ಹೆಸರಾದ ಭಾರತದ ಶ್ರೇಷ್ಠಕೊಡುಗೆ ಇದಾಗಿದೆ. ಇಂದಿನ ಸ್ಪರ್ಧಾತ್ಮಕ ಜಗತ್ತಿನಲ್ಲಿ ಮಾನವನು ಸುಖಾಪೇಕ್ಷಿಯಾಗಿ ಅವಿರತ ಹೋರಾಟದಲ್ಲಿ ತೊಡಗಿದ್ದಾನೆ. ಹೀಗಾಗಿ ಅತೀ ಯಾಂತ್ರಿಕವಾಗಿ ಕಾರ್ಯಮಾಡುತ್ತ ತನ್ನ ಮನಃಶಾಂತಿಯನ್ನು ಅಲ್ಲದೆ ದೇಹಸ್ವಾಸ್ಥ್ಯವನ್ನು ಕಳೆದುಕೊಳ್ಳುವಂತಾಗಿದೆ. ಇಂಥ ಒತ್ತಡದ ಬದುಕಿನಿಂದ ಮುಕ್ತಿಪಡೆಯಲು ಯೋಗಭ್ಯಾಸವೇ ಏಕೈಕ ಸಾಧನವೆಂದು ತಿಳಿದಕಾರಣ ಈಗ ಇದೊಂದು ಜಾಗತಿಕ ಸಂಗತಿಯಾಗಿದೆ.

ಇಂದು ಮಾನವನ ಏನೆಲ್ಲವನ್ನು ಸಾಧಿಸಲು ಮನೋನಿರ್ಧಾರ ಮತ್ತು ಅದಕ್ಕೆ ಅನಿವಾರ್ಯವಾದ ಮನೋನಿಗ್ರಹ ಅತ್ಯಗತ್ಯವಾಗಿದೆ ಅಲ್ಲದೆ ಯೋಗವು ಜಾತ್ಯತೀತವಾಗಿರುವದು. ಅದಕ್ಕೆ ವಯೋಮಿತಿಯಿಲ್ಲ. ಎನ್ನುತ್ತಾರೆಡಾ. ಸಿ. ಎಸ್. ನಾಯ್ಕರ[3] ಕಾರಣವೆಂದರೆ, **मन एव मनुष्याणां कारणं बंध मोक्षयोः।** ಮಾನವ ಮಹಾದೇವನಾಗಲು ಯೋಗವನ್ನು ಆಚರಿಸುವುದರ ಮೂಲಕ ಬಂಧನ ಹಾಗೂ ಮೋಕ್ಷಗಳಿಂದ ಮನವನ್ನು ಮುಕ್ತಗೊಳಿಸಬೇಕೆಂಬುದೇ ಇವರ ತಾತ್ಪರ್ಯವಾಗಿದೆ.

ಯೋಗಶಾಸ್ತ್ರವು ಎಲ್ಲ ಶಾಸ್ತ್ರಗಳಲ್ಲಿ ಶ್ರೇಷ್ಠಶಾಸ್ತ್ರ. ಎಂದು ಶಿವಸಂಹಿತೆಯು ಸಾರಿ ಹೇಳಿದೆ.

आलोक्य सर्वशास्त्राणि विचार्य च पुनः पुनः।
इदमेव सुनिष्पन्नं योगशास्त्रम परं मतम्॥

0ಯೋಗದಿಂದ ಬಹಳ ಪ್ರ0ಯೋಜನಗಳುಂಟು. 0ಯೋಗಾಭ್ಯಾಸದಿಂದ ದೇಹಾರೋಗ್ಯವು ಮಾನಸಿಕ ಸ್ವಾಸ್ಥ್ಯವು[4] ಲಭಿಸುತ್ತದೆ. ಕೊನೆ0ಯಲ್ಲಿ ಶಿವಸಾ0ಯುಜ್ಯ ಕೂಡ ದೊರೆ0ಯುತ್ತದೆ. ಹಠ0ಯೋಗ ಸಾಧನದಿಂದ ಅಧಿಕ ತರ ಲಾಭಗಳುಂಟು

.वपुः कृशत्वं। वदने प्रसन्नता नादस्फुटत्वं नयने सुनिर्मले।
अरोगता बिंदुजययोऽग्निदिपनं नाडिविशुद्धिः
हठयोगलक्षणम्॥(ಹಠಯೊಗ ಪ್ರದೀಪಿಕಾ) [4]

ಮಾನವನು ಎಷ್ಟೇ ಜ್ಞಾನಿ, ವಿರಕ್ತ ಧರ್ಮಿಷ್ಟ ಮತ್ತು ಜಿತೇಂದ್ರಿಯನಾಗಿರಲಿ ,ಯೋಗಸಾಧನವಿಲ್ಲದೆ ಮುಕ್ತಿಗೆ ಅರ್ಹನಾಗಲಾರನು. ಎಂದು ಯೋಗಸಾಧನದ ಮಹತ್ವವನ್ನು ಕೆಳಗಿನ ಶ್ಲೋಕ ವಿವರಿಸುತ್ತದೆ.

ज्ञाननिष्ठो विरक्तोवा धर्मज्ञोऽपि जितेंद्रियः।
विना योगेन देवोऽपि न मोक्षम लभते प्रिये॥ (ಭಗವಾನ ಶಂಕರ) [5]

೩. ಡಾ.ಸಿ ಎಸ್. ನಾಯ್ಕರ. 'ಘಟಸ್ಥಯೋಗ' ಪ್ರ. ಮೇಧಾ ಪಬ್ಲಿಶರ್ಸ.ಧಾರವಾಡ.7 1997 ಪು 3

೪. ಅದೇ ಲೇಖಕರು 'ಘಟಸ್ಥಯೋಗ' ಪ್ರ. ಮೇಧಾ ಪಬ್ಲಿಶರ್ಸ.ಧಾರವಾಡ.7 1997. 'ಹಾರೈಕೆ' 0ಯಲ್ಲಿ ಉದ್ಧೃತ .

ಜಿ. ಶ್ರೀ ರಾಘವೇಂದ್ರ ಸ್ವಾಮೀಜಿ ತಿರುಕ ಆನಂದವನ ಪ್ರ ಸದ್ಭೋಧಚಂದ್ರಿಕೆ ಕಾರ್ಯಾಲಯ ಆಗಡಿ ೧೯೮೪ ಭಾಗ ೨ ಪುಟ ೧೦೨.

'ಯೋಗ' ಪದದ ಅರ್ಥ ಮತ್ತು ವ್ಯಾಖ್ಯೆಗಳು:

ಯೋಗ ಶಬ್ದವು ಸಂಸ್ಕೃತದ 'ಯುಜ್'ಧಾತುವಿನಿಂದ ನಿಷ್ಪನ್ನವಾಗಿದೆ. 'ಯುಜ್'ಎಂದರೆ ಕೂಡುವುದು, ಸೇರುವುದು ಎಂದರ್ಥ. **युज्यते अनेन इति योगः** युज्यते अनेन इति योगः। ಒಂದುಗೂಡಿಸುವುದು ಕೂಡುವುದು ಇದರೊಂದಿಗೆ. ಏನನ್ನು? ಜೀವಾತ್ಮ – ಪರಮಾತ್ಮರನ್ನು, ಅಂಗ – ಲಿಂಗದೊಂದಿಗೆ ಒಂದುಗೂಡಿಸುವುದು. ಮತ್ತು ಸಂಕುಚಿತವಾದ ಸೀಮಿತವಾದ ಅಹಂಕಾರ ತುಂಬಿದ ವ್ಯಕ್ತಿತ್ವವನ್ನು ವಿಶಾಲಗೊಳಿಸಿ ಶಾಶ್ವತ ಹಾಗೂ ಆನಂದಕರವಾದ ಸತ್ಯಸ್ಥಿತಿಗೆ ತಲುಪಿಸುವುದು ಯೋಗ.

ಯೋಗವು ಮನೋವಿಜ್ಞಾನ, ಪರಮ ಮನಃಶಾಸ್ತ್ರ. योगः चित्तवृत्ति निरोधः।

ಯೋಗ ಮನೋನಿಯಂತ್ರಣದ ವಿಧಾನ'[6]

मनःप्रशमनोपायः योगःइत्यभिधीयते ।

ಮನಸ್ಸನ್ನು ಪ್ರಶಾಂತಗೊಳಿಸುವ ಉಪಾಯವು – ಎನ್ನುತ್ತಿದೆ – ಯೋಗವಾಶಿಷ್ಠ

योगः कर्मसु कौशलम्। ಕರ್ಮದ ಕುಶಲತೆಯೇ ಯೋಗ.ಮತ್ತು

समत्वं योगमुच्यते । ಸಮಭಾವವೇ ಯೋಗ.[7]

तां योगमिति मन्यते स्थिराम् इंद्रिय धारणम्।

ಇಂದ್ರಿಯಗಳು ಮತ್ತು ಮನಸ್ಸಿನ ಮೇಲೆ ಸಂಪೂರ್ಣ ಹತೋಟಿ ಹೊಂದಿರುವ ಸ್ಥಿತಿ[8]

ಸ್ವಾಮಿವಿವೇಕಾನಂದರ ಮಾತಿನಲ್ಲಿ ಇದೇ ಅರ್ಥವಿದ್ದು 'ಮನುಷ್ಯ ತನ್ನ ಸಂಪೂರ್ಣ ವಿಕಾಸವನ್ನು ಸಾಧಿಸಬಹುದಾದ ಸಾಧನವೇ ಯೋಗ'. ಯೋಗದಿಂದ ಶಾರೀರಿಕ, ಮಾನಸಿಕ,ಬೌದ್ಧಿಕ, ಭಾವನಾತ್ಮಕ ಹಾಗೂ ಆಧ್ಯಾತ್ಮಿಕ ಸರ್ವಾಂಗೀಣ ವಿಕಾಸ ಸಾಧ್ಯವಾಗುತ್ತದೆ. ಯೋಗವು ಸಾಧನೆಯ ವಿಷಯ, ಅನುಭವಕ್ಕೆ ತಂದುಕೊಳ್ಳುವ ವಿಷಯವೇ ವಿನಃ ಅದನ್ನು ಕುರಿತು ಚರ್ಚಿಸುವ ಅಥವಾ ವರ್ಣಿಸುವ ವಿಷಯವಲ್ಲ ಎಂದು ಕಂಡುಬರುತ್ತದೆ. ಅಲ್ಲದೆ ವೇದಾಂತಿಗಳು **'ಜೀವಾತ್ಮ – ಪರಮಾತ್ಮರ ಐಕ್ಯವೇ ಯೋಗ'** ಎಂದು ಹೇಳಿದರೆ, ಆಗಮಕಾರರು ಶಿವಶಕ್ತಿಯರ ಅಭೇಧ ಬುದ್ಧಿಯೇ ಯೋಗ' ಎಂದರು.

'योगस्समतावस्था जीवात्म परमात्मनः'ಪರಮಾತ್ಮನಲ್ಲಿ ಜೀವಾತ್ಮನು ಸಮರಸಗೊಳ್ಳುವುದೇ ಯೋಗ. ಹೀಗೆ ಯೋಗವನ್ನು ಕುರಿತು ವಿವಿಧ ವ್ಯಾಖ್ಯಾನಗಳಿದ್ದರೂ ಅವುಗಳ ಆಶಯ ಒಂದೇ ಆಗಿದೆ. ಮನಸ್ಸಿನ ಏಕಾಗ್ರತೆ, ನಿಗ್ರಹ ಹಾಗೂ ವಿಕಾಸದ ವಿಧಾನ. ಇಂಥ ಶ್ರೇಷ್ಠ ಯೋಗವು ಲಿಂಗಬೇಧವಿಲ್ಲದೇ, ಜಾತಿಬೆಧವಿಲ್ಲದೇ, ವಯೋಬೇಧವಿಲ್ಲದೇ, ಯಾರು ಬೇಕಾದರೂ ಆಚರಿಸಬಹುದು.

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೬. – ಪತಂಜಲಿ(೨–೧)

೭. (ಭಗವದ್ಗೀತೆ ೨–೪೮)

೮. (ಕಠೋಪನಿಷತ್ ೨–೩.–೧೧).

ಶಿವಯೋಗ:

'ಯೋಗ'ಶಬ್ದವು 'युज्–समाधौ' ಎಂಬ ಅರ್ಥವನ್ನೂ ಕೊಡುತ್ತದೆ. ಹೀಗಾಗಿ ಯೋಗ ಶಬ್ದವು ಎರಡಾದರೂ ವಸ್ತುಗಳ ಕೂಡುವಿಕೆಯನ್ನು ಸೂಚಿಸುವ ಕಾರಣ ಪ್ರತಿಯೊಂದು ಪ್ರಕಾರದ ಯೋಗದಲ್ಲಿಯೂ ಎರಡರ ಮೇಳವನ್ನು ಸಾಧಿಸಲಾಗುತ್ತದೆ ಎಂಬುದನ್ನು ವಿದ್ವಾನ್ ಕೆ.ಎಸ್.ವರದಾಚಾರ್ಯರು ಈ ರೀತಿ ಉದಾಹರಿಸಿದ್ದಾರೆ.

ಮಂತ್ರಯೋಗದಲ್ಲಿ ವೈಖರೀ ವಾಣಿ– ಪರಾವಾಣಿಗಳನ್ನು ಒಂದುಗೂಡಿಸಿ ಮಂತ್ರಯೋಗಿಗಳು ಪರಾವಾಣಿಯನ್ನು ಆಲಿಸುತ್ತಾ ತನ್ಮಯರಾಗುವರು. ಹಠಯೋಗದಲ್ಲಿ ಪ್ರಾಣ ಅಪಾನ ವಾಯುಗಳನ್ನು ಮೇಳೈಸಿ ಪ್ರಾಣ ಶಕ್ತಿಯ ಸಾಮರ್ಥ್ಯವನ್ನು ಕಾಣುವರು. ಲಯಯೋಗದಲ್ಲಿ ನಾದ ಬಿಂದುಗಳನ್ನು ಬೆರೆಸಿ ಲಯಯೋಗಿಗಳು ಮನ ಮಾರುತಗಳ ಉಲುಹನ್ನು ಅಡಗಿಸಿ ನಾದಾತೀತ ನಿಲುವನ್ನು ಸಾಧಿಸುವರು.ಹಾಗೆಯೇ ರಾಜಯೋಗದಲ್ಲಿ,ಚಂದ್ರಸೂರ್ಯರನ್ನು ಅಥವಾಇಡಾ–ಪಿಂಗಳ.

ನಾಡಿಯನ್ನು ಒಂದುಗೂಡಿಸಿ ದೃಷ್ಟಿಯೋಗಸಿದ್ಧಿಯನ್ನು ಪಡೆಯುವರು. ಇನ್ನು ಶಿವಯೋಗದಲ್ಲಿ ಶಿವ–ಶಕ್ತಿಗಳನ್ನು ಒಟ್ಟುಗೂಡಿಸಿ ಶಿವಯೊಗಿಗಳು ಶಿವ–ಶಕ್ತಿಗಳ ಅವಿನಾಭಾವ ಸಂಬಂಧ'ವನ್ನು ಕಾಣುವರು. ಸಾಮರಸ್ಯಸುಖವನ್ನು ಅನುಭವಿಸುವರು.

ಶಿವಯೋಗದ ದಾರ್ಶನಿಕ ಹಿನ್ನೆಲೆ:ಶಿವಯೋಗದ ಮೂಲ ಉದ್ದೇಶ ಭವದಿಂದ ಬಿಡುಗಡೆ , ಶಿವನೊಂದಿಗೆ ಐಕ್ಯತೆ ಅಥವಾ ಭವತ್ವವನ್ನು ನೀಗಿ ಶಿವತ್ವವನ್ನು ಗಳಿಸುವದು. ಇದುವೇ ಜೀವನು ಶಿವನಾಗುವ ಸ್ಥಿತಿ.

ಯೋಗದ ವಿವಿಧ ಮಾರ್ಗಗಳಲ್ಲಿ ಬಳಸುವ ಸಾಧ'ನ ಸ್ವರೂಪಗಳಲ್ಲಿಕಾಣುವ ವೈವಿಧ್ಯಕ್ಕೆ ಆಯಾಯ ಸಿದ್ಧಾಂತ ಗಳನಡುವೆ ಕಂಡುಬರುವ ದಾರ್ಶನಿಕ ಹಿನ್ನೆಲೆಯೇ ಕಾರಣವೆನಿಸುತ್ತದೆ. 'ಶಿವಯೋಗ'ವೆನ್ನುವ ಪದವನ್ನು ಶುದ್ಧ ಶೈವರೂ ಮತ್ತು ವೀರಶೈವರೂ ಬಳಸುವದುಂಟು. ಇವರುಗಳ ಬಳಕೆಯಲ್ಲಿ ಸ್ವಲ್ಪಮಟ್ಟಿಗಾದರೂ ಅರ್ಥವ್ಯತ್ಯಾಸವಿರಲು ಕಾರಣವೆಂದರೆ.ಈ ಎರಡೂ ಸಿದ್ಧಾಂತಗಳ ನಡುವೆ ದಾರ್ಶನಿಕವಾಗಿ ಪ್ರಭೇದವುಂಟು. ಪಶು.ಪತಿ.ಪಾಶ ಎಂಬ ಮೂಲತತ್ವಗಳನ್ನು ಒಪ್ಪಿದ ಶೈವಧರ್ಮದ ಪ್ರಕಾರ ಪಶುವೆನಿಸಿದ ಜೀವಿಯು ಮಲತ್ರಯಯುಕ್ತವಾದ ಪಾಶಕ್ಕೆ ಆಧೀನವಾಗಿ 'ಪತಿ'ಎನಿಸಿದ ಶಿವನಿಂದ ದೂರವಾಗಿದ್ದಾನೆ. ಭವರೋಗದಿಂದ ನೊಂದಜೀವಿಯು ಶಿವಾನುಭವದ ಸಾಧನೆಯಲ್ಲಿ ತೊಡಗಿ ಕೊನೆಗೆ ಶಿವಯೋಗವನ್ನು ಪಡೆಯಲು ಈ ಧರ್ಮ'ದಲ್ಲಿ ಅವಕಾಶವಿದೆ. ಇಲ್ಲಿ ಗಳಿಸುವ ಶಿವಯೋಗಕ್ಕೂ ವೀರಶೈವ ಸಾಧಕನು ಗಳಿಸುವ ಶಿವಯೋಗಕ್ಕೂ ಅಂತ್ಯಸ್ವರೂಪದಲ್ಲಿ ವ್ಯತ್ಯಾಸವಿರುತ್ತದೆ. ಆದೆನೆಂದರೆ, ಶೈವಸಿದ್ಧಾಂತದ ಪ್ರಕಾರ ಜೀವಿಯು ಶಿವನೊಂದಿಗೆ ಸಮರಸಗೊಂಡು ಐಕ್ಯಗೊಳ್ಳಲು ಅವಕಾಶವಿಲ್ಲ.

ಡಾ.ಎ. ಎಲ್. ಶಿಉವರುದ್ರಪ್ಪ . ಶಿವಯೋಗ 'ಶ್ರೀ ಶಿವರಾತ್ರೀಶ್ವರ ಧಾರ್ಮಿಕ ದತ್ತಿ' ವಿಚಾರ ಸಂಕೀರ್ಣ ಪು.೪೪.

ಆದ್ದರಿಂದಲೇ ಈ ಸಿದ್ಧಾಂತದಲ್ಲಿ ಮೋಕ್ಷ ಸ್ವರೂಪವನ್ನು ವಿವರಿಸುವಾಗ ಸಾಲೋಕ್ಯ, ಸಾಮಿಪ್ಯ. ಸಾರೂಪ್ಯ ಮತ್ತು ಸಾಯುಜ್ಯ ಎಂಬ ತಾರತಮ್ಯವನ್ನು ಗುರುತಿಸಿ, ಕೊನೆಯದಾದ ಸಾಯುಜ್ಯ ಪದವಿಯನ್ನು ಪರಮಪದವೆಂದು ಒಪ್ಪಲಾಗಿದೆ. ಅವರು ಐಕ್ಯವನ್ನು ಒಪ್ಪುವದಿಲ್ಲ. ಇನ್ನು ವೀರಶೈವ ಸಿದ್ಧಾಂತದ ತಾತ್ವಿಕ ಹಿನ್ನೆಲೆಯನ್ನು ಕುರಿತು ಹೇಳುತ್ತಾ, ಪ್ರೊ.ವ್ಹಿ.ಜಿ.ಮಾರಿಹಾಳರು 'ದಾರ್ಶನಿಕ ದೃಷ್ಟಿಯಿಂದ ವೀರಶೈವ ಸಿದ್ಧಾಂತವನ್ನು ಶಕ್ತಿ ವಿಶಿಷ್ಟಾದ್ವೈತ ಎಂದು ಕರೆಯಲಾಗುತ್ತದೆ.

ಪರಶಿವನು ಶಕ್ತಿವಿಶಿಷ್ಟನಾಗಿರುವುದರಿಂದ ಅವನು ಸರ್ವಕಾಲದಲ್ಲಿಯೂ ಸಗುಣನಾಗಿಯೇ ಇರುತ್ತಾನೆ ಎಂಬುದು ಈ ಸಿದ್ಧಾಂತದ ನಿಲುವು. ಶಂಕಾರಾಚಾರ್ಯರಲ್ಲಿ ಬರುವ ನಿರ್ಗುಣ ಬ್ರಹ್ಮನಂತೆ ಪರಶಿವನು ನಿರ್ಗುಣನೆಂದೆನಿಸುವುದಾದರೆ, ಆಗ ಶಕ್ತಿಯ ಸ್ವರೂಪ ಮತ್ತು ಅದಕ್ಕೆ ಆಧಾರವಾದ ವಿಶ್ವದ ಸತ್ಯತೆಯ ಬಗ್ಗೆ ಶರಣರು ಹೊಂದಿರುವ ನಿಲುವಿಗೆ ವಿರೋಧಾಭಾಸ ಉಂಟಾಗುತ್ತದೆ. ಈ ಕಾರಣದಿಂದಲೇ ಈ ಸಿದ್ಧಾಂತವನ್ನು ಶುದ್ಧಾದ್ವೈತ ಎಂದು ಕರೆಯದೆ ಶಕ್ತಿವಿಷ್ಟಾದ್ವೈತವೆಂದು ಕರೆಯಲಾಗಿದೆ' ಎಂದು ಸ್ಪಷ್ಟಪಡಿಸಿದ್ದಾರೆ.

ಆಗಮಗಳಲ್ಲಿ ನಿರೂಪಿತವಾದ ಅನೇಕ ಸಿದ್ಧಾಂತಗಳನ್ನು, ಅಲ್ಲಿ ಬಳಕೆ ಹೊಂದಿದ ಅನೇಕ ಪದಗಳನ್ನು ಶಿವಶರಣರು ಸ್ವೀಕರಿಸಿದ್ದರೂ ಅದಕ್ಕೆ ಅವರು ನೀಡಿದ ಅನುಭವಾತ್ಮಕವಾದ ಅರ್ಥವೈಭವವು ಒಂದು ವಿಶಿಷ್ಟವಾದ ಅಧ್ಯಾತ್ಮ ಸಂಪತ್ತಿಯನ್ನು ಸೂಚಿಸುತ್ತದೆ. ಹೀಗೆ 'ಶಿವಯೋಗ' ಎಂಬ ಪದವು ಸಹ ಇಂಥ ಒಂದು ಅನನ್ಯವಾದ ಅನುಭಾವದ ನಿಲವನ್ನು ಸೂಚಿಸುತ್ತದೆ. ಶಿವಶರಣರಿಗೆ ಷಟ್‌ಸ್ಥಲವು ಒಂದು ಸಾಧನಪಥವಾದರೆ, ಶಿವಯೋಗವು ಅಥವಾ ಸಾಮರಸ್ಯವು ಅದರ ಪರಮಸಿದ್ಧಿಯಾಗಿರುತ್ತದೆ. ಅವರ ಪ್ರಾಣಲಿಂಗಿ ಸ್ಥಲವು ಶಿವಯೋಗದ ಆಚರಣೆಯ ಮಹೋನ್ನತವಾದ ಸ್ಥಿತಿ ಎನ್ನಬಹುದು. ಏಕೋತ್ತರ ಶತಸ್ಥಲದ ತತ್ವಸಾಧನೆಯ ಯೋಜನೆಯಲ್ಲಿ ಶಿವಯೋಗ ಸಮಾಧಿಯೂ ಒಂದು ಸ್ಥಲವಾಗಿರುತ್ತದೆ. ವಚನಗಳಲ್ಲಿ ಬರುವ ಶಿವಯೋಗಿ ಶರಣ, ಜಂಗಮ, ಶಿವಶರಣ ಎಂಬ ಪದಗಳು ಸಮಾನಾರ್ಥಕಗಳಾಗಿವೆ.

ಸರ್ವಭೋಗಪ್ರದವಾದ, ಪಾವನಾತ್ಮಕವಾದ ಶಿವಸಾಯುಜ್ಯವನ್ನು ಪಡೆಯುವುದು ಆಗಮಕಾಲದ ಶಿವಯೋಗಿಗಳ ಜೀವನದ ಆತ್ಯಂತಿಕ ಉದ್ದೇಶವಾಗಿರುತ್ತಿತ್ತು. ಜ್ಞಾನಯೋಗದ ಸಿದ್ಧಿಗಾಗಿ ಅಂತಃಶುದ್ಧಿ, ಬಹಿಃ ಶುದ್ಧಿಗಳನ್ನು ಸಂಪಾದಿಸಿ ಕರ್ಮಬಂಧವನ್ನು ಕಳಚಿಕೊಳ್ಳುವುದೂ, ಅದಕ್ಕಾಗಿ ತಪ, ಕರ್ಮ, ಜಪ, ಜ್ಞಾನ ಎಂಬ ಐದುಬಗೆಯ ಸಾಧನಗಳಲ್ಲಿ ನಿರತನಾಗಿರುವುದು,[1] ತನ್ಮೂಲಕ ಆತ್ಯಂತಿಕ ಉದ್ದೇಶವನ್ನು ಈಡೇರಿಸಿಕೊಳ್ಳುವುದು ಅವರಿಗೆ ಇಷ್ಟವಾಗಿರುತ್ತಿತ್ತು. ಅದಕ್ಕಾಗಿ ಅವರು ಆರಾಧಿಸುತ್ತಿದ್ದ ಲಿಂಗವು ಅವರಿಗೆ ಇಷ್ಟಲಿಂಗವೆನಿಸುತ್ತಿತ್ತಲ್ಲದೆ, ಈ ಆರಾಧನೆ ಅವರಿಗೆ ಪ್ರಾಣದಷ್ಟು ಪ್ರೀಯವಾಗುತ್ತಿದ್ದುದರಿಂದ ಅದುವೇ ಪ್ರಾಣಲಿಂಗವಾಗಿಯೂ ತೋರುತ್ತಿತ್ತು. ಹೀಗೆ ಶಿವಯೋಗಿಗಳ ಅಂತಃಪ್ರವೃತ್ತಿ, ಜ್ಞಾನಸಾಧನೆ, ಸಾಧನೆಯ ವೈವಿಧ್ಯ, ಅಧ್ಯಾತ್ಮದ ನಿಲುವು ಇವುಗಳಿಗನುಗಣವಾಗಿ ಅವಧೂತ, ಸನ್ಯಾಸಿ, ಯೋಗಿ, ಪಾಶುಪತ, ಶಿವ, ಲಿಂಗಿ, ವೀರಶೈವ, ಮಹಾಮಾಹೇಶ್ವರ ಮುಂತಾದ ಪದಗಳಿಂದ ಅವರನ್ನು ಸಂಭೋದಿಸುತ್ತಿದ್ದರು. [2]

ಶಿವಾಗಮಗಳ ಯೋಗಪಾದದಲ್ಲಿ ಪರಂಪರಾಗತವಾದ ಯೋಗದ ಅಷ್ಟಾಂಗಗಳ ನಿರೂಪಣೆಯಿರುತ್ತಿದ್ದರೂ ಯಮ, ನಿಯಮ, ಆಸನ, ಪ್ರಾಣಾಯಾಮ, ಪ್ರತ್ಯಾಹಾರಗಳಿಗೆ ಆ ಕಾಲದಲ್ಲಿ ಪೂರ್ವಯೋಗವೆಂದೂ, ಧ್ಯಾನ, ಧಾರಣ, ಸಮಾಧಿಗಳಿಗೆ ಉತ್ತರಯೋಗವೆಂದೂ ತಿಳಿಯಲಾಗುತ್ತಿತ್ತು. ಶಿವಶರಣರ ಕಾಲದಲ್ಲಿ ಎರಡೂ ಯೋಗಗಳನ್ನು ಅಂಗೀಕರಿಸಿದ್ದರೂ, ಉತ್ತರಯೋಗಕ್ಕೆ ಪ್ರಾಧಾನ್ಯತೆಯನ್ನು ಕೊಟ್ಟು ಇವುಗಳನ್ನು ಷಟ್‌ಸ್ಥಲ ಯೋಜನೆಯಲ್ಲಿ ಬಳಸಿಕೊಂಡ ಪ್ರಯತ್ನವನ್ನು ಕಾಣಬಹುದು.

೧. (ಪಾತಂ.೧೨–೧೩–೧೪)
೨. (ಪಾತಂ. ೪–೬೭,೬೮)

ಶಿವಯೋಗದ ನೆಲೆ: ಯೋಗದ ಸ್ವರೂಪವನ್ನು, ಅದರ ಮಹತ್ವವನ್ನು ತಿಳಿದಮೇಲೆ, ಶಿವಾ ಗಮಗಳಲ್ಲಿ ಪ್ರತಿಪಾದಿಸಿದ ಶಿವಯೋಗವನ್ನು ತಿಳಿಯೋಣ.

ಶೈವಧರ್ಮ ಪ್ರಾಚೀನವಾದುದು. ಆಗಮಗಳ ಪೂರ್ವಭಾಗದಲ್ಲಿ ಶೈವಧರ್ಮವು ಉತ್ತರ ಭಾಗದಲ್ಲಿ ವೀರಶೈವ ಧರ್ಮವು ಪ್ರತಿಪಾದಿತವಾಗಿದೆ ೧ ಭಾರತೀಯ ದರ್ಶನಶಾಸ್ತ್ರವು ಹಲವಾರು. ಈ ದರ್ಶನಗಳ ಅಂತಿಮ ಗುರಿ ಕೆಲವರಿಗೆ ಮುಕ್ತಿಯಾದರೆ ,ಹಲವರಿಗೆ ಸಾಮರಸ್ಯ– ಆತ್ಮಸಾಕ್ಷಾತ್ಕಾರ ಇದಕ್ಕಾಗಿ ಶಿವಯೋಗ ಸಾಧನೆ ಅವಶ್ಯ. ಶೈವಧರ್ಮಕ್ಕೆ ಮೂಲ ಆಕರಗಳಾದ ಆಗಮಗಳಲ್ಲಿ ಯೋಗವನ್ನು ಕುರಿತ ವಿಚಾರವು ವಿವರವಾಗಿ ಬಂದಿದೆ. ಶಿವಾಗಮಗಳು ಸಪ್ತವಿಧ ಶೈವಪ್ರಭೇದಗಳನ್ನು ತಿಳಿಸುತ್ತಿದ್ದು, ಅದರಲ್ಲಿ ಬರುವ ಯೋಗಶೈವ ,ಜ್ಞಾನಶೈವ ಎಂಬಿವು ಒಂದಕ್ಕೊಂದು ಪೂರಕವಾಗಿದ್ದವೆಂಬುದು ಈ ಶ್ಲೋಕವು ತಿಳಿಸುತ್ತದೆ.

सर्व पाप हरो योगो विरक्तस्यैव कथ्यते ।
वैराग्यात जायते ज्ञानं ज्ञानात योगः प्रवर्तते ॥ ೨

ಯಮ, ನಿಯಮಗಳ ಅಭ್ಯಾಸದಿಂದ ಇಂದ್ರಿಯಗಳನ್ನು ಗೆದ್ದವಿರಕ್ತನಿಗೆ ಮಾತ್ರ ಯೋಗವು ಸರ್ವಪಾಪ ಪರಿಹರಿಸುವಂಥಹುದು. ವೈರಾಗ್ಯದಿಂದ ಜ್ಞಾನವು ಹುಟ್ಟುತ್ತದೆ ಜ್ಞಾನದಿಂದ ಯೋಗವು ಮುಂದುವರಿಯುತ್ತದೆ. ಪಾರಮೇಶ್ವರಾಗಮ ೧೦ ಪಟಲವು ಯೋಗ ವಿಷಯಕ್ಕೆ ಮೀಸಲಾದಂತಿದೆ. ಈಶಾನಶಿವಯೋಗಿಗಳು ಈಶಾನ ಶಿವಗುರುದೇವ ಪದ್ಧತಿಯಲ್ಲೂ ಸುಪ್ರಭೇದ ,ಸೂಕ್ಷ್ಮ, ಹಾಗೂ ಚಂದ್ರಜ್ಞಾನಾಗಮಗಳಲ್ಲೂ ಶಿವಯೋಗದ ವಿಚಾರಗಳಿವೆ. ಪಾರಮೇಶ್ವರಾಗಮದಲ್ಲಿ ಜ್ಞಾನಶೈವ ಯೋಗಶೈವ ಗಳ ಉಲ್ಲೇಖವಿದೆ.

चराचरात्मकम सर्वं जगदेतच्छिवात्मकम ।
भावयन्नात्म तादात्म्यम योगशैवमते वसेत ॥ [3]

ಜಗತ್ತನ್ನು ಶಿವಸ್ವರೂಪವೆಂದು ಭಾವಿಸಿ, ಅದರಲ್ಲಿಅಧ್ಯಾತ್ಮಭಾವ ಹೊಂದಿದವನು ಯೋಗಶೈವ ಎಂದು ಹೇಳಲಾಗಿದೆ. ಹೀಗೆ ಮನಸ್ಸಿನ ಏಕಾಗ್ರತೆ ಸಾಧಿಸಿ ಸಮಾಧಿಯನ್ನು ಸಾಧಿಸುವ ಮಾರ್ಗಕ್ಕೆ ಶೈವಾಗಮಗಳು ಪ್ರಾಮುಖ್ಯತೆಯನ್ನು ಕೊಟ್ಟಿವೆ.

द्विविधो योगःसाकारश्च निराकृतिः ॥ [3]

ಯೋಗವು ಸಾಕರ ನಿರಾಕಾರವೆಂದು ಎರಡು ವಿಧ
ಇವು ಸಗುಣ ನಿರ್ಗುಣಯೋಗಗಳಿಗೆ ಅಥವಾ ಸವಿಕಲ್ಪಕ ,ನಿರ್ವಿಕಲ್ಪಕ ಯೋಗಗಳಿಗೆ ಇವು ಸಮಾನವಾಗಿರುತ್ತವೆ.

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೧ ಸಿದ್ಧಾಂತಶಿಖಾಮಣಿ. ಪಂಚಾರ್ಯಪ್ರೆಸ್ಸ್. ಮೈಸೂರು ೧೮–೧೪
೨. ಸಂ ಡಾ ಎಮ್.ಶಿವಕುಮಾರ ಸ್ವಾಮಿ ಪಾರಮೆಶ್ವರಾಗಮ ವೀರಶೈವ ಅನುಸಂಧಾನ ಸಂಸ್ಥಾನ, ಬೆಂಗಳೂರ. ೧೯೯೯.ಟಿ.೧೨–೫೨. ಟ್ಟಿ. ೨೬೬
೩. ಅದೇ ಲೇಖಕರು [ಪಾ.ಆಗಮ.ಪ. ೭.೨೧.] ಪು. ೧ ೪೯
೪. ಅದೇ ಲೇಖಕರು [ಪಾ.ಪಟಲ೧೦.ಶ್ಲೋಕ–೧೩]

ನಿರಾಕೃತಿಂಯೆಂದರೆ ನಿರಾಕಾರ; ಧ್ಯಾನಿಸುವವನು,ಮತ್ತು ಧ್ಯಾನಿಸಲ್ಪಡುವವನು ಎಂಬ ಭೇದರಹಿತವಾದುದು.
ಜ್ಞಾನ, ಜ್ಞೇಯ,ಮತ್ತು ಜ್ಞಾತೃ, ಎಂಬ ತ್ರಿವಿಧ ಭೇದ

ಪ್ರತೀತಿಯಿಲ್ಲದುದು. ಯಾವುದು ಅವ್ಯಕ್ತವೋ ,ಅಖಂಡಶ್ರೇಷ್ಠ ಜ್ಞಾನವೋ ಮನಸ್ಸಿಗೆ ಮೀರಿದ್ದು ಆಗಿದೆಯೋ ಅದೊಂದೇ ಕೇವಲ ಬ್ರಹ್ಮ , ಶಿವ .ಹಾಗೂ ಈ ನಿಲುವಿಗೆ ಏರಲು ಯಾವನು ಅಧಿಕಾರಿಯೋ ಅವನು ಜ್ಞಾನಯೋಗಿ,ವೀರಶೈವ, ಅವಧೂತ ಎಂದು ತಿಳಿಸಿದೆ.

ಯಾವಾಗಲೂ ಆತ್ಮ ಭಾವದಲ್ಲಿ ತಾನಿರುವುದರಿಂದ ಈ ತಾದಾತ್ಮ್ಯದ ಭಾವದಿಂದಾಗಿ ಅವನು ಜ್ಞಾನಶೈವ ವ್ರತಿಯಾಗುತ್ತಾನೆ. ಎಂದು ಶಿವಯೋಗದ ವಿಚಾರವನ್ನು ಸ್ಪಷ್ಟಪಡಿಸಿದೆ. ವೀರಶೈವನಿಗೆ ಜ್ಞಾನವೇ ಯೋಗ ಸಾಧನವಾಗಿದೆ.

विरशैव मतस्यास्य ज्ञानयोगो हि साधनम ।

ಆಗಮದ ವಿಚಾರದಂತೆ ವೀರಶೈವರಿಗೆ ಜ್ಞಾನ ಮತ್ತು ಯೋಗಗಳೆರಡೂ ಗಮ್ಯ ವಿಷಯಗಳಾಗಿವೆ. ಜ್ಞಾನವಿಲ್ಲದ ಯೊಗವೂ, ಯೋಗವಿಲ್ಲದ ಜ್ಞಾನವೂ,ಜ್ಞಾನಯೋಗಗಳೆರಡೂ ಇಲ್ಲದ ಜೀವನವೂ ನಿರರ್ಥಕವೆಂದೂ ತಿಳಿಯುತ್ತಾರೆ.

ಇವೆರಡನ್ನು ನಡೆಸಿಕೊಂಡು ಹೊಗುವುದಕ್ಕೆ ಸ್ವಶರೀರ ರಕ್ಷಣೆ ಮಾಡುವುದು ಜ್ಞಾನ ಯೋಗ ಸಾಧಕರಿಗೆ ಆದ್ಯ ಕರ್ತವ್ಯವೆಂಬುದನ್ನು ಶಿವಯೋಗ

योगात् संजायते ज्ञानम् ज्ञानात् योगःप्रवर्तते ।
द्वयोः संसिद्धये भूमौ शरीरं रक्षयेत् बुधः ।।[3]

ಧರ್ಮ ಪರಿಪಾಲನೆಗೆ ಶರೀರ ರಕ್ಷಣೆ ಆದ್ಯ ಕರ್ತವ್ಯವೆಂದು ಮಹಾಕವಿ ಕಾಳಿದಾಸನು ಹೇಳಿದ್ದಾನೆ

शरीरमाद्यं खलु धर्म साधनम् ।೪ (‘ಕುಮಾರ ಸಂಭವಮ್’ ಐದನೇ ಸರ್ಗ)

ಧರ್ಮವೇ ಪ್ರಥಮ ಪುರುಷಾರ್ಥ. ಧರ್ಮ ಸಂಪಾದನೆಗೆ ದೆಹಾರೋಗ್ಯವು ಸ್ವಸ್ಥವಾಗಿರಬೇಕು ಧರ್ಮದ ಮೂಲಕ ಯೋಗಾಂಗಗಳ ಮೂಲಕ ಮೋಕ್ಷ ಕೂಡ ಲಭಿಸುತ್ತದೆ.ಶರೀರ ಸ್ವಾಸ್ಥ್ಯಕ್ಕೆ ಯೋಗದ ಅವಶ್ಯಕತೆ ಇದೆ ಯೋಗ ದರ್ಶನಕರನಾದ ಪಥಂಜಲಿ ಮಹರ್ಷಿಯು ಅಷ್ಟಾಂಗ ಯೋಗವನ್ನು ಉಪದೇಶಿಸಿದ್ದಾನೆ.

यम नियमासन प्राणायाम प्रत्याहार।
ध्यान धारण समाधयो अष्टावंगानि ॥೫

ಆಗಮಗಳಲ್ಲಿ ಕೂಡ ಶಿವಯೋಗದ ವಿಚಾರದಲ್ಲಿ ಅಷ್ಟಾಂಗ ಯೋಗದ ಸ್ಪಷ್ಟ ಪರಿಕಲ್ಪನೆ ಇದೆ.

ಈ ೦ಯೋಗದ ಅಂಗಗಳು ಪಾಥಂಜಲಿ ೦ಯೋಗಶಾಸ್ತ್ರದ ಅಷ್ಟಾಂಗಗಳಿಗಿಂತ ವಿಭಿನ್ನವಾಗಿ ವೈಶಿಷ್ಟ್ಯ ಪೂರ್ಣವಾಗಿದೆ.

भक्ति वैराग्यमभ्यासो ध्यानमेकांत सेवनम्।
भिक्षाटनं लिंगपूजा स्मरणं सततं विदुः ।।[1]

ಭಕ್ತಿ ವೈರಾಗ್ಯ–ಅಭ್ಯಾಸ–ಧ್ಯಾನ ಏಕಾಂತ ಸೇವನ–ಭಿಕ್ಷಾಟನ–ಲಿಂಗಪೂಜೆ, ಸತತ ಶಿವಸ್ಮರಣೆ ಇವು ಆಗಮದ ಅಷ್ಟಾಂಗಗಳು.–ಪತಂಜಲಿ ತಿಳಿಸುವ ಯಮ ನಿಯಮ, ಆಸನ ಪ್ರಾಣಾಯಾಮ ಪ್ರತ್ಯಾಹಾರ ಧಾರಣ ಧ್ಯಾನ ಸಮಾಧಿಗಳು ಶಿವಯೋಗ ಪ್ರಕ್ರೀಂಯೆಯಲ್ಲಿ ಸಮಾವೇಶವಾಗುತ್ತವೆ.ಆನಂತರ ಪಾರಮೇಶ್ವರಾಗಮದಲ್ಲಿ ಧ್ಯಾನ ಶೈವ ವೀರಶೈವರ ಯೋಗ ಪದ್ಧತಿಗಳನ್ನು ವಿವರಿಸಿ ಶಿವಯೋಗಿಗಳಿಗೆ ಶಮೆ –ದಮೆ–ಸಮಾಧಿ–ತಿತೀಕ್ಷಾ–ಉಪರತಿ–ಶ್ರದ್ಧೆ ಎಂಬ ಆರು ಅಂಗಗಳನ್ನು ವಿಧಿಸಲಾಗಿದೆ. ಅದೇ ಆಗಮದ ೧೨ ನೆಯ ಪಟಲದಲ್ಲಿಕರ್ಮಯೋಗ,ಜ್ಞಾನಯೋಗ, ಭಕ್ತಿಯೋಗಗಳ ಪರಸ್ಪರ ಸಂಬಂಧ ,ಜ್ಞಾನ–ಕ್ರಿಯಾ –ಚರ್ಯ ಮತ್ತು ಯೋಗವೆಂಬ ೪ ಮಾರ್ಗಗಳ ಸ್ವರೂಪಗಳನ್ನು ವಿವರಿಸಿ , ಇವು ಶಿವಜ್ಞಾನ ಪ್ರಾಪ್ತಿಗೆ ಅವಶ್ಯಕವೆಂದು ನಿರೂಪಣೆ ಇದೆ. ಧ್ಯಾನಯೋಗ ಪದ್ಧತಿಯನ್ನು ಕುರಿತು ಸುಂದರವಾ ದೃಷ್ಟಾಂತದೊಂದಿಗೆ ವಿವರಿಸಲಾಗಿದೆ ।

अतिष्ठेत् स्थाणुवत् स्वस्थोयथा दीपो निवातहः।
समं काय शिरोग्रीवं धारयन्नचलं स्थिरम्।। [2]

ಶರೀರ ತಲೆ ,ಮತ್ತು ಕತ್ತುಗಳನ್ನು ಚಲಿಸದಂತೆ ಸ್ಥಿರವಾಗಿ ,ನೆಟ್ಟಗೆ ಇಟ್ಟುಕೊಂಡು ಸ್ವಸ್ಥನಾಗಿ ಕಂಬದಂತೆ, ಗಾಳಿ ಇಲ್ಲದ ದೀಪದಂತೆ ಕುಳಿತುಕೊಳ್ಳಬೇಕು ಎಂದು ಹೇಳುತ್ತಾ, ಹೃದಯಕಮಲ, ನಾಭಿ,ಸ್ವಾಧಿಷ್ಟಾನ ಮೂಲಾಧಾರ, ವಿಶುದ್ಧಿ, ಆಜ್ಞಾ – ಸಹಸ್ರಾರ – ಬ್ರಹ್ಮರಂಧ್ರ – ಶಿಖಾಗ್ರ – ದ್ವಾದಶಾಂತ, ಪಶ್ಚಿಮಶಿಖಾ, ಚಿದಾತ್ಮಾ ಇವುಗಳಲ್ಲಿಒಂದು ಸ್ಥಾನದಲ್ಲಿ ಧ್ಯಾನಿಸಬೇಕು ಎಂದು ಹೇಳುತ್ತದೆ. ಹಾಗೆಯೆ ಯೋಗಾಸನ ಸ್ಥಿತಿಯನ್ನು ಕೂಡ ನಿರೂಪಿಸಲಾಗಿದೆ.ಶುಚಿಯಾದ ಭೂಮಿಯ ಮೇಲೆ ಸ್ಥಿರವಾದ .ತನ್ನದಾದ ಆಸನವನ್ನು ಹಾಕಿ ,ಅದರ ಮೇಲೆ ಜಿಂಕೆ ಚರ್ಮವನ್ನು ಹರಡಿ, ಆರಂಭದಲ್ಲಿ ಯಾವುದೇ ಕ್ಲೇಶವಿಲ್ಲದಂತೆ ಕುಳಿತು ಆಸನವನ್ನು ಅಭ್ಯಾಸ ಮಾಡಬೇಕು ಆಸನವನ್ನು ಗೆದ್ದರೆ ಸ್ವತಃ ದೇಹವನ್ನು ಗೆದ್ದಂತೆ ಹಿಮ್ಮಡಿಗಳ ಮೇಲೆ ಎರಡು ಕೈಗಳನ್ನು ಇರಿಸಿ ಮೂಗಿನ ತುದಿಯಲ್ಲಿ ಕಣ್ಣುಗಳನ್ನು ಕೇಂದ್ರಿಕರಿಸಬೇಕು.[3] ಅದೇ ಆಗಮ ವೀರಶೈವ ಲಕ್ಷಣವನ್ನು ಅರ್ಥಪೂರ್ಣವಾಗಿ ವಿವರಿಸಿದೆ.

ಯೋಗ ಧ್ಯಾನಗಳ ಅಭ್ಯಾಸವುಳ್ಳವನು, ಶಿವನಲ್ಲಿ ಭಕ್ತಿವುಳ್ಳವನು , ವಿಷಯ ಸುಖಗಳಲ್ಲಿ ಆಸಕ್ತಿ ಇಲ್ಲದವನು,ಧೃಡ ಮನಸ್ಸಿಲ್ಲದವನು,ಶಿವೋಹಂ ಭಾವನೆವುಳ್ಳವನು ವೀರಶೈವ. ಶಿವಜ್ಞಾನ ಶಿವಭಕ್ತಿಃ ಶಿವಾಚಾರ, ಶಿವವ್ರತಂ ಲಿಂಗಾರ್ಚನಾಜ್ಞಪ್ತಿ ಶಿವಯೋಗೊಹಿ ಪಂಚಧಾ ಎಂದು ಐದು ವಿಧ ಶಿವಯೋಗಗಳನ್ನು ವೀರಾಗಮ ತಿಳಿಸುತ್ತದೆ.

ಇಷ್ಟಲಿಂಗಧಾರಣೆಯಜೊತೆಗೆ,‘जगदेतत्चराचरंसर्वशिवमयम्।
ಎಂದು ಧ್ಯಾನಿಸುತ್ತ ಶಿವೋಹಮ್ ಎಂದುಭಾವಿಸಬೇಕು ಎಂದು ಹೇಳಲಾಗಿದೆ.

ಇಷ್ಟಲಿಂಗದಲ್ಲಿ ದೃಷ್ಟಿಯೋಗ, ಪ್ರಾಣಲಿಂಗದಲ್ಲಿ ಮನೋಯೋಗ ಮತ್ತೆ ಭಾವಲಿಂಗದಲ್ಲಿ ಭಾವಯೋಗಗಳನ್ನು ಏಕಕಾಲದಲ್ಲಿ ಸಾಧಿಸಿದ ಸಾಧಕರು ಮುಕ್ತರು . ಈ ಮೂರರ ಸಮನ್ವಯವೆ ‘ಶಿವಯೋಗ’ ಇದು ಶಿವಾರಾಧನೆಯ ಕ್ರಮವೆಂದು ತಿಳಿಸುತ್ತದೆ. ೨

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೧ ಅದೇ ಲೇಖಕರು. ಅದೇ ಪ. ೧೦. ೧೪–೧೭

೨. [ಪಾರಮೇಶ್ವರಾಗಮ. ಪ .೭–೩೨]

೩. ಸಂ. ಎಂ. ಎಂ. ಕಲಬುರ್ಗಿ. ಮತು ಪಂನಾಗಭೂಷಣ ಶಾಸ್ತ್ರಿಗಳು, ಚೆನ್ನ ಸದಾಶಿವಯೋಗಿ ವಿರಚಿತ (ಶಿವಯೋಗ ಪ್ರದೀಪಿಕೆ೨–೨) ಕ ವಿ. ವಿ. ಧಾರವಡ. ೧೯೭೬

೪. (ಯೋಗ ಸೂತ್ರಂ ೨–೨೬)

೫. ಕಾಲಿದಾಸ ವಿರಚಿತ ಕುಮಾರಸಂಭವಮ್ V.ನೆಯ ಸರ್ಗ.

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೧. [ಪಟಲ .೧೦,ಶ್ಲೋ.೭೨.]

೨. (ಪಟಲ ಹತ್ತು ಶ್ಲೋಕ ೨೩.)

೩. (ಪಾ.ತಂ.ಪಟಲ ಹತ್ತು ಶ್ಲೋಕ ೨೨)

೪. (ಪಟಲ ೬ ಶ್ಲೋ ೨೬)

ಶರೀರದ ಮಲೀನತೆ ದೂರ ಮಾಡಲು ಯಮ ,ನಿಯಮ ಆಸನ, ಪ್ರಾಣಾಯಾಮ, ಪ್ರತ್ಯಾಹಾರಗಳು ಬಾಹ್ಯ ಆರೋಗ್ಯ ದೃಷ್ಟಿಯಿಂದ ಅವಶ್ಯಕ. ಆದರೆ ದೇಹವೇ ಮನುಷ್ಯನಲ್ಲ; ಅವನಲ್ಲಿ ಒಂದು ಚೈತನ್ಯವಿದೆ. ಅದೇ ಆತ್ಮ. ಈ ಆತ್ಮನಿಗೆ ಬುದ್ಧಿ– ಮನಸ್ಸು–ಅಹಂಕಾರ–ಚಿತ್ತಗಳಿವೆ. ಇವುಗಳ ಆಂತರಿಕ ಶುದ್ಧಿಗಾಗಿ ಧಾರಣ –ಧ್ಯಾನ–ಸಮಾಧಿಯೋಗಗಳ ಅವಶ್ಯಕತೆ ಇದೆ . ಮನಸ್ಸು ಎನ್ನುವುದು ಸ್ಥೂಲ ಶರೀರದ ಒಳಗೆ ಇರುವ ಒಂದು ಸೂಕ್ಷ್ಮ ಅಂಗ.

ಯೋಗ ಸಾಧನೆಯ ಧ್ಯಾನ ಮಾಡಲು ಒಂದು ಕುರುಹು ಬೇಕೆ ಬೇಕು. ಅದು ಇಲ್ಲದಿದ್ದಲ್ಲಿ ಮನಸ್ಸು ಅಲೆದಾಡುತ್ತದೆ.ಏಕಾಗ್ರತೆ ಯ ಅನುಕೂಲಕ್ಕಾಗಿ ಓಂಕಾರ ಜಪ ಸಾಕು. ಅದು ಮನಸ್ಸನ್ನು ಅಂತರಾತ್ಮದ ಕಡೆಗೆ ಹೊರಳಿಸಿ ಚಿತ್ತದ ಏಕಾಗ್ರತೆಗೆ ಸಾಹಾಯಕವಾಗುತ್ತದೆ ಎಂದು ಪತಂಜಲಿ ತಿಳಿಸುತ್ತಾನೆ.(ಯೋಗ ಸೂತ್ರ ೧–೨೭–೨೯)ಇದೊಂದು ಸಾಧನೆಯ ವಿಧಾನ.

ವೀರಶೈವರಿಗೆ ಇಷ್ಟಲಿಂಗವು ಶಿವಯೋಗ ಸಾಧನೆಯ ಕುರುಹು ಆಗಿದೆ. ಏಕೆಂದರೆ ವ್ಯಕ್ತಿ ತನ್ನ ಬಾಹ್ಯ ಸ್ವರೂಪವನ್ನು ಅರಿಯಲು ಕನ್ನಡಿಯ ಅಗತ್ಯವಿರುವಂತೆ ಆಂತರಿಕ ಆತ್ಮಸ್ವರೂಪವನ್ನು ತಿಳಿಸಲು ಕನ್ನಡಿಯಂತಹ ಒಂದು ಪವಿತ್ರ ವಸ್ತುವನ್ನು ಸ್ವೀಕರಿಸಲೇಬೇಕಾಯಿತು. ಸ್ಥಾವರ ಮೂರ್ತಿಗಳ ಬದಲಾಗಿ ಆತ್ಮನ ಕುರುಹಾದ ಇಷ್ಟಲಿಂಗ ಸ್ವೀಕರಿಸಿ, ಅಹಂ ಗ್ರಹೋಪಾಸನೆಯಿಂದ ಸಾಧನೆ ಸುಲ ಭವಾಗುತ್ತದೆ.ಶಿವಯೋಗ ಸಾಧಕನಿಗೆ ಭಕ್ತಿಯು ಸಾಧನೆಯ ಮೊದಲ ಹಂತವಾಗುತ್ತದೆ. ಶಿವಯೋಗ ಸಾಧಕನು ಮಂತ್ರ ಮೊದಲಾದ ಯೋಗಗಳನ್ನು ಅರಿತು ಅಳವಡಿಸಿಕೊಂಡಿದ್ದರೂ ಅವನ್ನು ಬದಿಗಿರಿಸಿ ಕೇವಲ ಭಕ್ತಿ ಯೋಗವನ್ನು ಮಾತ್ರ ಆಶ್ರಯಿಸಬೇಕು. ಶಿವಯೋಗವನ್ನು ಕಾಣಬೇಕು. ಎಂಬ ಅಭಿಪ್ರಾಯ ಚನ್ನಬಸವಣ್ಣನವರದು.

"ಮಂತ್ರಯೋಗ ಹಠಯೋಗ ಲಯಯೋಗ ಜ್ಞಾನಯೋಗ
ಇಂತೀ ಎಲ್ಲಾ ಯೋಗವನರಿದು ಮರೆದು ಭಕ್ತಿಯೋಗದ
ಮೇಲೆ ನಿಂದು ರಾಜಯೋಗದ ಮೇಲೆ ನಡೆವ ;ನುಡಿವ.
ಕಾಣಿರೋ"

೧ [ಪಾರಮೇಶ್ವರ ತಂತ್ರ.ಪಗ೧–೬೦]
೨ (ಚಾಂದ್ರಜ್ಞಾನಾಗಮ. ಕ್ರಿಯಾಪದ ೩–೩೯–೪೦)
೩ .(ಪತಂಜಲಿ. ಯೋಗ ಸೂತ್ರ ೧–೨೭–೨೯)

ಸಾಕ್ಷಿ: वागतीतं मनोतीतं भावातितं निरंजनम्॥ सर्वशून्यं निराकारं नित्यत्वं परमं पदम् ॥ಎಂದುದಾಗಿ ಮಹಾಲಿಂಗೈಕ್ಯರ ನಿಲವ ಅನುಮಾನಿಗಳಿತ್ತ ಬಲ್ಲರು ಕೂಡಲಚನ್ನಸಂಗಮದೇವಾ"[೧]

ಶಿವಯೋ ಗದ ಸಾಧನೆಗಾಗಿ ಚನ್ನಬಸವಣ್ಣನವರು ಹೇಳಿದ ಮಾರ್ಗವು ವಿಶಿಷ್ಟವಾದುದು. ಶಿವಯೋಗವನ್ನು ಅವರು "ನಿಜಸುಖದ ರಾಜಾಧಿರಾಜ ಶಿವಯೋಗ"ವೆಂದು ಗುರುತಿಸಿದರು.

"ಹೊನ್ನು ಮಣ್ಣು ಹೆಣ್ಣು ಅನ್ನ ನೀರು ವಸ್ತ್ರ ಆಭರಣ ವಾಹನವೆಂಬ
ಅಷ್ಟಮಲಂಗಳಲ್ಲಿ ಅಷ್ಟಕಾಮವಿಕಾರದಿಂದ ಮಾಯಾಪಾಶಬದ್ಧ
ಮಲದಲ್ಲಿ ಬಿದ್ದು ತೊಳಲುವ ಜಡಜೀವಿಗಳತ್ತ ಬಲ್ಲರಯ್ಯ
ನಿಮ್ಮ ಸರ್ವಾಚಾರ ಸಂಪತ್ತಿನಾಚರಣೆಯ,
ನಿಜಸುಖದ ರಾಜಾಧಿರಾಜ ಶಿವಯೋಗದ ನಿಲುಕಡೆಯ
ಕೂಡಲಚನ್ನಸಂಗಮದೇವಾ?"[೨]

ಅದೇ ರೀತಿಯಾಗಿ ಪ್ರಾಣಲಿಂಗಿ ಸ್ಥಲದ ವಚನಗಳು ಶಿವಯೋಗದ ಸ್ಥಿತಿಯನ್ನು ವಿವರಿಸುತ್ತವೆ.

ಮಾನವನ ಸುಖದ ಕಲ್ಪನೆ ದೊಡ್ಡದು. ಅವನು ಶರೀರದ ಸುಖ ಬಯಸಿ ರೋಗಿಯಾದನು;ಮನಸ್ಸಿನ ಸುಖ ಬಯಸಿ ಹುಚ್ಚನಾದನು; ಇಂತು ಆತ್ಮದ ಸುಖವೇ ನಿಜಸುಖ. ಈ ನಿಜಸುಖವು ಶಿವಯೋಗದಿಂದ ಸಾಧ್ಯ. ಹೀಗೆ ಶಿವತತ್ವದೊಂದಿಗೆ ಸಹಯೋಗವೇ ಶಿವಯೋಗ. ಇದುವೆ ಲಿಂಗಾಂಗ ಸಾಮರಸ್ಯ. ಲಿಂಗನೊಂದಿಗೆ ಅಂಗನು ಒಡವೆರೆದು ಬೇರಿಲ್ಲದಿಪ್ಪ. ಬೆಡಗೇ ಲಿಂಗಾಂಗ ಸಾಮರಸ್ಯ. ಶಿವಯೋಗದ ಫಲವೇ ಸಹಜ ಕೈವಲ್ಯ ಆದ್ದರಿಂದ .ಮಾನವ ಜೀವನ ಕೇವಲ ವಿಷಯ ಭೋಗಕ್ಕಾಗಿ ಅಲ್ಲ. ಭವ ಬಂಧನದಿಂದ ಮುಕ್ತವಾಗುವುದು.ಮಾನವೀಯ ಮೌಲ್ಯಗಳನ್ನು ಅರಿತು ಮಹಾಮಾನವನಾಗುವ ಮಣಿಹ ಮಾನವನದಾಗಬೇಕು.

ಆಚಾರ ವಿಚಾರ ಪ್ರಧಾನವಾದ ಷಟ್ ಸ್ಥಲವನ್ನು ಮೈಗೂಡಿಸಿಕೊಂಡರೆ ಸಾಮಾಜಿಕ ಸ್ವಾಸ್ಥ್ಯ ಬಂಧುರವಾಗುತ್ತದೆ. ಮಾನವೀಯ ಮೌಲ್ಯಗಳಿಂದಾಗಿ ಶಾಂತಿ ಸಮಾಧಾನಗಳು ದೊರೆತು ನಿತ್ಯ ತೃಪ್ತ ಜೀವನ ಲಭಿಸುತ್ತದೆ. ಇಂದಿನ ಒತ್ತಡದ ಜೀವನದಿಂದ ಮುಕ್ತರಾಗಲು , ನೆಮ್ಮದಿಯ ಬದುಕನ್ನು ಬದುಕಲು ಯೋಗಸಾಧನೆ ಅತ್ಯವಶ್ಯವಾಗಿದೆ.

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೧ ಸಂ. ಡಾ. ಆರ್. ಸಿ. ಹಿರೇಮಠ (ಚ. ಬ. ವ. ೧೪೫೬.)
೨ ಚನ್ನಬಸವಣ್ಣನವರು. ಬಸವೇಶ್ವರ ಪೀಠ. ಕ.ವಿ.ವಿ. ಧಾರವಾಡ್ ದಲ್ಲಿ ಉದ್ಧತ.

P.S.P.S:-04

HUMANISTIC TOUCH IN THE DELENATION OF PURANIC GODDESSES _A SOCIO CULTERAL PERSPECT

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A marakosa, the lexicon of sanskrit explains the five salient features of puranas as_ creation, the deluge and after creation the geneologies of gods and goddesses the manvantaras the epoch of Manus and the geneologies of the kings of lunar and solar races i.e., and the five characteristics of the puranas.

The oldest treatise on etymology and phisology defines there fore puranas are the ancient treatises, recording the events of past acting as a source of knowledge to present era. puranas are the popular literature, or the explanatory commentaries to understand the principles of vedas and Upanishads, here it is relevant to quote veda vyasas words from Mahabharata. "Puranas are the extention of Veda."

In puranas, the principles or the messages are conveyed through stories and inset stories. The gods and goddesses of puranas are projected as human beings, who have attained

the highest virtues and glory. They are well versed in different sastras, they practice yoga and perform yajnas .They are the beneficiaries of mankind and manuficent in conferring boons to their devotees. The present paper aims at interpreting the socio-cultural perspective of these goddesses.

The story of parvati and siva occurs in puranas many times.
1)Vamana purana 1 chapter
2)Skanda purana kashi kanda chapter 88
Avanti kanda ch 4, ch 18, ch 21,
3) Brahma vaip Ganapati khanda ch 1
4) Padma p. srusti khan ch, 7.
5) Linga p. purva Bhaga ch. 99_103
6)Varaha p. ch. 20
7) Matsa p. ch. 154
8) Bramha vai p. Brahma khanda ch. 57 to 60

Daksha Brahma, father of parvati performed a sacrifice. All the gods were invited except shiva but parvati, though not invited.Inspite of the repeated warnings from siva wants to attend the sacrifice siva is an ideal husband who, cares for his wife and wants to console her, He says " I will create a separate yajna, separate rsis and perform myself for your sake. Donot go to the yajna of your father because the father neglected me and also neglected you- But-parvati goes without heeding the words of siva. She went to the sacrifice. Daksa neglects her parvati commits self immolation, these details occur in almost all the puranas but with slight variations

The social aspect in this story is-
1) Siva and parvati are premordial husband and wife. They have a family . The puranas depict siva as an ideal husband loving, advising and protecting her wife
2) parvati, ordinary house wife much worried about her family. In vamana purana there is a beautiful description of rainy season. It is well-known that parvati and siva lives in Himalaya mountain according to mythology, parvati begins to worry about a safe and warm place for her family. She is Bhogi and siva is yogi, always meditating and not worried about the comforts of worldly life . They represent the two ways of thinking in India.

Parvati is Mahadevi. She is most powerful and called by various names like Uma, Kali., Hymavati, Gowri and manifests in many forms. Parvati performs penance to get siva as her husband is of ten captures our attention, Siva coming in the guise of a brahmin, scording Siva, to test the devotion and love of parvati. Parvati marries siva (sati) parvati acts as a very ordinary women when she wants to attend the sacrifice performed by Daksha, her father siva who loves her wants to protect her dignity. parvati goes to the sacrifice and unattended (neglected) by her father and other rsis commits self immolation. Further she performs penance and takes birth as the daughter of Himavan and marries siva. The marriage procession, The rituals of marriage are elaborate and humanaistic skanda puranas.

Lakshmi, saraswati and many other goddesses are different forms of sakti, The supreme goddess.Though there are many goddesses in puranas like saktis, matrukas, yogins etc. Therefore for this paper I am considering the deity parvati.

The deities have physical forms and feelings of ordinary human beings. They also have personal problems.

Markandeya purana narrates the exploits of durga or parvati in 13 chapters. This is called Durga Sapta sati she kills the demons Madhu and Kaitabha, Mahisasura, Canda, Munda and others, when the gods wanted to kill Mahissasura and were unable to destroy him due to the boons given by Brahma to Mahisasura, Parvati, Durga, Mahalakshmi or Sakti was given birth by the Tejas or lustre of the gods brahma, visnu and siva. She appeared as a lustre, the valour and brilliance of gods, the mental power, was given physical form. Her prowess was personified in the forms of her arms with various weapons gifted by the devatas (Dikpalakas).

Puranas are popular literature and show the ways to gain all the wordly things. THey prescribe some poojas or vratas for the fulfilment of these wishes these varatas are the cultural aspects of indian tradition Vratas are simplified forms of Yajnas and penance. Agni purana defines vrata, in vrata paribhasa- " The injunction laid down by sastras is vrataa it is called Tapas. The injunctions ordiained the qualities of self controls. Etc."

TO name a few vratas for Gowri or parvati-
Lalitha vrata, Harakali vrata, Sowbhagya vrata, Akshathruthiya, Badhapathithuthiya

Parvati became Durga, camundi, candika, kali kausika, Mahisa masadini. She is Sapta Matruka Chamuda, varahi, gmdri, Vaisnavi, maheshwari Kaymari, brahmi.

The humanistic touch in goddness can be seen in the Navaratri or Dasahara Festival, The Vratas have three parts. Niyama (rules for worship) Upavasa (food restriction) and dama(charity)

A society has a social system. the basis of which is culture or tradition of the community. The goddesses are sentimental puranas depiets even the abstruct sentiments as having human forms. From Kama(desire) Yogisvari, from Krodha (wrath) Mahesvari from Mada (infratuation) Brahmani, from Moha (greed), Kaumari from Matsarya (jelsousy) Indraja from Paisunya (wickedness) Yamadanda dhara and from Anasuya (lack of jealousy) varahi, (varaha purana 34.37) the human traits found in all the human being are personified as goddesses.

The Supression of human feelings or the controls of mind and Spirit helps in controlling the troubles caused by the above goddesses. Parvati becames kali when she becomes angry. Our mind is parvati, the creator when it is calm. When it is purturbed she becomes kali the the ferocious to destroy

the evil. The process of anihilation itself is Durga, Kali etc., If a person tries to stop the anihilation of good with a balanced mind, he will elivate himself from the bonds of this world, what ever we find in this Prakrti (sataroopa) it is in every human being, what is in andanda (universal soul) it is in Pindanda (human body).

Woman, as Purnas depict is the Narisakthi, which reaches devinity (Daivisakti) and finally the tranquility of mind. It is the manifestation of Avyakta into Vyakta and the Avyaktha again.

FOCAL THEME
NEED FOR WOMEN LEADERSHIP IN EDUCATION & RESEARCH

F/T:- N.W.L.E.R:-01

WOMEN'S LEADERSHIP IN EDUCATION AND RESEARCH

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Introduction

Like wise it is inevitable to women to be educated and by that she can develop her leadership in educating others, although leadership is often viewed as many different things as it varies from individual to individual and context to context. Now the women developed the knowledge, skills and abilities to rise through the education.

Women are holding a higher percentage of managerial and executive jobs than in the past, which is evidenced by recent reports in the field of Industries, Communications, Entertainment and Recreation services, Finances, Insurance and Real Estate business and repair services retail trade and other professional services

The general impression is that women are becoming incrementally more successful in the workforce — and some of the news *is* good. Women are represented in the workforce in greater numbers than ever and holding a higher percentage of managerial and executive jobs than in the past. Women-owned businesses have doubled in the last dozen or so years. But some news is not so good.

Lack of pay equity and the ever-present glass ceiling continue to be obstacles to women's career success. But women have secret weapons, opportunities to deploy their special strengths, and the ability to adapt talents typically thought to be men's domain. If our 10 strategies seem to suggest male-bashing or a war between the sexes, that's not the intent. It's just about leveling the playing field in a work world that has been inequitable for women for far too long.

Women have secret weapons, opportunities to deploy their special strength and the ability to adopt talents typically thought to be men's domain. Therefore it is just above leveling the playing field in a work world, the women should have **10 strategies** for advancing their careers as follows

1. Get as much education & training as you can
2. Be a surfer girl
3. Leverage Communication & interpersonal skills
4. Plan your career
5. Network
6. Find a mentor
7. Cultivate & Project confidence
8. Self Promote
9. Incubate your talents
10. Become a free agent

Here are 10 strategies women should consider for advancing their careers:

1. Get as much education and training as you can

Education is, by far, women's most powerful secret weapon, and we have been preparing for a sneak attack for at least the last decade. In previous years majority of the college degrees awarded went to men. This was true at the associate, bachelor's, master's, first professional, and doctorate levels. In recent years majority of the associate, bachelor's, and master's degrees were awarded to women, according to the Postsecondary Education Opportunity Research Letter. The Research Letter also reports that at the first professional and doctorate degree levels, the wide gap seen in previous years has mostly closed, and within a decade a majority of these degrees also will be awarded to women.

"The story told by the data describe an extraordinarily broad and long-term shift in the proportion of higher education earned degrees from men to women," the Research Letter notes. "In a world increasingly dependent on the education and training provided by colleges and universities," the publication continues, "women are preparing for that world and men are not. We are heading into a world where the interests and values of women will gradually come to displace the interests and values of men. It will be a different kind of world as a result."

There you have it. The workplace may not have quite caught up, but women are making serious inroads in the "knowledge is power" equation, and our best hope to crash through that glass ceiling is to keep doing what we're doing.
Get the highest degree you can possibly manage. The old obstacles of lack of money and time need not deter women anymore because many new options for financial aid and distance learning are available.

A very helpful resource for financial aid is the book *Pathways to Career Success for Women: A Resource Guide to Colleges, Financial Aid, and Work*.

Consider informal ways of educating yourself through, for example, joining professional organizations, attending conferences, and keeping up with trade publications in your field. To the extent possible when seeking a job, look for companies that offer training programs and professional development opportunities. Make a point of asking in job interviews what kind of training is available. Your goal should be to develop a set of portable skills that are transferable and applicable to various career fields. Learn more about transferable skills. An excellent resource for learning how to leverage your education and training is Caitlin Williams' book, *Successful Woman's Guide to Working Smart*, particularly Chapter 4.

The survey respondents' sage advice below is much more

commonly practiced by today's education career of woman

- Find out who is in power and is most influential in making promotions, and then make sure that person knows you and your accomplishments.
- Know the power bases in the organization and in the community.
- Get the right people to know you and for the right reasons.
- Put yourself in a system that will give women the opportunity to advance.
- Consider the impact on personal goals.
- Women can do anything they want to do providing they are willing to pay the costs.
- Be aware of the challenges and time demands.
- Be prepared to take on extra responsibilities and longer hours.
- Know what's at stake, the high costs and the consequences.

2. Be a surfer "girl"

Women are in the majority, not only in most realms of higher education, but also in Internet use, comprising at least 52 percent of Internet users, according to Nielsen/Net Ratings. Women are also more efficient in their Internet use; they spend less time surfing because they know what they're looking for. Women are already harnessing the vast amount of information that the Internet puts at their fingertips. Now it is an age where the amount of information available to us is 10,000 times more than in previous days. It's hard to avoid the notion that knowledge is power, and women are well positioned for the power afforded by their efficient use of the information superhighway.

And women's command of the 'Net ties closely with their quest to overtake men in education. A recent report by the American Association of University Women (AAUW) Educational Foundation found that distance- or online-learning is on the rise, and women make up the majority of students. Sixty percent of nontraditional online learners are over 25 and female.

The bottom line here is that women can stay on the cutting edge through continued dominance on the Internet and by taking advantage of online learning opportunities.

3. Leverage communication and interpersonal skills

Numerous recent studies have noted differences in the way men and women communicate and relate interpersonally. Women's way of communicating is not necessarily better than men's, but it may be better suited to newer styles of management. So-called "feminine attributes," such as the ability to build relationships with customers, strike up joint ventures, and partner with suppliers are increasingly important.

In her book *Successful Woman's Guide to Working Smart*, Caitlin Williams lists these changes in the workforce: more team-based work, increased customer contact, multiple demands, greater workforce diversity, higher expectations, and tighter timelines. "While successfully dealing with all these changes may call for different knowledge and technical expertise in each instance, the need to interact well with others is a constant across every single change we make...interpersonal competence is moving front and center as a requirement for organizational success today."

Generally speaking, more women than men are likely to earn the comment "plays well with others" on their workplace report cards. Women should deploy their strong interpersonal and communication skills at every opportunity and tout their accomplishments in this realm.

4. Plan your career

Career planning is important for everyone, but especially for women because they generally have more twists and turns to negotiate along the road to career success than do men. If you have a road map, you'll be less likely to become derailed if you should, for example, decide to relocate to be with a significant other, have a baby, or suddenly need to care for an elderly parent.

Decide where you want to be five, 10, and 15 years from now. Build flexibility into your career plans to allow for changing circumstances. Your plan may need to change to accommodate those life changes, but your core plan with better equip you when that happens.

Tools to consider using as you plan your career include career assessments, a workplace values exercise, a personal mission statement, and a SWOT Analysis.

In planning your career ……

- Excel in your work.
- I made sure that I knew more and produced more!
- Do whatever you do well; don't be afraid to do more and to take on more responsibility.
- Women can lead just as well as men, but they must work much harder to get to the same level.
- Do the best job possible and respect will come.
- Be the best you can be.
- Prove your worth! Men don't always need to do this; just being a male is sufficient!!
- Be persistent!
- Do not give up! Keep pushing for the position you'd like to have.
- Be strong and independent.
- Be firm, strong, and fair.
- Be honest.
- Maintain personal ethics and values—nothing is worth losing them.
- Being oneself, modeling what one values, and having the courage and confidence to follow one's value system are critical components to survival in the quest and attainment of top leadership positions.

- Work to maintain calm, trusting relationships.

5. Network

Who are the more successful networkers, men or women? You might guess women because women seem like the natural talkers, while we tend to think of men as holding back. The facts indicate that men use networking more effectively than women, however women are more likely than men to find their next job through an ad in the classifieds, while networking is a more effective strategy for men than women. Does that mean that women should start scouring the classifieds? No, it just means that men and women should use their different styles to greatest advantage. Consider the following:

• Women's networks tend to be more egalitarian and inclusive than men's, according to writer Kathy Harvey, who describes a career consulting company's experience with asking women to list people who might form part of their network. Women were more likely to mention people at lower levels than themselves, as well as those at the higher echelons, while men tend to focus on people with power and influence. Men may benefit from network contacts with greater clout, but women can take advantage of wider and more diverse circles of contacts. Some experts also say women are better at sharing than men, so both men and women may be able to expect more career-based generosity from female members of their networks than either gender can from men.

• Women have traditionally been expected to devote more time to family and domestic responsibilities, thus lacking as much time as men to build networks. We're starting to see more women networking out there on the golf course, for instance, but that's a fairly new phenomenon. To be truly competitive in the networking arena, women may have to put more time into making contacts — and may have to ask their male partners to take on a bigger share in juggling family life and work.

• The number of all-women networking groups is increasing enormously, in part to create the same kind of networks that are already entrenched for men. An all-woman networking group can be enormously beneficial to women seeking mentors and contacts who've already succeeded in breaking through the glass ceiling. These groups also can be an efficient way to deal with the time crunch that curtails women's networking. Increasingly, women are organizing networks within their own companies, often with corporate support. Two books by Catalyst, the nonprofit research and advisory organization that works to advance women in business and the professions, provide detailed information about creating women's internal networks.

6. Find a mentor

If you do no other kind of networking, at least find yourself a mentor — or let one find you. "While mentoring relationships are important for all organizational members, they are essential for women," writes Dorothy Perrin Moore in *Careerpreneurs: Lessons from Leading Women Entrepreneurs on Building a Career Without Boundaries*. "Mentors can both protect women from discrimination and help them learn what men supposedly learn from the 'old boy's network' about how to navigate their way past obstacles to their career success." Echoes Caitlin Williams, "The majority of women who have succeeded in their careers and reached position of influence credit their participation in some sort of mentoring effort for getting them where they are today."

A mentor is that one person who can guide you, help you, take you under his or her wing, and nurture your career quest. A Yoda to your Luke Skywalker. What separates a mentor from the average network contact is long-term commitment and a deep-seated investment in your future. Where a typical network contact might be associated with quick introductions, exchanges of business cards, and phone calls, your relationship with a mentor likely involves long lunches and time spent in the mentor's office. A mentor is often in a position you'd like to be in and has the clout and connections to guide you to a similar position. He or she is someone you probably have unusually good chemistry with who will share stories with you of his or her own climb to success. An effective mentor isn't afraid to criticize constructively.

To find a mentor, identify someone you admire, and test the waters by asking advice. Be sure to reveal as much of yourself as possible. Mentors are most likely to invest themselves in those in whom they see a little of themselves, which is why you should never approach a prospective mentor in state of desperation or helplessness. The mentor wants to work with someone he or she can respect. He or she may even desire to mold the protégé in his or her own image, which is fine as long as the mentor is not too obsessive about it, and you are comfortable with the image into which you're being molded. You should have a good feel after a few meetings as to whether the rapport is right for a mentoring relationship. At that point, you can either come right out and ask the person to be your mentor, if that feels appropriate, or you can simply tell him or her how much you've benefited from the advice you've received so far and that you hope he or she will continue to share it with you. Although the mentor will tend to give a lot more than you do to the relationship, be sure to express regularly that you value and appreciate the mentor's guidance. The feeling of being needed and making a difference in a protégé's life will often be a rewarding payoff for the mentor.

7. Cultivate and project confidence

Women often suffer from a crisis of confidence in the workplace, especially when the environment is hostile or chilly to them. Caitlin Williams, author of *Successful Woman's Guide to Working Smart*, informally surveys women to whom she presents workshops, asking them "what one quality do you believe is the most important for your career success?" Confidence wins the top spot every time, Williams reports. The author, whose book provides numerous inventories and exercises for assessing and building confidence, suggests remembering past successes, believing in your ability (educa-

tion and training play a big role here), knowing yourself, and seeking career encouragement (a mentor can help).
Williams also suggests creating a career portfolio as a great way to reinforce your sense of confidence. You may also get a boost to your confidence from tracking your accomplishments.
For cultivating confidence these below points are helpful…

- Accept responsibility for self.
- Set personal goals.
- Know your professional ethics and maintain them.
- Be firm, strong and fair.
- Be an example for peers.
- …have a breadth to you.
- Remember, be yourself, not what others think you ought to or should be.
- Be able to stand up against diversity.
- Don't expect special treatment; expect to pull your own weight.
- Know what you stand for so that decisions come quickly and with consistency and fairness.

8. Self-promote

Once you've shored up your confidence, you need to make sure others know how terrific you are. "In today's workplace," Caitlin Williams writes," one of your keys to success is your ability to let others know who you are, what you have to offer, and how you can make a difference in their organization."
Self-promotion is not easy for women. "Many women are uncomfortable with self-promotion because it flies in the face of society's message that a woman is the support person who is supposed to put other needs ahead of her own," write Binnie Shusman Kafrissen and Fran Shusman in their book, *Winning Roles for Career-Minded Women: Understanding the Roles We Learned as Girls and How to Change Them For Success at Work*. But women need to toot their own horns because they can't depend on others to do it for them.
Make sure people within and outside your workplace know about your accomplishments. Submit news of accomplishments to your company newsletter and local newspaper. Let your boss know what you're up to. One professional we know sends out a monthly email to his boss and his boss's boss to keep them updated on his progress on various projects — and to share any accomplishments and accolades from the previous month. Promote yourself as an expert on one or more topics and volunteer to speak to local organizations.
Again to self promote ……..

- Remember it's up to you—decide what you want and then strive for it.
- Be a risk taker.
- Keep trying, but mostly, do whatever you do well, don't be afraid to do more and
to take on more responsibility.
- It's a complex playing field, not for the faint hearted.

GO FOR IT.

- Be willing to take risks.
- …be ahead of the trends.
- If you stumble or fall on hard times, pick yourself up and carry on—don't give up.
- Courage and integrity are hallmarks of real leaders.
- Be open to new opportunities, challenges and experiences.
- Dare to be different.
- Dare to be great!

9. Incubate your talents

If you have big dreams of career or entrepreneurial success, seek to spend some time working in organizations that will help you incubate your talents. This incubator concept is a centerpiece of Dorothy Perrin Moore's book, *Careerpreneurs: Lessons from Leading Women Entrepreneurs on Building a Career Without Boundaries*. Moore suggests that corporate incubators can help you gain exposure to customers, suppliers, and competitors; foster specific managerial, technical and planning skills; and learn how to do things better by working in less-than-optimal environments for sub-optimal managers. By spending a few years in a corporate environment specifically cultivating skills and making contacts, you can more easily propel yourself either to greater success in your next career move or to a position where you can start your own business.

10. Become a free agent

In a study by Catalyst and the National Foundation for Women Business Owners, women business owners cited four major reasons for leaving the private sector: lack of flexibility (51 percent); glass ceiling (29 percent); unhappiness with work environment (28 percent), and feeling unchallenged in their jobs (22 percent).

Other studies have shown different reasons for the bailout by women. "Bucking conventional wisdom, professional growth, power, and money were the big drivers in influencing women to leave corporate jobs in the past five years — not the glass ceiling, balance, or personal life,"

No matter what women's reasons, corporate loss is apparently women's gain since women-owned businesses are being created at twice the rate of all businesses.

"Companies cannot afford to lose a generation of women leaders". In today's world, talent is the primary source of competitive advantage. Even with the current wave of layoffs, the generation shift from Baby Boomers to the much smaller 35- to 44-year-old age group will leave us with a drought of seasoned talent.

Suggested Citation

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ಕೈ ತೋಟ ನಿರ್ವಾಹಣೆ ಮಾಡಿ ಕುಟುಂಬದ ಆರೋಗ್ಯ ಕಾಪಾಡುವಲ್ಲಿ ಗ್ರಾಮೀಣ ಮಹಿಳೆಯರ ಪಾತ್ರ

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*ವಿಷಯ ತಜ್ಞೆ (ತೋಟಗಾರಿಕೆ) ಕೃಷಿ ವಿಜ್ಞಾನ ಕೇಂದ್ರ, ಚಾಮರಾಜನಗರ.

ಗ್ರಾಮೀಣ ಮಹಿಳೆಯರ ಪಾತ್ರ ಕೇವಲ ಅಡುಗೆ ಮನೆಗೆ ಸೀಮಿತವಾಗಿದೆ. ಪಟ್ಟಣದ ಮಹಿಳೆಗಿಂತ ಹೆಚ್ಚು ಕೆಲಸ ಮತ್ತು ಭಿನ್ನವಾದ ಜವಾಬ್ದಾರಿ ಹೊರುತ್ತಾಳೆ. ಪ್ರಪಂಚದ ಕೃಷಿ ಉತ್ಪನ್ನದಲ್ಲಿ ಮಹಿಳೆಯರು ಶೇ 50% ರಷ್ಟು ಆಹಾರ ಉತ್ಪಾದನೆಗೆ ರೈತ ಮಹಿಳೆಯರೇ ಕಾರಣಕರ್ತರು ಎಂದರೆ ತಪ್ಪಾಗಲಾರದು. ಮಹಿಳೆಯರು ಎಲ್ಲಾ ತನ್ನ ಕುಟುಂಬದ ಆರ್ಥಿಕ ಸ್ಥಿತಿ ಮತ್ತು ಆರೋಗ್ಯ ರಕ್ಷಣೆ ಭಾರವನ್ನು ಹೊತ್ತಿರುತ್ತಾಳೆ. ಶೇ 60% ಭಾಗ ಸಮಯವನ್ನು ಕೃಷಿಯಲ್ಲಿ ಕೆಲಸ ನಿರ್ವಹಿಸುವ ದೇಶದ ಕೃಷಿ ಉತ್ಪನ್ನಕ್ಕೆ ರೈತರ ಜೊತೆ ಹೆಗಲು ಜೋಡಿಸುವ ಮಹಿಳೆಯರಿಗಾಗಿ ಡಿಸೆಂಬರ್ 4ನ್ನು "ರೈತ ಮಹಿಳಾ ದಿನ" ಎಂದು ಘೋಷಿಸಲಾಗಿದೆ. ಗ್ರಾಮೀಣ ಮಹಿಳೆಯ ಸ್ವಲ್ಪ ಮಟ್ಟಿಗೆ ಆರ್ಥಿಕವಾಗಿ ಸ್ವಾವಲಂಬಿಯಾಗಲು ಮತ್ತು ಕುಟುಂಬದವರಿಗೆ ಅವಶ್ಯಕತೆಗೆ ತಕ್ಕಂತೆ ತಾಜಾ ಸೊಪ್ಪು ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳನ್ನು ಪಡೆದು ಸಮತೋಲನ ಆಹಾರಕ್ಕೆ ಮಾರ್ಗದರ್ಶಿ ಈ "ಕೈ ತೋಟ"

ಎಲ್ಲಾ ಕುಟು ಬಗಳು ತಾಜಾ ತರಕಾರಿ ಮತ್ತು ಹಣ್ಣುಗಳನ್ನು ಪಡೆ ಯಲು ತಮ್ಮ ಮನೆ ಯ ಆವರಣ / ಹಿತ್ತಲಿನಲ್ಲಿ ಬೆಳೆಸುವ ತೋಟಕ್ಕೆ "ಕೈ ತೋಟ"ವೆ ದು ಹೆಸರು. ಕೈತೋಟವು ತೋಟಗಾರಿಕೆ ಯ ದು ಭಾಗ ್. ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳನ್ನು ಪ್ರತ್ಯೇಕವಾಗಿ ಇಲ್ಲವೇ ಗು ಪುಗಳಲ್ಲಿ ಬೆಳೆಸಬಹುದು.

ಕೈತೋಟದ ಪ್ರ ಯೋಜನಗಳು:-

- ಕೈತೋಟವು ಮನೆ ಯ ಅ ದವನ್ನು ಹೆಚ್ಚಿಸುತ್ತದೆ ಯಲ್ಲದೆ ಸುತ್ತಲಿನ ವಾತಾವರಣವನ್ನು ತಿಳಿ ಯಾಗಿಸಿ ಪ್ರಶಾ ತತೆ ಯನ್ನು ಕಾಪಾಡುತ್ತದೆ.
- ಹಸಿರು ವಾತಾವರಣದಿ ದ ಶುದ್ದ ಗಾಳಿ ದೊರೆ ಯುವುದಲ್ಲದೇ ಮನಸ್ಸಿಗೆ ನೆಮ್ಮದಿ ಮತ್ತು ಆನ ದ ದೊರೆ ಯುವುದು.
- ಬಿಡುವಿನ ವೇಳೆ ಯಲ್ಲಿ ಕೈತೋಟದ ಕೆಲಸಗಳಲ್ಲಿ ತೊಡ ಗುವುದರಿ ದ ದೇಹಕ್ಕೆ ವ್ಯಾ ಯಾಮ ಸಿಗುವ ತಾಗುವುದು. ಮತ್ತು ನಮ ಗೆ ಬೇಕಾದ ಹಣ್ಣು, ತರಕಾರಿ ಮತ್ತು ಹೂವುಗಳನ್ನು ನಾವೇ ಬೆಳೆದುಕೊ ಡು ಸ್ವಲ್ಪ ಹಣ ಉಳಿತಾ ಯ ಮಾಡಲು ಸಾಧ್ಯ.
- ಮನೆ ಯ ಸುತ್ತಲೂ ಸಾಕಷ್ಟು ಸ್ಥಳ ಇದ್ದಲ್ಲಿ ಹೆಚ್ಚು ಬೆಳೆಗಳನ್ನು ಬೆಳೆ ಯಲು ಸಾಧ್ಯ. ಇದರಿ ದ ಬ ದ ಹೆಚ್ಚುವರಿ ಫಸಲನ್ನು ಮಾರಾಟ ಮಾಡಬಹುದು.
- ಮನೆಯಿ ದ ಹೊರೆಗೆ ವ್ಯರ್ಥವಾಗಿ ಹರಿದು ಹೋಗುವ ನೀರನ್ನು ಸಮರ್ಪಕವಾಗಿ ಬೆಳೆಸಿಕೊಳ್ಳಬಹುದು.
- ಕೈತೋಟ ಮಾಡುವುದರಿ ದ ಮನೆ ಯ ಮಕ್ಕಳು ಮತ್ತು ಗೃಹಿಣಿ ಯರಿಗೆ ಬಿಡುವಿನ ವೇಳೆ ಯಲ್ಲಿ ಕೆಲಸ ಸಿಗುತ್ತದೆ.
- ಕೈತೋಟ ನಿರ್ಮಾಣ ದು ಕಲೆ, ಇದೊ ದು ಹವ್ಯಾಸವು ಹೌದು. ಇದನ್ನು ಅತ್ಯ ತ ಕಡಿಮೆ ವೆಚ್ಚ ಹಾಗೂ ಶ್ರಮದಿ ದ ಹೆಚ್ಚು ಪ್ರತಿಫಲ ಪಡೆ ಯುವ ಪುಟ್ಟ ಕ್ಷೇತ್ರವೆ ದು ಹೇಳಬಹುದು.
- ದಿನದಿ ದ ದಿನಕ್ಕೆ ಹೆಚ್ಚುತ್ತಿರುವ ಹಣ್ಣು ತರಕಾರಿ ಬೆಲೆಗಳು ಜನಜೀವನ ನಿರ್ವಹಣೆ ಯಲ್ಲಿ ಸ ಕಷ್ಟಕ್ಕೀಡು ಮಾಡಿದೆ. ಇ ತಹ ಸನ್ನಿವೇಶದಲ್ಲಿ ಇದಷ್ಟು ಜಾಗದಲ್ಲಿ ಕೈತೋಟ ನಿರ್ಮಾಣ ದುರ್ಬಲ ವರ್ಗದವರಿಗೆ ಆರ್ಥಿಕವಾಗಿ ನೆರವಾಗಬಲ್ಲದು.

ತೋಟಗಾರಿಕಾ ಬೆಳೆಗಳ ಉತ್ಪಾದನೆ ಹೆಚ್ಚಾಗುತ್ತಿದ್ದರೂ ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳ ಸೇವನೆಯ ಪ್ರಮಾಣ ಮಧ್ಯಮ ಹಾಗೂ ಬಡ ವರ್ಗದ ಜನರಲ್ಲಿ ಕಡಿಮೆಯಾಗುತ್ತಿರುವುದು ಆತಂಕದ ವಿಚಾರ. ಇದರಿಂದ ಅಪೌಷ್ಟಿಕತೆಯ ಸಮಸ್ಯೆ ಅಧಿಕಗೊಂಡು ಸೂಕ್ಷ್ಮ ಪೋಷಕಾಂಶಗಳಾದ ಜೀವಸತ್ವ ಹಾಗೂ ಖನಿಜಾಂಶಗಳ ಕೊರತೆಯಿಂದ ಆರೋಗ್ಯ ಸಮಸ್ಯೆಗಳು ಹೆಚ್ಚುತ್ತಿದೆ.

ನಗರ ಪ್ರದೇಶದಲ್ಲಿಯೂ ಸಮಯ ಸಂಪನ್ಮೂಲ ಹಾಗೂ ಸ್ಥಳದ ಅಭಾವದಿಂದಾಗಿ ಕೈ ತೋಟಗಳು ವಿರಳವಾಗುತ್ತಿವೆ. ಗ್ರಾಮೀಣ ಜನರಿಗೆ ಮೂಲ ಸೌಕರ್ಯಗಳಿದ್ದೂ ಕಡಿಮೆ ತಿಳುವಳಿಕೆಗೆ ಹಾಗೂ ಉಪೇಕ್ಷೆಯಿಂದಾಗಿ ಕೈ ತೋಟಗಳು ಕಣ್ಮರೆಯಾಗುತ್ತಿವೆ.

ಇಂದಿನ ಪೀಳಿಗೆಯವರಿಗೆ ಕೈ ತೋಟ ಮಾಡಲು ಸಮಯವಿಲ್ಲವೆನ್ನುವುದಕ್ಕಿಂತ ಅದರ ಉಪಯೋಗಗಳ ಬಗ್ಗೆ ಅರಿವಿಲ್ಲವೆನ್ನಬಹುದು. ಕೃಷಿ ಅವಲಂಬಿತ ರೈತ ಕುಟುಂಬದವರಿಗೆ ವರ್ಷ ಪೂರ್ತಿ ಕೆಲಸವಿರುವುದಿಲ್ಲ ಕೆಲವೊಂದು ಹಂತಗಳಲ್ಲಿ ಮಾತ್ರ ಕೆಲಸವಿರುತ್ತದೆ. ಆದ್ದರಿಂದ ಈ ಪುಟ್ಟ ಕೈ ತೋಟಗಳಲ್ಲಿ ತಮ್ಮನ್ನು ತಾವು ತೊಡಗಿಸಿಕೊಂಡರೆ ತಮ್ಮ ಮನೆಯ ಅವಶ್ಯಕತೆಗೆ ತಕ್ಕಂತೆ ತಾಜಾ ಸೊಪ್ಪು ಹಣ್ಣು ತರಕಾರಿಗಳನ್ನು ಪಡೆದು ಕುಟುಂಬದ ಆರೋಗ್ಯವನ್ನು ಕಾಪಾಡಬಹುದು. ಕೈ ತೋಟದ ನಿರ್ವಹಣೆಯ ಸ್ವಲ್ಪ ಕಷ್ಟವೆನ್ನಿಸಿದರೂ ಸಹ ಗ್ರಾಮೀಣ ಮಹಿಳೆಯವರಿಗೆ ಇದೇನು ಶ್ರಮದಾಯಕವಲ್ಲ ಬದಲಿಗೆ ಪ್ರಯೋಜನಕಾರಿಯೇ ಹೌದು. ಆಕೆಗೆ ಅದರ ಉಪಯೋಗಗಳ ಬಗ್ಗೆ ಅರಿವುಂಟು ಮಾಡಿದರೆ ಅವಳು ಬಿಡುವಿನ ವೇಳೆ ಸದುಪಯೋಗವಾಗುತ್ತದೆ.

ಕೈತೋಟದ ಸುಲಭ ನಿರ್ವಹಣೆಗೆ ಸಾವಯುವ ವಿಧಾನ

ಸಾವಯುವ ವಿಧಾನವೆಂದರೆ ನಮ್ಮಲ್ಲಿಯೇ ದೊರಕುವ ಪ್ರಾಕೃತಿಕ ವಸ್ತುಗಳನ್ನು ಉಪಯೋಗಿಸಿ ಮಣ್ಣಿನ ಫಲವತ್ತತ್ತೆಯನ್ನು ಹೆಚ್ಚಿಸುವ ವ್ಯವಸಾಯ ಕ್ರಮ ಉತ್ಪನ್ನಗಳನ್ನು ಕೀಟ ಮತ್ತು ರೋಗಗಳಿಂದ ರಕ್ಷಿಸಲು ಬೆಳೆಗಾರರ ವಿಪರೀತ ವಿಷಯುಕ್ತ ವಸ್ತುಗಳನ್ನು ಬಳಸುತ್ತಿದ್ದಾರೆ. ನಾವು ಕೊಂಡು ಭಕ್ಷಿಸುವ ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳು ವಿಷಯುಕ್ತವಾಗಿ ನಮ್ಮ ಆರೋಗ್ಯವನ್ನು ಹಾಳು ಮಾಡುತ್ತದೆ. ಗ್ರಾಮೀಣ ಮಹಿಳೆಗೆ ಈ ವಿಧಾನದಿಂದ ಚಿಕ್ಕ ಕೈ ತೋಟಗಳನ್ನು ನಿರ್ವಹಿಸುವುದು ಬಹಳ ಸುಲಭ, ಕಡಿಮೆ ವೆಚ್ಚದಲ್ಲಿ ಸ್ಥಳೀಯವಾಗಿ ಸಿಗುವ ಸಗಣಿ, ಕಸಕಡ್ಡಿ, ಹಾಗೂ ಗಿಡಬಳ್ಳಿಗಳ ತರಗೆಲೆ ಮತ್ತು ಬಚ್ಚಲು ಮನೆಯ ನೀರನ್ನು ಉಪಯೋಗಿಸಬಹುದು.

ನಾವೇ ಬೆಳೆದ ಗಿಡಗಂಟೆಗಳಿಂದ ಬೀಜ ಮತ್ತು ಸಸಿಗಳನ್ನು ತಯಾರಿಸಿಕೊಂಡು ಮುಂದೆ ಬಿತ್ತನೆಗೆ ಸಹಾ ಉಪಯೋಗಿಸಿ

ಕೊಳ್ಳಬಹುದು.

ಕೈತೋಟದ ಭೂ ಸಿದ್ಧತೆ

ಮೊದಲನೇ ಹಂತದಲ್ಲಿ ಭೂಮಿಯನ್ನು ಸಾವಯವಯುಕ್ತಗೊಳಿಸಲು ಹಸಿರುವ ಗೊಬ್ಬರದ ಬೆಳಗಳಾದ ಅಲಸಂದಿ, ಹೆಸರು, ಉದ್ದು, ಸೋಯಅವರೆ, ಲುಸರ್ನ್, ಸೆಣಬು, ಇತ್ಯಾದಿ ಆ ಜಾಗದಲ್ಲಿ ಬೆಳೆದು ಇವು ಹೂ ಬಿಡುವ ಹಂತದಲ್ಲಿ ಭೂಮಿಗೆ ಮರುಕಳಿಸುವುದರಿಂದ ಪೋಷಕಾಂಶಗಳ ಲಭ್ಯತೆ, ಜೊತೆಗೆ ಮಣ್ಣಿನ ಭೌತಿಕ ರಸಾಯನಿಕ ಹಾಗೂ ಜೈವಿಕ ಕ್ರಿಯೆ ಉತ್ತಮಗೊಳ್ಳುವುದು ಇವು ದ್ವಿದಳ ಜಾತಿಗೆ ಸೇರಿದ ಬೆಳೆಗಳಾಗಿರುವುದರಿಂದ ಮಣ್ಣಿನಲ್ಲಿ ಸಾರಜನಕ ಲಭ್ಯತೆ ಹೆಚ್ಚುತ್ತದೆ. ಅಥವಾ ಹಸಿರೆಲೆ ಗೊಬ್ಬರದ ಬೆಳೆಗಳಾದ ಗ್ಲಿರಿಸಿಡಿಯಾ, ಸುಬಾಬುಲ್ ಹೊಂಗೆ, ಚೊಗಚೆ ಇತ್ಯಾದಿ ಗಿಡ ಮರಗಳ ಟೊಂಗೆಗ ಳನ್ನು ಕಟಾವು ಮಾಡಿ ಭೂಮಿಗೆ ಸೇರಿಸುವುದರಿಂದ ಮಣ್ಣಿನ ಫಲವತ್ತತೆ ಹೆಚ್ಚುತ್ತದೆ.

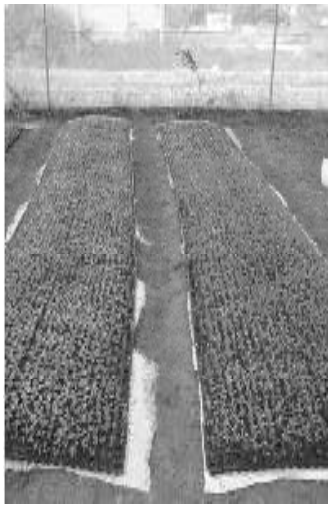
ಕೈತೋಟದ ನಕ್ಷೆ :-

ತೋಟದ ಗಾತ್ರ ಲಭ್ಯವಿರುವ ಜಾಗ ಹಾಗೂ ಅದರ ಉಸ್ತುವಾರಿಗೆ ಸಿಗುವ ಕಾಲಾವಕಾಶ ದಿನನಿತ್ಯ ಕುಟು ಬಕ್ಕೆ ಬೇಕಾಗುವ ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳ ಪ್ರಮಾಣ ಮು ತಾದ ಅ ಶಗಳನ್ನು ಅವಲ ಬಿಸಿರುತ್ತದೆ. ಸರಾಸರಿ 5-6 ಜನರಿರುವ ಕುಟು ಬಕ್ಕೆ ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳನ್ನು ದಗಿಸಲು 200 ಚದರ ಮೀಟರ್ ಜಾಗ ಸಾಕಾಗುತ್ತದೆ. ಹಾಗಾಗಿ ಮನೆ ಯ ಸುತ್ತ ಲಭ್ಯವಿರುವ ಜಾಗ ಮತ್ತು ಕುಟು ಬದ ಜನ ಸ ಖ್ಯೆ ಯನ್ನು ಅನುಸರಿಸಿ ದೊಡ್ಡ, ಮಧ್ಯಮ ಮತ್ತು ಸಣ್ಣ ಗಾತ್ರದ ಕೈತೋಟ ಬೆಳೆಸಬಹುದು,

- ಕೈತೋಟವನ್ನು ಪ್ರಾಣಿಗಳಿಂದ ರಕ್ಷಿಸಲು ಬೇಲಿಯನ್ನು ಹಾಕಿ. ಐದಾರು ಮೀಟರ್‌ಗೊಂದರಂತೆ ಗೂಟಗಳನ್ನು ನೆಟ್ಟು 3 – 4 ಎಳೆ ಮುಳ್ಳುತಂತಿಯನ್ನು ಎಳೆದು ಕಟ್ಟಿದರೆ ಸಾಕಷ್ಟು ರಕ್ಷಣೆ ಸಿಗುತ್ತದೆ. ಹಬ್ಬುವ ತರಕಾರಿಗಳಾದ ಹೀರೆ, ಸೌತೆ, ಕುಂಬಳ ಇತ್ಯಾದಿಯನ್ನು ಬೇಲಿಗೆ ಹಬ್ಬಿಸಬಹುದು.
- ತೋಟ ಮಾಡುವ ಸ್ಥಳವನ್ನು ಚಿಕ್ಕ ಚಿಕ್ಕ ತಾಕುಗಳನ್ನಾಗಿ ಮಾಡಿ
- ಒಂದೇ ಸಸ್ಯ ಕುಟುಂಬಕ್ಕೆ ಸೇರಿದ ತರಕಾರಿಗಳನ್ನು ಅದೇ ಜಾಗದಲ್ಲಿ ಸತತವಾಗಿ ಬೆಳೆಯಬಾರದು. ಅದಕ್ಕಾಗಿ ಸೂಕ್ತ ಬೆಳೆ ಪರಿವರ್ತನೆ ಮಾಡಬೇಕು ವಿವಿಧ ತಾಕುಗಳಲ್ಲಿನ ಫಸಲು ಏಕ ಕಾಲಕ್ಕೆ ಕೋಯ್ಲಿಗೆ ಬರುವ ಬದಲಾಗಿ ಬೇರೆ ಬೇರೆ ಸಮಯಕ್ಕೆ ಕೋಯ್ಲಿಗೆ ಬರುವಂತಿರಬೇಕು. ಕೈತೋಟದಲ್ಲಿ ಇರುವ ಸ್ಥಳಾವಕಾಶ ನೋಡಿಕೊಂಡು ಮತ್ತು ಆಯಾ ಪ್ರದೇಶಕ್ಕೆ ಅನುಗುಣವಾಗಿ ಹೊಂದಿಕೊಳ್ಳಲು ಬೆಳೆ ಮತ್ತು ತಳಿಗಳ ಆಯ್ಕೆ ಕೂಡಾ ಅಷ್ಟೇ ಮಹತ್ವವಾದುದು.
- ಬೇಗ ಬೆಳೆಯುವ ಬಹು ವಾರ್ಷಿಕ ತರಕಾರಿ, ಹಣ್ಣು ಗಿಡಗಳನ್ನು (ಉದಾ:– ನುಗ್ಗೆ, ಕರಿಬೇವು, ಬಾಳೆ, ನಿಂಬೆ, ಪಪ್ಪಾಯ) ಉತ್ತರ ದಿಕ್ಕಿನಲ್ಲಿ ನಾಟಿ ಮಾಡಿದರೆ ಅವುಗಳ ನೆರಳು ಕೈತೋಟದ ಬೇರೆ ಬೆಳೆಗಳ ಮೇಲೆ ಬೀಳುವುದಿಲ್ಲ. ನಿಧಾನವಾಗಿ ಬೆಳೆಯುವ ಮತ್ತು ದೀರ್ಘಾವಧಿ ತರಕಾರಿಗಳಾದ ನಡುವಣ ಜಾಗದಲ್ಲಿ ಅಲ್ಪಾವಧಿಯ ಮತ್ತು ಕಡಿಮೆ ಆಳಕ್ಕೆ ಬೇರು ಬಿಡುವ ಕೊತ್ತಂಬರಿ, ಮತ್ತಿತರ ಸೊಪ್ಪು ತರಕಾರಿಗಳನ್ನು ಬೆಳೆಯಬಹುದು.
- ಕಾಲು ದಾರಿ ಮತ್ತು ನೀರುಗಾಲುವೆಗಳು ತೋಟದ ಎಲ್ಲಾ ಭಾಗಗಳನ್ನು ತಲುಪುವಂತಿರಬೇಕು.

ಸಸಿ ಮಡಿ ತಯಾರಿಕೆ:– ಪ್ರತಿ ಸಸಿ ಮಡಿಗೆ ಸಾಕಷ್ಟು ಚೆನ್ನಾಗಿ ಕಳಿತ ಕೊಟ್ಟಿಗೆ ಗೊಬ್ಬರ, ಹರಡಿ, ಮಣ್ಣಿನಲ್ಲಿ ಬೆರೆಸಬೇಕು. ಸಸಿ ಮಡಿ ತಯಾರಿಕೆಯಲ್ಲಿ ಭೂಮಿಯನ್ನು ಚೆನ್ನಾಗಿ ಅಗೆಯಲು ಸಮತಟ್ಟಾದ ಮತ್ತು ಎತ್ತರಿಸಿದ ಪಾತಿ ಮಾಡಬೇಕು. ಅನಂತರ ಅಡ್ಡ ಗೀರು ಸಾಲುಗಳನ್ನು ಎಳೆದು, ಬೀಜಗಳನ್ನು ಸಮವಾಗಿ ಬೀಳುವಂತೆ ಉದುರಿಸಿ, ಮಣ್ಣು ಹರಡಿ ಅನಂತರ ನೀರು ಹರಿಸುವ ಡಬ್ಬಿಯಿಂದ ನೀರು ಹಾಕಬೇಕು.

ಇದು ಮಹಿಳೆಯರಿಗೆ ಅಧಿಕ ಶ್ರಮವೆನಿಸಿದರೆ ಸಸಿ ಮಡಿ ತಯಾರಿಸಲು ಸೂಕ್ತ ಚಿಕ್ಕ ಟ್ರೇಗಳು ಸಹಾ ದೊರಯುತ್ತದೆ. ಈ ಟ್ರೇಗಳ ಗುಳಿಗಳಲ್ಲಿ ಗೊಬ್ಬರ ಮತ್ತು ಮಣ್ಣನ್ನು ತುಂಬಿ ಪ್ರತಿಯೊಂದು ಗುಳಿಗಳಲ್ಲಿ, ಒಂದು ಬೀಜ ಹಾಕಬೇಕು. ಇದು ಮಹಿಳೆಯರಿಗೆ ಕಡಿಮೆ ಶ್ರಮ ಮತ್ತು ಟ್ರೇಗಳನ್ನು ತಮಗೆ ಬೇಕಾದ ಕಡೆಗೆ ಸ್ಥಳಾಂತರಸಬಹುದು. ಸುಮಾರು 3 – 4 ವಾರಗಳಲ್ಲಿ ಸಸಿಗಳು ನಾಟಿಗೆ ಸಿದ್ಧವಾಗಿರುತ್ತದೆ.



ಸಾವ ಯವ ಗೊಬ್ಬರಗಳಲ್ಲಿ ಕೊಟ್ಟಿಗೆ ಗೊಬ್ಬರ, ಹಸಿರೆಲೆ ಗೊಬ್ಬರ, ಕಾ ಪೋಸ್ಟ್, ಕೋಳಿಗೊಬ್ಬರ ಇತ್ಯಾದಿ ಯಾಗಿ ಹಲವು ವಿಧಗಳಿವೆ. ಇದನ್ನು ಕೈತೋಟದ ಮೂಲೆ ಯಲ್ಲಿ ನಾವೇ ತ ಯಾರಿಸಿಕೊಳ್ಳಬಹುದು. ಮಹಿಳೆಯರು ಪ್ರಕೃತಿಯಲ್ಲಿ ದೊರೆಯುವ ಕೆಲವು ವಸ್ತುಗಳನ್ನು

ಬಳಸಿ **ಸಾವಯವ ಗೊಬ್ಬರ**ಗಳನ್ನು ತಯಾರಿಸಿಕೊಳ್ಳಬಹುದು.

ಸಾವಯವ ಟಾನಿಕ್ :– 50 ಲೀಟರ್ ನೀರಿನಲ್ಲಿ 10 ಕೆ.ಜಿ ಸಗಣಿ, 1 ಕೆ.ಜಿ ಹೊಂಗೆ ಹಿಂಡಿ ಅಥವಾ ಕಡ್ಲೆ ಹಿಂಡಿ, 1 ಕೆ.ಜಿ ಬೇವಿನ ಹಿಂಡಿ ಇವುಗಳ ಮಿಶ್ರಣ ಮಾಡಿ 24 ಗಂಟೆಗಳ ಕಾಲ ಇಡಬೇಕು. ನಂತರ ಈ ದ್ರಾವಣಕ್ಕೆ 2 ಕೆ.ಜಿ ಬೆಲ್ಲ ಹಾಗೂ 100 ಗ್ರಾಂ. ಅರಿಶಿಣ ಪುಡಿಯನ್ನು ಬೆರೆಸಬೇಕು. ಈಗ ಸಾವಯವ ಟಾನಿಕ್ ತಯಾರು. ಈ ದ್ರಾವಣ ಬಳಸುವಾಗ ಒಂದು ಪ್ರಮಾಣ ದ್ರಾವಣಕ್ಕೆ 10 ಪ್ರಮಾಣದ ನೀರನ್ನು ಬೆರೆಸಿ ಬಳಸಬೇಕು. ತರಕಾರಿ ಗಿಡಗಳಿಗೆ, ಹೂವಿನ ಗಿಡಗಳಿಗೆ ಪ್ರತಿ ಗಿಡಕ್ಕೆ ಒಂದು ಲೀಟರ್‌ನಷ್ಟು ಅದರ ಬುಡಕ್ಕೆ ಹಾಕಬೇಕು. ಇದರಿಂದ ಉತ್ತಮ ಫಲಿತಾಂಶ ಪಡೆಯಬಹುದು.

ದ್ರವ ಗೊಬ್ಬರದ ಬಳಕೆ :–

5 ಕೆ.ಜಿ ಯಷ್ಟು ದ್ವಿದಳ ಎಲೆ ಅಥವಾ ಸಗಣಿಯನ್ನು ಒಂದು ಗೋಣಿ ಚೀಲದಲ್ಲಿ ಹಾಕಿ ಕಟ್ಟಿ ಅದನ್ನು 20 ಲೀಟರ್ ನೀರಿರುವ ಮಡಿಕೆ ಅಥವಾ ಟ್ಯಾಂಕ್‌ನಲ್ಲಿ ಪೂರ್ತಿಯಾಗಿ ಮುಳಗಿಸಬೇಕು. ಚೀಲ ತೇಲದಂತೆ ಒಂದು ಭಾರವಾದ ಕಲ್ಲನ್ನು ಅದರ ಮೇಲೆ ಹೇರಬೇಕು. ಈ ಮಡಿಕೆ ಅಥವಾ ಟ್ಯಾಂಕ್‌ನ್ನು ಗಾಳಿಯಾಡದಂತೆ ಬಿಗಿಯಾಗಿ ಮುಚ್ಚಿ 25 ದಿನ ಬಿಡಬೇಕು. ಈ ಕೊಳೆತ ನೀರಿಗೆ ಒಂದಕ್ಕೆ 3 ರಷ್ಟು ನೀರು ಬೆರೆಸಿ ಮಡಿಗಳಿಗೆ ಉಣಿಸಬೇಕು. ಇದು ಮಣ್ಣಿನ ಸಾರವನ್ನು ಹೆಚ್ಚಿಸಿ, ಸೊಂಪಾಗಿ ಬೆಳೆಯಲು ಸಹಾಯಮಾಡುತ್ತದೆ. ಈ ನೀರು ಗೊಬ್ಬರವನ್ನು ಬೀಜ ಬಿತ್ತಿದ ಸಸಿ ನೆಟ್ಟ 5 ದಿನಗಳ ನಂತರ 40 ದಿನಗಳ ನಂತರ ಮತ್ತು ಆಮೇಲೆ 10 ದಿನಗಳಿಗೊಮ್ಮೆ ಗಿಡಗಳಿಗೆ ಹನಿಸುತ್ತಿರಬೇಕು.

ಕೈ ತೋಟ ನಿರ್ವಹಣೆಯಲ್ಲಿ ಇತ್ತೀಚೆಗೆ ಕೀಟ - ರೋಗಗಳ ಹಾವಳಿ ಹೆಚ್ಚಾಗುತ್ತಿದೆ. ಅವುಗಳ ಹತೋಟಿಗೆ ಸೂಕ್ತ ಔಷಧಿಗಳನ್ನು ಉಪಯೋಗಿಸಬೇಕಾಗಬಹುದು, ಸಾಧ್ಯವಾದಷ್ಟು ಮು ಜಾರೂಕತೆ ಕ್ರಮಗಳನ್ನು ಅನುಸರಿಸಬೇಕು. ರೋಗ ಕೀಟ ಭಾದೆಯನ್ನು ತಡೆಗಟ್ಟಲು ಮಹಿಳೆಯರು ಪ್ರಕೃತಿಯಲ್ಲಿ ದೊರೆಯುವ ಕೆಲವು ವಸ್ತುಗಳನ್ನು ಬಳಸಿ ಕಷಾಯಗಳನ್ನು ಸಂಪಡಿಸಬಹುದು.

ಉದಾ:– 4 ಕೆ.ಜಿ. ಕವಚರಹಿತ ಬೇವಿನ ಬೀಜಗಳನ್ನು ಚೆನ್ನಾಗಿ ನೀರಿನಲ್ಲಿ ಬೆರಸಿ 12 ಗಂಟೆಗಳ ಕಾಲ ನೆನೆಸಿಡಬೇಕು. ನಂತರ ಚೆನ್ನಾಗಿ ಕಲಕಿ ತೆಳುವಾದ ಬಟ್ಟೆಯಿಂದ ಶೋಧಿಸಬೇಕು. ಶೋಧಿಸಿದ ದ್ರಾವಣಕ್ಕೆ 100 ಮಿ.ಲೀ ದ್ರಾವಣ ರೂಪದ ಸೋಪನ್ನು ಬೆರಸಿ ಸಿಂಪರಣೆಗೆ ಉಪಯೋಗಿಸಬಹುದು.

ತುಳಸಿ ಎಲೆ ಕಷಾಯ 2 ಕೆ.ಜಿ. ತುಳಸಿ ಎಲೆಯನ್ನು 10–20 ಲೀ ನೀರನ್ನು ರಾತ್ರಿಯಿಡಿ ನೆನೆಸಬೇಕು. ಮಾರನೇ ದಿನ ಇದನ್ನು ಚೆನ್ನಾಗಿ ರುಬ್ಬಿ ಸೋಸಿಕೊಳ್ಳಬೇಕು ಇದಕ್ಕೆ 90 ಲೀಟರ್ ನೀರನ್ನು ಬೆರೆಸಿ ಸಿಂಪರಣೆ ಮಾಡಬೇಕು. ಈ ಕಷಾಯದಿಂದ ಎಲೆ ತಿನ್ನುವ ಹುಳು, ಕೆಂಪು ನುಸಿ, ಹಣ್ಣಿನ ನೊಣಗಳನ್ನು ಹತೋಟಿ ಮಾಡಬಹುದು.

4 ಕೆ.ಜಿ. ಸೀತಾಫಲ ಗಿಡದ ಎಲೆಗೆ 5 ಲೀ ನೀರನ್ನು ಬೆರೆಸಿ ನಂತರ ಸೋಸಿಕೊಳ್ಳಬೇಕು. 1 ಕೆ.ಜಿ. ಕೆಂಪು ಮೆಣಸಿನಕಾಯಿಯನ್ನು ರಾತ್ರಿಯಿಡಿ ನೀರಿನಲ್ಲಿ ನೆನೆಸಿಡಬೇಕು. ಮಾರನೇ ದಿನ ಅದನ್ನು ಚೆನ್ನಾಗಿ ರುಬ್ಬಿಕೊಳ್ಳಬೇಕು. ನಂತರ 90 ಲೀ ನೀರನ್ನು ಬೆರೆಸಿ ನಂತರ ಸಿಂಪರಣೆ ಮಾಡಬೇಕು.

ಅರಿಸಿನ ಗೆಡ್ಡೆಯ ಕಷಾಯ :– 1 ಕೆ.ಜಿ. ಹಸಿರುಗಡ್ಡೆಯನ್ನು 20 ಲೀ ಗೋಮೂತ್ರದಲ್ಲಿ ಬೆರಸಿ ನಂತರ 100 ಲೀ ನೀರಿನಲ್ಲಿ ಬೆರೆಸಿ ಸಿಂಪರಣೆ ಮಾಡಿ.

ಶುಂಠಿ ಕಷಾಯ:– 2 ಕೆ.ಜಿ. ಶುಂಠಿಯನ್ನು ರುಬ್ಬಿಕೊಂಡು ಅದಕ್ಕೆ 10 ಲೀ ನೀರಿನಲ್ಲಿ ಕರಗಿಸಿ ನಂತರ ಬಟ್ಟೆಯಿಂದ ಸೋಸಿಕೊಳ್ಳಿ ಇದಕ್ಕೆ 90 ಲೀ ನೀರನ್ನು ಬೆರೆಸಿ ಸಿಂಪರಣೆ ಮಾಡಿ ಈ ಕಷಾಯದಿಂದ ಥ್ರಿಪ್ಸ್ ಬೆಗಿ ಹುಳುಗಳನ್ನು ಹತೋಟಿ ಮಾಡಬಹುದು.

ನಮ್ಮ ಮನೆಯ ಸುತ್ತಮುತ್ತಲಿರುವ ಅಲ್ಪಸ್ವಲ್ಪ ಜಾಗದಲ್ಲಿಯೇ ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳನ್ನು ವರ್ಷವಿಡೀ ಬೆಳೆದು ಅವುಗಳ ಉಪಯುಕ್ತತೆಯನ್ನು ಪಡೆಯುವುದೇ ಕೈ ತೋಟದ ಮೂಲ ಉದ್ದೇಶ. ಅತ್ಯ ತಕಡಿಮೆ ವೆಚ್ಚ ಹಾಗೂ ಶ್ರಮದಿ ದ ಹೆಚ್ಚು ಪ್ರತಿಫಲ ಪಡೆ ಯುವ ಪುಟ್ಟ ಕ್ಷೇತ್ರ, ಈ ರೀತಿ ಯಾಗಿ ಮನಸ್ಸಿಗೆ ಮುದ ನೀಡುವ, ಪರಿಸರ ಸ ರಕ್ಷಿಸಿ ಮನೆ ಯ ಸೌಬಗನ್ನು ಹೆಚ್ಚಿಸುವುದರ ಜೊತೆಗೆ ಆದಾ ಯವನ್ನೂ ನೀಡುವ ಕೈತೋಟವೊ ದು ಬಹು ಉಪ ಯೋಗಿ ಕಸುಬು ಎನ್ನಬಹುದು.

F/T:- N.W.L.E.R:-03

"ಮಾನವ ಹಕ್ಕುಗಳಿಗಾಗಿ ಶಿಕ್ಷಣ ಮತ್ತು ಶಿಕ್ಷಕರ ಪಾತ್ರ"

ಶ್ರೀಮತಿ ಎಮ್. ಎನ್. ಸುಶೀಲಂಬಾಳ್
ಉಪನ್ಯಾಸಕಿ, ವಿಜಯ ಶಿಕ್ಷಕರ ಮಹಾವಿದ್ಯಾಲಯ, ಜಯನಗರ, ಬೆಂಗಳೂರು

ಪೀಠಿಕೆ :

ನಮ್ಮ ಸಂಸ್ಕೃತಿ ಹಾಗೂ ನಾಗರೀಕತೆಗೆ ಪ್ರಾಚೀನ ಹಾಗೂ ಆಧುನಿಕ ಮಾನವ ಚಿಂತನೆ ಕೊಟ್ಟಿರುವ ಅಮೂಲ್ಯ ಆಸ್ತಿ ಮಾನವ ಹಕ್ಕುಗಳ ಪರಿಕಲ್ಪನೆ. 'ಮಾನವ ಹಕ್ಕುಗಳು' ಎಂಬ ಪರಿಕಲ್ಪನೆಯು ಈ ಆಧುನಿಕ ಜಗತ್ತಿನಲ್ಲಿ ದಿಡೀರನೆ ಬೆಳೆದು ಬಂದ ಕಲ್ಪನೆಯಲ್ಲ. ಮಾನವನ ಮೂಲಭೂತ ಹಕ್ಕುಗಳನ್ನು ಉಳಿಸಿ ಬೆಳೆಸುವ ಪ್ರಯತ್ನ ಎಲ್ಲ ಕಾಲದಲ್ಲೂ ಎಲ್ಲಾ ಸಮಾಜದಲ್ಲೂ ನಡೆಯುತ್ತಲೆ ಬಂದು, ಸುದೀರ್ಘವಾದ ಇತಿಹಾಸವನ್ನು ಹೊಂದಿ ಇಂದು ಇದು ಹೆಮ್ಮರವಾಗಿ ಬೆಳೆಯತೊಡಗಿದೆ. ಈ ಪ್ರಕಿಯೆಯಲ್ಲಿ ಹೊಸ ಹಕ್ಕುಗಳು ಮೂಡಿಬಂದಿವೆ. ಕೆಲವು ಬರಲಾಗಿದೆ. ಆದರೆ "ಮಾನವನ ಘನತೆ ಹಾಗೂ ಅದರ ಸಂರಕ್ಷಣೆಯೇ" ಮಾನವ ಹಕ್ಕುಗಳ ಪರಿಕಲ್ಪನೆಯ ತಿರುಳು ಎಂಬ ಗ್ರಹಿಕೆ ಮಾತ್ರ ಬದಲಾಗದೆ ಉಳಿದುಕೊಂಡು ಬಂದಿವೆ.

ಇಂದು ಎಲ್ಲರೂ ಅದರ ಬಗ್ಗೆ ಚರ್ಚಿಸುವ ಮತ್ತು ಚಿಂತಿಸುವ ಅಗತ್ಯತೆ ಎಲ್ಲಾ ಕಡೆ ಕಂಡು ಬರುತ್ತಿದ್ದು ವಿಶ್ವವ್ಯಾಪ್ತಿಯಾಗಿದೆ. ಸ್ಥಳೀಯ, ರಾಷ್ಟ್ರೀಯ, ಅಂತರ ರಾಷ್ಟ್ರೀಯವಾಗಿ ಮಾತ್ರವಲ್ಲದೆ, ಕೌಟುಂಬಿಕವಾಗಿಯೂ ಕೂಡ ಒಳಗೂ ಮತ್ತು ಹೊರಗೂ ವಾದ–ವಿವಾದಗಳನ್ನು ಹುಟ್ಟು ಹಾಕುತ್ತಿವೆ. ಜಗತ್ತಿನ ಎಲ್ಲಾ ಸರ್ಕಾರಗಳು ತಮ್ಮ ತಮ್ಮ ಇಲಾಖೆಗಳಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಸಂರಕ್ಷಿಸುವ

ಹಾಗೂ ನಿರ್ವಹಿಸುವ ಕಾಯಕದಲ್ಲಿ ನಿರತವಾಗಿದೆ. ಅದುದರಿಂದ ಇಂದು ಯಾರೂ ಕೂಡ ಮಾನವ ಹಕ್ಕುಗಳ ಬಗ್ಗೆ ಕಡಿಮೆ ಎಣಿಕೆ ಮಾಡುವಂತಿಲ್ಲ.

ಮಾನವ ಹಕ್ಕುಗಳು ಎಂದರೇನು? What are Human Rights?
ಸಾಮಾಜಿಕ ನ್ಯಾಯದ ದೃಷ್ಟಿಯಿಂದ ಮಾನವ ಹಕ್ಕುಗಳ ಪರಿಕಲ್ಪನೆಯ ಅರಿವು ನಮ್ಮೆಲ್ಲರಿಗೂ ಅಗತ್ಯ. 'ಮಾನವ ಹಕ್ಕುಗಳು' ಯಾವಾಗ ಮಾನವ ಉದಯಿಸಿದನೋ ಅಂದೇ ಅವನ ಉದ್ಧಾರಕ್ಕಾಗಿ ಪ್ರಕೃತಿ ನೀಡಿದ ಕೊಡುಗೆಗಳಾಗಿವೆ. ಮುಂದೆ ಈ ಕೊಡುಗೆಗಳೇ ಮೌಲ್ಯಗಳಾಗಿ ಪರಿವರ್ತನೆಗೊಂಡು ಇದೀಗ ಹಕ್ಕುಗಳ ಅರ್ಥಪರಿಕಲ್ಪನೆಯನ್ನು ಪಡೆದುಕೊಂಡು, ಹೊಸ ಬೆಳಕಾಗಿ ಎಲ್ಲೆಡೆ ಹರಿಯುತ್ತಿದೆ. ಆದರೆ ಮಾನವ ಹಕ್ಕುಗಳಿಗೆ ನಿರ್ದಿಷ್ಟವಾದ ಅರ್ಥವನ್ನು ನೀಡುವುದು ಕಷ್ಟಕರವಾದ ವಿಷಯವಾಗಿದೆ. ಏಕೆಂದರೆ ಕಾಲ ಘಟ್ಟಗಳಿಗೆ ಅನುಗುಣವಾಗಿ ಹಾಗೂ ಆಯಾಯಾ ಸಮಾಜ ಮತ್ತು ಆಯಾಯಾ ಸಮಯದಲ್ಲಿನ ಪರಿಸ್ಥಿತಿಯನ್ನು ಅವಲಂಬಿಸಿ ಅರ್ಥಪಡೆದುಕೊಳ್ಳುತ್ತದೆ. ಆದರೂ ಮಾನವ ಹಕ್ಕುಗಳು ಮಾನವನ ಕಲ್ಯಾಣವನ್ನು ಬಯಸುತ್ತದೆ ಹಾಗೂ "ಸರ್ವೇಜನೋ ಸುಖಿನೋ ಭವಂತು" ಎಂಬ ತತ್ವಾದರ್ಶದ ನೆಲೆಯ ಮೇಲೆ ನಿಂತಿದೆ.

ಈ ಮಾನವ ಹಕ್ಕುಗಳು ಎಲ್ಲ ಮುಖಗಳೊಂದಿಗೆ ಅರ್ಥ ಮಾಡಿಕೊಂಡು ಸಮಾಜದಲ್ಲಿ ಅನ್ವಯಿಸಗೊಂಡಾಗ ಹಾಗೂ ಅವಕಾಶಗಳನ್ನು ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ಮತ್ತು ವ್ಯಯಕ್ತಿಕ ಹಾಗೂ ಸಾಮಾಜಿಕ ಉನ್ನತಿಗೆ ಅವುಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳಲು 'ಮಾನವಹಕ್ಕುಗಳ ಶಿಕ್ಷಣ' ಎಂಬ ಪರಿಕಲ್ಪನೆ ನಮಗೆ ಸಹಾಯಕವಾಗುತ್ತದೆ.

ವ್ಯಾಖ್ಯೆಗಳು :–
1) ರಿಚರ್ಡ್ ವಾಸರ್ ಸ್ಟಾಮ್ ಪ್ರಕಾರ "ಒಬ್ಬ ವ್ಯಕ್ತಿಗೆ ತನ್ನ ಸಾಮರ್ಥ್ಯವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳಲು ಕನಿಷ್ಠ ಅಗತ್ಯತೆಗಳನ್ನು ಪೂರೈಸಿಕೊಳ್ಳಲು ಇರುವ ಅರ್ಹತೆಗಳೇ ಮಾನವ ಹಕ್ಕುಗಳು".
2) ಜೋಯಲ್ ಫಿನ್ ಬರ್ಗರವರ ಪ್ರಕಾರ, "ಮಾನವ ಹಕ್ಕುಗಳೆಂದರೆ ಎಲ್ಲ ಮಾನವರು ಬದಲಿಸಲಾರದ ಸಮಾನವಾಗಿ ಹೊಂದಿರುವ ನೈತಿಕ ಹಕ್ಕುಗಳೇ ಆಗಿವೆ".
3) ನನ್ನ ಪ್ರಕಾರ ಮಾನವನ ಜೀವನದ ಸರ್ವತೋಮುಖ ವಿಕಾಸಕ್ಕೆ ನೆರವಾಗುವ ಜೀವಸತ್ವಗಳು/ಜೀವನ ಸತ್ಯಗಳೇ ಆಗಿದೆ. ಹಾಗೂ ಅವುಗಳನ್ನು ಪಡೆದುಕೊಳ್ಳುವಲ್ಲಿ ತಡೆಯುಂಟಾದಾಗ ಚಲಾವಣೆಗೊಂಡ ಮೌಲ್ಯಗಳ ಪ್ರತಿಪಾದನೆಯೇ ಮಾನವ ಹಕ್ಕುಗಳು.

ಮಾನವ ಹಕ್ಕುಗಳ ಸಾರ್ವತ್ರಿಕ ಪೋಷಣೆ ಮತ್ತು ವಿಕಾಸದ ಮೈಲಿಗಲ್ಲು :–
ಎರಡನೇ ಜಾಗತಿಕ ಯುದ್ಧವು ನಾಜಿಸಂ ಹಾಗೂ ಫ್ಯಾಸಿಸಂಗಳಿಂದಾಗಿ ಮನುಕುಲದ ಮೇಲಾದ ನೋವಿನ ಹೊಡೆತದಿಂದ ಮಾನವ ಜೀವನದಲ್ಲಿ ವಿಧಿಯ ಕೈವಾಡದ ಪರಿಚಯ ಮಾಡಿಕೊಟ್ಟಿತು. ಅಭದ್ರತೆ ಭೇದ–ಭಾವ, ದಬ್ಬಾಳಿಕೆ, ನ್ಯಾಯವಲ್ಲದ ಸಾಮಾಜಿಕ ಹಾಗೂ ಆರ್ಥಿಕ ಸನ್ನಿವೇಶಗಳು ರಾಷ್ಟ್ರೀಯ ಹಾಗೂ ಅಂತರರಾಷ್ಟ್ರೀಯ ಮಟ್ಟಗಳೆರಡಲ್ಲೂ ನೆಲೆಯೂರಿತ್ತು. ಇದರಿಂದಾಗಿ ಮನುಕುಲವು ಜೀವನದಲ್ಲಿ ಸಾರ್ವತ್ರಿಕ ಒಪ್ಪಂದದ ಮೂಲಕ ಶಾಂತಿ, ಸೌಹಾರ್ದತೆ ಮತ್ತು ಭದ್ರತೆಯನ್ನು ಪುನಃ ಸ್ಥಾಪಿಸುವ ದಾರಿಗಳನ್ನು ಹುಡುಕುತ್ತಿತ್ತು. ಇದಕ್ಕೆ ಪ್ರತಿಕ್ರಿಯೆಯಾಗಿ 1948ರಲ್ಲಿ ಸಂಯುಕ್ತ ರಾಷ್ಟ್ರಗಳ ಮಾನವ ಹಕ್ಕುಗಳ ಕರಡು ತಯಾರಾಗಿ ಅದು ಸ್ವೀಕೃತವಾಯಿತು. ಇದು ಸ್ಥಿರವಾದ ಅಂತರ ರಾಷ್ಟ್ರೀಯ ವ್ಯವಸ್ಥೆಗೆ ಹಾಗೂ ಶಾಶ್ವತವಾದ ಶಾಂತಿಗೆ ಮೂಲವಾದ ಸಾಮಾಜಿಕ ನ್ಯಾಯ ಹಾಗೂ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ದೃಢೀಕರಿಸಿತು. ಸನ್ನದಿನ ಪೀಠಿಕೆಯಲ್ಲಿ ಅದರ ರಚನಕಾರರು ವಿಷಯವನ್ನು ಹೀಗೆ ಪ್ರಸ್ಥಾಪಿಸಿರುತ್ತಾರೆ.

"ಮಾನವವನ ಘನತೆ ಹಾಗೂ ಸಾರ್ಥಕತೆಯಲ್ಲಿ ಹಾಗೂ ಮಾನವನ ಮೂಲಭೂತ ಹಕ್ಕುಗಳಲ್ಲಿ ನಂಬಿಕೆಯನ್ನು ಪುನಃ ಸ್ಥಾಪಿಸುವುದಕ್ಕಾಗಿ ."

ಈ ಅಂಶವೇ ಮುಂದೆ 10ನೇ ಡಿಸೆಂಬರ್ 1948ರಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳ ವಿಸ್ತರಣೆಗೆ ಆಧಾರವಾಯಿತು. ಸಂಯುಕ್ತ ರಾಷ್ಟ್ರಗಳ ಸಾಮಾನ್ಯ ಸಭೆಯು ಈ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಅಂಗೀಕರಿಸಿ ಸಾರ್ವತ್ರಿಕ ಮಾನವ ಹಕ್ಕುಗಳ ಪೋಷಣೆಯನ್ನು ಮುಂದಿಟ್ಟಿತು.

ಮಾನವ ಹಕ್ಕುಗಳ ವಿಕಾಸದ ಮೈಲಿಗಲ್ಲುಗಳು

ಕ್ರಿ.ಪೂ. 1750	–	ಹಮ್ಮುರಬಿ
ಕ್ರಿ.ಶ. 1215	–	ಮ್ಯಾಗ್ನಕಾರ್ಟ್
ಕ್ರಿ.ಶ 1689	–	ಇಂಗ್ಲೀಷ್ ಹಕ್ಕುಗಳ ಬೇಡಿಕೆ.
ಕ್ರಿ.ಶ 1776	–	ಸ್ವಾತಂತ್ರ್ಯ ಘೋಷಣೆ – ಅಮೇರಿಕಾ
ಕ್ರಿ.ಶ. 1787	–	ಅಮೇರಿಕಾ ಸಂಯುಕ್ತ ಸಂಸ್ಥಾನದ ಸಂವಿಧಾನ
ಕ್ರಿ.ಶ. 1789	–	ಮಾನವ ಮತ್ತು ನಾಗರಿಕ ಹಕ್ಕುಗಳ ಘೋಷಣೆ – ಫ್ರಾನ್ಸ್
ಕ್ರಿ.ಶ. 1791	–	ಅಮೇರಿಕಾ ಸಂಯುಕ್ತ ಸಂಸ್ಥಾನದ ಹಕ್ಕುಗಳ ಬೇಡಿಕೆ.
1894 – 1989	–	ಜನಿವಾ ಒಡಂಬಿಕೆ – ಅಂತರಾಷ್ಟ್ರೀಯ ರೆಡ್‌ಕ್ರಾಸ್

ಇಲ್ಲಿ ಗಮನಿಸತಕ್ಕ ಒಂದು ಅಂಶವೆಂದರೆ ಇಂಗ್ಲೆಂಡಿನಲ್ಲಿ ಪ್ರಚೋದಿತವಾದ ಮಾನವ ಹಕ್ಕುಗಳು, ಅಮೇರಿಕಾ, ಫ್ರಾನ್ಸ್ ಮತ್ತು ರಷ್ಯಾ ಕ್ರಾಂತಿಗಳು ಜರುಗಿದ ಬಳಿಕೆ ಹೆಚ್ಚು ಪ್ರಸ್ತುತಗೊಂಡು ಚಲಾವಣೆಗೊಂಡವು (ಸ್ವಾತಂತ್ರ್ಯ, ಸಮಾನತೆ, ಬ್ರಾತೃತ್ವ, ನ್ಯಾಯ) ನಂತರದ ದಿನಗಳಲ್ಲಿ ಇವುಗಳೇ ಆಧುನಿಕ ಪ್ರಪಂಚದ ಮೂಲಭೂತ ಹಕ್ಕುಗಳಾದವು, ಬಳಿಕ 20ನೇ ಶತಮಾನವು ಕಂಡ ಅಮಾನವೀಯ, ದುರಂತದ ಪರಾಕಾಷ್ಠತೆಯನ್ನು ಮೆರೆದ ಎರಡು ಜಾಗತಿಕ ಯುದ್ಧಗಳು ಮಾನವ ಹಕ್ಕುಗಳ ಮೇಲೆ ನಡೆದ ಆತ್ಯಾಚಾರಗಳೆಂದೇ ಪರಿಗಣಿಸಿ, ಕಪ್ಪು ಅಧ್ಯಾಯವೊಂದು ಇತಿಹಾಸ ಸೇರಿಕೊಂಡಿತು. ಆದರೂ ಎರಡನೆ ಮಹಾಯುದ್ಧವು ಮಾನವ ಹಕ್ಕುಗಳ ಅಂತರಾಷ್ಟ್ರೀಯ ಪ್ರಾಮುಖ್ಯತೆಯ ಬೆಳವಣಿಗೆ ಒಂದು ಪ್ರಮುಖ ತಿರುವಾಗಿದೆ. ಫ್ಯಾಸಿಸಂ ಮತ್ತು ನ್ಯಾಸಿಸಂಗೆ ಸವಾಲುಗಳು ಎದುರಾಗಿ, ಪ್ರಜಾಪ್ರಭುತ್ವ ಪ್ರಕ್ರಿಯಯಲ್ಲಿನ ತ್ವರಿತ ಅಭಿವೃದ್ಧಿಗೆ ಕಾರಣವಾದವು. ಇದು ಮಾನವ ಹಕ್ಕುಗಳಿಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ಅಂತರಾಷ್ಟ್ರೀಯ ಕಾನೂನಿನಲ್ಲಿ ಕ್ರಾಂತಿಕಾರಿ ಬೆಳವಣಿಗೆಯಾಯಿತು. 'ಸ್ವಾತಂತ್ರ್ಯ' ವೆಂಬುದು ಕೆರಳಿದ ಆತ್ಮಸಾಕ್ಷಿಯನ್ನು ಪ್ರತಿಬಿಂಬಿಸುತ್ತಿದ್ದವು. ಈ ಸಂದರ್ಭದಲ್ಲಿ ಉದಯಿಸಿದ ವಿಶ್ವ ಸಂಸ್ಥೆಯು ಮಾನವ ಹಕ್ಕುಗಳ ಸಾರ್ವತ್ರಿಕ ಘೋಷಣೆಯನ್ನು 10ನೇ ಡಿಸೆಂಬರ್ 1948ರಲ್ಲಿ ಹೊರಡಿಸಿ, ಆ ಮೂಲಕ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಸಂರಕ್ಷಿಸುವ ಮತ್ತು ಅವುಗಳಿಗೆ ಬದ್ಧವಾಗಿ, ಜಗತ್ತಿನ ಶಾಂತಿ ಮತ್ತು ಭದ್ರತೆಯನ್ನು ಕಾಪಾಡುವ ನಿರ್ಧಿಷ್ಟ ನಿಲುವನ್ನು ತೆಗೆದುಕೊಂಡಿತು. ಅಲ್ಲದೆ, ಮಾನವ ಹಕ್ಕುಗಳ ಸ್ವರೂಪವನ್ನು ಹಾಗೂ ಅವುಗಳ ಪಟ್ಟಿಯನ್ನು ಬಿಡುಗಡೆಗೊಳಿಸಿತು. ತತ್ಪರಿಣಾಮವಾಗಿ ಭಾರತವೂ ಸೇರಿದಂತೆ

ಪ್ರಪಂಚದ ಬಹುತೇಕ ರಾಷ್ಟ್ರಗಳು ಈ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಮೂಲಭೂತ ಹಕ್ಕುಗಳೆಂದು ಹೆಸರಿಸಿ ತಮ್ಮ ಸಂವಿಧಾನಗಳಲ್ಲಿ ಅಳವಡಿಸಿಕೊಂಡವು. ನಂತರ 1968ರಲ್ಲಿ ಟೆಹರಾನಿನಲ್ಲಿ ನಡೆದ ಅಂತರರಾಷ್ಟ್ರೀಯ ಮಾನವ ಹಕ್ಕುಗಳ ಕಾಂಗ್ರೆಸ್, 1978ರಲ್ಲಿ ನಡೆದ ಅಂತರರಾಷ್ಟ್ರೀಯ ವಿಯನ್ನಾ ಸಮ್ಮೇಳನ, 1988ರಲ್ಲಿ ಜೆನಿವಾದಲ್ಲಿ ಜರುಗಿದ 'ಮಾನವ ಹಕ್ಕುಗಳ ಬೋಧನೆ' ಎಂಬ ಅಂತರರಾಷ್ಟ್ರೀಯ ವಿಚಾರ ಸಂಕಿರಣದಲ್ಲಿ ವಿಚಾರ ವಿನಿಮಯಗಳು ನಡೆದು, ಅವುಗಳನ್ನು ಸಶಕ್ತಗೊಳಿಸಲಾಯಿತು. ಮಾತ್ರವಲ್ಲದೆ ವಿಶ್ವ ಸಂಸ್ಥೆಯು 1995–2004ರ ಅವಧಿಯನ್ನು 'ಮಾನವ ಹಕ್ಕುಗಳ ಶಿಕ್ಷಣ'ದ ದಶಕವೆಂದು ಘೋಷಿಸಿ, ಕ್ರಿಯಾ ಯೋಜನೆಯನ್ನು ರೂಪಿಸಿ ಕಾರ್ಯಕ್ರಮಗಳನ್ನು ಹಮ್ಮಿಕೊಂಡಿತು.

ಭಾರತೀಯ ಸನ್ನಿವೇಶದಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳು ಮತ್ತು ಅದರ ಮಹತ್ವ

ನಮ್ಮ ಭಾರತೀಯ ನಾಗರೀಕತೆಯಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳ ಕಲ್ಪನೆಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಅಂಶಗಳು ನಮ್ಮ ಸಾಹಿತ್ಯ ಮತ್ತು ತತ್ವಶಾಸ್ತ್ರಗಳಲ್ಲಿ ಅಡಕವಾಗಿರುವುದನ್ನು ಗುರುತಿಸಬಹುದಾಗಿದೆ. ನಮ್ಮ ಭಾರತೀಯ ಸಂವಿಧಾನವು ಕೂಡ ಬಹುತೇಕ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಮೂಲಭೂತ ಹಕ್ಕುಗಳನ್ನಾಗಿ ಪರಿವರ್ತಿಸಿ ಸೇರಿಸಿಕೊಂಡಿದೆ. ಅವುಗಳೆಂದರೆ,

1) ವಾಕ್ ಸ್ವಾತಂತ್ರ್ಯ ಹಾಗೂ ಅಭಿವ್ಯಕ್ತಿ ಸ್ವಾತಂತ್ರ್ಯ (ಕಲಂ – 19)
2) ನಿಶಸ್ತ್ರಧಾರಿಯಾಗಿ ಶಾಂತಿಯುತವಾಗಿ ಸಭೆ ಸೇರುವ ಹಕ್ಕು (ಕಲಂ – 19)
3) ಕಾನೂನಿನ ಸಮಾನತೆಯ ಹಕ್ಕು (ಕಲಂ –18)

ಅಲ್ಲದೆ ರಾಷ್ಟ್ರದ ಯಾವುದೇ ಭಾಗದಲ್ಲಿ ವಾಸಿಸುವ ಹಕ್ಕು ಸಂವಿಧಾನದ ರಾಜ್ಯ ನಿರ್ದೇಶಕ ತತ್ವಗಳಲ್ಲೂ ಕೂಡ ಮಾನವ ಹಕ್ಕುಗಳ ಅಧ್ಯಾಯಗಳನ್ನು ಅಳವಡಿಸಿ, ಕೇಂದ್ರ ಮತ್ತು ರಾಜ್ಯ ಸರ್ಕಾರಗಳು ಅವುಗಳನ್ನು ಸಂರಕ್ಷಿಸುವಂತೆ ನಿರ್ದೇಶಿಸಲಾಗಿದೆ.

ಈ ಮೇಲೆ ತಿಳಿಸಿದಂತೆ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಬಡವರ ಮತ್ತು ದುರ್ಬಲರ ಹಾಗೂ ಎಲ್ಲರ ಏಳಿಗೆಗೆ ಕೆಲವೊಂದು ಅವಕಾಶಗಳನ್ನು ನಮ್ಮ ಸಂವಿಧಾನದಲ್ಲಿ ಅಳವಡಿಸಲಾಗಿದ್ದರೂ, ಅವುಗಳು ಸಮರ್ಪಕವಾಗಿ ಜಾರಿಗೆ ಬಂದಂತಿಲ್ಲ. ಜಾತಿ, ಧರ್ಮ, ಭಾಷೆ, ಸಂಸ್ಕೃತಿಗಳ ಕಾರಣಗಳಿಂದಾಗಿ ಮಾನವ ಹಕ್ಕುಗಳು ಉಲ್ಲಂಘನೆಯಾಗುತ್ತಿವೆ. ಆದುದರಿಂದ ಕೆಲವೊಂದು ರಾಷ್ಟ್ರೀಯ ಸಂಸ್ಥೆಗಳ ಮೂಲಕ ದಲಿತ, ಹಿಂದುಳಿದ, ಅಲ್ಪ ಸಂಖ್ಯಾತ ಸಮುದಾಯಗಳ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಸಂರಕ್ಷಿಸುವ ಪ್ರಯತ್ನ ಸಾಗಿದೆ. ಆ ಮೂಲಕ ಆ ವರ್ಗಗಳ ಸ್ಥಾನಮಾನವನ್ನು ಏರಿಸುವ ಪ್ರಯತ್ನಕ್ಕೆ ರಾಷ್ಟ್ರೀಯ ನೀತಿ ಆಯೋಗ, ಕಾನೂನು ಆಯೋಗ ಮುಂತಾದವು ಪೌರರ ಹಕ್ಕು ಮತ್ತು ಸ್ವಾತಂತ್ರವನ್ನು ರಕ್ಷಿಸುವ ಕಾರ್ಯದಲ್ಲಿ ಮತ್ತಷ್ಟು ತೊಡಗಿಸಿಕೊಳ್ಳಬೇಕಾಗಿದೆ.

ಭಾರತದಲ್ಲಿ ರಾಷ್ಟ್ರೀಯ ಮಾನವ ಹಕ್ಕುಗಳ ಆಯೋಗವು ಸ್ಥಾಪನೆಯಾಗಿದ್ದು, ಮಾನವ ಹಕ್ಕುಗಳ ರಕ್ಷಣೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ರಾಷ್ಟ್ರದ ವಿವಿಧ ಭಾಗಗಳ ವಿವಿಧ ಸಂಸ್ಥೆಗಳೊಡನೆ ವ್ಯವಹರಿಸುತ್ತಿದೆ. ಈ ಆಯೋಗವು ಸ್ವತಂತ್ರವಾಗಿದ್ದು, ಭಾರತದ ಪ್ರತಿಯೊಬ್ಬ ಪೌರನ ಹಕ್ಕುಗಳನ್ನು ರಕ್ಷಿಸಲು ಬದ್ದವಾಗಿದೆ ಮತ್ತು ಭಾರತದ ಭವಿಷ್ಯದ ಪ್ರಜೆಗಳಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳ ಬಗ್ಗೆ ಅರಿವನ್ನು ಮೂಡಿಸುವ ಸಲುವಾಗಿ, ವಿಶ್ವಸಂಸ್ಥೆಯ ಘೋಷಣೆಯಂತೆ ಡಿಸೆಂಬರ್ 10ನ್ನು ಮಾನವ ಹಕ್ಕುಗಳ ದಿನವನ್ನಾಗಿ ಆಚರಿಸಲಾಗುತ್ತಿದೆ.

ಮಹತ್ವ :

ಶಾಂತಿಯ ಅರಿವಿನಿಂದ ಅರ್ಥೈಸಿಕೊಳ್ಳುವಿಕೆಯಿಂದ ಸಾಧಿಸುವಂತ ಹುದೇ ವಿನಃ ಬಲತ್ಕಾರದಿಂದಲ್ಲ ಎಂದರು ಮಹಾತ್ಮಾಗಾಂದಿಜೀ. ಈ ಅರಿವನ್ನು ನಮ್ಮ ಇಂದಿನ ಜನಾಂಗದ ಮಕ್ಕಳಲ್ಲಿ ಮೂಡಿಸಿದರೆ ನಮ್ಮ ಸಮಾಜವು ಹೆಚ್ಚು ಶಾಂತಿಯುತ ಸಾಮರಸ್ಯದಿಂದ ತುಂಬಿರುತ್ತದೆ.

ಯುನೆಸ್ಕೋದ ಅಧ್ಯಕ್ಷರು ಹೇಳಿದಂತೆ "ಯುದ್ದಗಳು ಮಾನವರ ಮನಸ್ಸಿನಲ್ಲಿ ಮೂಡಿಸುವುದರಿಂದ ಅದಕ್ಕೆ ಅನುಗುಣವಾದ ರಕ್ಷಣೆಯು ಅವನ ಮನಸ್ಸಿನಲ್ಲೆ ಮೂಡಬೇಕು.

ಈ ಮಾತು ಇಂದಿನ ಸಮಾಜದ ಮೌಲ್ಯ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ ಏನೋ ಕೊರತೆಯಿದೆ ಎಂಬುದನ್ನು ಸೂಚಿಸುತ್ತದೆ. ಇದರಿಂದಾಗಿ ಮಾನವನ ಚರಿತ್ರೆಯಲ್ಲಿ ಅಮಾನವೀಯ ಕೃತ್ಯಗಳು ನಡೆಯುವುದು ಇಂದು ಸಾಮಾನ್ಯ ಸಂಗತಿಯಾಗಿ ಬಿಟ್ಟಿದೆ. ಮಾನವ ಹಕ್ಕುಗಳ ಅರಿವಿನಿಂದ ಮೂಡಿ ಬರುವ ನಿರ್ದಿಷ್ಟ ಮಾರ್ಗೋಪಾಯಗಳನ್ನು ಅನುಸರಿಸುವುದರಿಂದ ಮಾತ್ರ ಮಾನವ ಹಕ್ಕುಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸಮಸ್ಯೆಗಳನ್ನು ಪರಿಹರಿಸಿಕೊಳ್ಳಲು ಸಾಧ್ಯ ಎಂಬುದು ಇದರಿಂದ ದೃಢೀಕರಿಸಲ್ಪಟ್ಟಿದೆ. ಇದಕ್ಕೆ ಸಮರ್ಥ ಸಾಧನೆ ಎಂದರೆ ಶಿಕ್ಷಣ. ಅದರಲ್ಲೂ ಮಾನವ ಹಕ್ಕುಗಳ ಪರಿಕಲ್ಪನಾ ಕ್ಷೇತ್ರ. ಹೀಗೆ ಮಾನವನ ಗೌರವ ಹಾಗೂ ಘನತೆಗಳನ್ನು ಕುರಿತ ಸಮಸ್ಯೆಗಳನ್ನು ಪರಿಹರಿಸುವಲ್ಲಿ ಹಾಗೂ ಗುರುತಿಸುವಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳನ್ನು ಕುರಿತ ಶಿಕ್ಷಣ ದಿಕ್ಸೂಚಿಯಾಗಿದೆ.

ಮಾನವನ ಅಲೋಚನೆ ಮತ್ತು ಆಚರಣೆಯಲ್ಲಿ ಮಾನವನನ್ನು ಕುರಿತಂತೆ ಘನತೆ ಗೌರವಗಳನ್ನು ಮೂಡಿಸಲು ತಾತ್ವಿಕ ಹಾಗೂ ಪ್ರಾಯೋಗಿಕ ನೆಲೆಗಳೆರಡರಲ್ಲಿಯೂ ಪ್ರಯತ್ನಗಳಾಗಿವೆ. ವಿಶ್ವ ಸಂಸ್ಥೆ ಹಾಗೂ ಬೃಹತ್ ಸಂಘಟನೆಗಳು ಜಾಗತಿಕ ಮಟ್ಟದಲ್ಲಿ ಹಾಗೂ 1998ರಲ್ಲಿ ಸ್ಥಾಪಿತವಾದ ರಾಷ್ಟ್ರೀಯ ಮಾನವ ಹಕ್ಕುಗಳ ಅಯೋಗವು ರಾಷ್ಟ್ರ ಮಟ್ಟದಲ್ಲಿ ಈ ಕುರಿತು ಕೆಲಸ ಮಾಡುತ್ತಿವೆ. ಈ ಸಂಘಟನೆಯಗಳು ಪಠ್ಯಕ್ರಮದಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳ ವಿಷಯವನ್ನು ಸೇರಿಸಲೇ ಬೇಕೆಂದು ಒತ್ತಾಯಿಸುವುದರ ಮೂಲಕ ಈ ವಿಷಯಕ್ಕೆ ಆರಂಭಿಕವಾದ ಚಾಲನೆ ನೀಡಿದೆ. ಮಾನವ ಹಕ್ಕುಗಳ ಘೋಷಣೆಯನ್ನು ಸಾರ್ವತ್ರಿಕರಣ ಗೊಳಿಸಿ ವಿಶ್ವ ಸಂಸ್ಥೆಯ ಮಾನವ ಹಕ್ಕುಗಳ ಶಿಕ್ಷಣವನ್ನು ಮತ್ತಷ್ಟು ಒತ್ತಿ ಹೇಳಿ, ಎಲ್ಲಾ ರಾಷ್ಟ್ರದ ಜನಾಂಗ, ಧಾರ್ಮಿಕ ಸಮೂಹದಲ್ಲಿ ಅರಿವು, ಸಲಹೆ ಹಾಗೂ ಸೌಹಾರ್ದ ವಿರಬೇಕು ಎಂಬ ಅಂಶವನ್ನು ಎತ್ತಿ ಹಿಡಿದಿದೆ. ಪ್ರತಿ ವ್ಯಕ್ತಿಯನ್ನು ವಿಶ್ವ ಮಾನವನನ್ನಾಗಿ ಪರಿವರ್ತಿಸುವ ಗುರಿಯನ್ನು ಹೊಂದಿರಬೇಕು. ಜಾಗತಿಕ ಮಾನವ ಹಕ್ಕುಗಳ ಸಂಸ್ಕೃತಿಗೆ ನಿರ್ದಿಷ್ಟ ಕೊಡುಗೆಗಳನ್ನು ಕೊಡಲು ವಿದ್ಯಾರ್ಥಿಗಳು ಸಮರ್ಥರಾಗುವಂತೆ ಮಾಡಬೇಕು.

ಮಾನವ ಹಕ್ಕುಗಳಿಗಾಗಿ ಶಿಕ್ಷಣ ಮತ್ತು ಶಿಕ್ಷಕರ ಪಾತ್ರ

ವಿಶ್ವಸಂಸ್ಥೆಯ ಮಾಜಿ ಪ್ರಧಾನ ಕಾರ್ಯದರ್ಶಿಯು ಟ್ಯಾನ್ಸ್, ಆಫ್ಟ್ಲಿ 'ಮಾನವೀಯ ಹಕ್ಕುಗಳನ್ನು ಒದಗಿಸುವುದೆಂದರೆ, ಸ್ವತಂತ್ರವಾಗಿ ಮಾನವನು ಅಭಿವೃದ್ದಿಗೊಳ್ಳುವುದರ ಜೊತೆಗೆ ಮಾನವನು ಅರ್ಥಿಕ ಮತ್ತು ಸಾಮಾಜಿಕ ಅಭಿವೃದ್ದಿಯನ್ನು ಸಾಧಿಸುವುದೇ ಆಗಿದೆ. ಇದರಿಂದ ನಿಜವಾಗಿ ಅಂತರರಾಷ್ಟ್ರೀಯ ಶಾಂತಿಯನ್ನು ಕಾಯ್ದುಕೊಳ್ಳಲು ತಳಹದಿ ಹಾಕಿದಂತಾಗುತ್ತದೆ" ಎಂದಿದ್ದಾರೆ.

ಹಾಗಾಗಿ, ಶಿಕ್ಷಕರು ತಮ್ಮ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಮಾನವ ಹಕ್ಕುಗಳ ಜ್ಞಾನ ಮತ್ತು ಕೌಶಲ್ಯಗಳನ್ನು ಒದಗಿಸಿ, ಅವರಲ್ಲಿ ಮಾನವ ಹಕ್ಕುಗಳ ಬಗ್ಗೆ ಪ್ರಜ್ಞೆ ಮೂಡಿಸುವುದರ ಜೊತೆಗೆ ಇತರರು ಕೂಡ ತಮ್ಮ ಹಕ್ಕುಗಳನ್ನು ಮತ್ತು ಕರ್ತವ್ಯಗಳನ್ನು ಅನುಭವಿಸಲು ಅವಕಾಶ ನೀಡುವುದು. ಹೀಗೆ ಮಕ್ಕಳಲ್ಲಿ ಇಂತಹ ಭಾವನೆಗಳನ್ನು ಬೆಳೆಸುವುದರಿಂದ ಕೇವಲ ಕುಟುಂಬ, ರಾಜ್ಯ ಮಾತ್ರವಲ್ಲದೆ ಇಡೀ ಜಗತ್ತೆ ಸಂತಸ ಮತ್ತು ಭದ್ರತೆಯಿಂದ ಜೀವಿಸಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.

1948 ರ ಮಾನವೀಯ ಹಕ್ಕುಗಳ ಆಯೋಗ ಪ್ರತಿಯೊಬ್ಬನು ಪ್ರಾಥಮಿಕ ಶಿಕ್ಷಣವನ್ನು ಪಡೆಯುವುದು ಕಡ್ಡಾಯ ಎಂದು ಹೇಳಿದೆ. ಅದರಂತೆ ಶಿಕ್ಷಕರು ಮಕ್ಕಳಿಗೆ ಪ್ರಾಥಮಿಕ ಶಿಕ್ಷಣವನ್ನು ಕೊಡಿಸುವಂತೆ ಪೋಷಕರಲ್ಲಿ ಮನದಟ್ಟು ಮಾಡಬೇಕು.

ಶಿಕ್ಷಣ ಎಂಬುದು ಮಾನವ ವ್ಯಕ್ತಿತ್ವವನ್ನು ಬೆಳೆಸುತ್ತದೆ. ಆದುದರಿಂದ ಶಿಕ್ಷಕರು ತಮ್ಮ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ತಾಳ್ಮೆ, ಸ್ನೇಹ ಭಾವವನ್ನು ಬೆಳೆಸಬೇಕು.

1992 ಎನ್.ಪಿ.ಇ. ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೂಚಿಸಿರುವ ಹತ್ತು ಮೂಲಾಂಶಗಳು ಮಕ್ಕಳಲ್ಲಿ ಬೆಳೆಯುವಂತೆ ನೋಡಿಕೊಂಡು ಆಗಿಂದಾಗ್ಗೆ ಮೌಲ್ಯ ಮಾಪನ ಮಾಡುತ್ತಿರಬೇಕು. ಅದಕ್ಕೆ ಪೂರಕವಾದ ಚಟುವಟಿಕೆಗಳನ್ನು ಕೈಗೊಳ್ಳಬೇಕು. ಶಿಕ್ಷಕರು ಕೂಡ ಮಾನವ ಹಕ್ಕುಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಕ್ರಿಯಾ ಸಂಶೋಧನೆಯನ್ನು ಕೈಗೊಳ್ಳಬಹುದು.

ಮಾನವ ಘನತೆಯ ರಕ್ಷಣೆಯಲ್ಲಿ ಶಿಕ್ಷಕರ ಪಾತ್ರ

ಮಾನವ ಘನತೆ ಗೌರವಿಸುದನ್ನು ಕುರಿತು ಮಕ್ಕಳಲ್ಲಿ ಅರಿವು ಮೂಡಿಸಬೇಕು ಎಂಬ ಕೂಗು ಈಗ ಎಲ್ಲೆಡೆ ಕೇಳಿಬರುತ್ತಿದೆ. ಜಗತ್ತಿನ ಬಹುತೇಕ ಭಾಗಗಳಲ್ಲಿ ನಡೆಯುತ್ತಿರುವ ಘರ್ಷಣೆಗಳು, ಹೋರಾಟಗಳು, ಯುದ್ದಗಳು, ಮಾನವ ಜೀವನದ ಒಟ್ಟಾರೆ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ ಎಲ್ಲಿಯೋ ದೋಷಗಳಿವೆ, ತಪ್ಪುಗಳಿವೆ ಎಂಬುದನ್ನು ತೋರಿಸಿಕೊಟ್ಟಿದೆ. ಮಾನವನ ಜೀವನದಲ್ಲಿ ನಿರ್ದಿಷ್ಟವಾದ ಯಾವುದೋ ಜ್ಞಾನದ ಕೊರತೆ ಇದೆ ಎಂಬುದು ಮನಸ್ಸಿಗೆ ಬರುತ್ತಿದೆ. ಮಾನವನ ಚರಿತ್ರೆಯಲ್ಲಿ ಹಿಂದೆಂದಿಗಿಂತಲೂ ಇಂದು ಈ ನೈಜತೆಯ ಕಡೆಗೆ ನಾವು ಗಮನಹರಿಸಬೇಕಾಗಿದೆ. ಮಾನವನ ಘನತೆಯನ್ನೂ ಗೌರವಿಸುವ ಮನೋಭಾವವನ್ನು ಮೂಡಿಸುವ ಮಾರ್ಗೋಪಾಯಗಳನ್ನು ಕಂಡುಕೊಳ್ಳಬೇಕಾಗಿದೆ.

ಮಾನವನು ಶಿಕ್ಷಣ ಪಡೆಯುತ್ತಾನೆ. ಪ್ರಾಣಿಗಳು ತರಬೇತಿ ಪಡೆಯುತ್ತವೆ. ಹಾಗಾಗಿ ಷೇಕ್ಸ್‌ಪಿಯರ್ ಮಾನವನನ್ನು ಒಂದು ಕಾರ್ಯದ ಉತ್ತಮ ಫಲವಾಗಿ ಉದಾತ್ತ ಆಲೋಚನೆಯ ವ್ಯಕ್ತಿಯಾಗಿ, ಅನಂತ ಸಾಮರ್ಥ್ಯವುಳ್ಳವನಾಗಿ ದೇವತಾಸದೃಶ ಜೀವಿಯಾಗಿ, ಜಗತ್ತಿನ ಸೌಂದರ್ಯವಾಗಿ, ಎಲ್ಲಾ ಚರಾಚರಗಳ ಉತ್ಕೃಷ್ಟ ಮಾದರಿಯಾಗಿ ಕಾಣಿಸುತ್ತಾನೆ. ಆದುದರಿಂದಲೇ ಮಾನವನಿಗೆ ಅವನದೇ ಆದ ಘನತೆ ಇದೆ. ಮತ್ತೊಬ್ಬರ ಘನತೆಯನ್ನು ಗೌರವಿಸು ಸಾಮರ್ಥ್ಯವಿದೆ. ಈ ಹಿನ್ನಲೆಯಲ್ಲಿ ಮಾನವ ಘನತೆಯನ್ನು ಉಳಿಸಿ ಬೆಳೆಸುವ ಸನ್ನಿವೇಶದಲ್ಲಿ ಶಿಕ್ಷಣದ ಪರಿಕಲ್ಪನೆಯನ್ನು ವ್ಯಾಖ್ಯಾನಿಸಬೇಕು. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಶಿಕ್ಷಣದಲ್ಲಿ ಮಾಡಬೇಕಾದುದೇನು ಎಂಬುದನ್ನು ಗಮನಿಸೋಣ.

– ಜನರಿಗೆ ಮಾನವ ಹಕ್ಕುಗಳ ಕುರಿತು ಅರಿವು ಮೂಡಿಸಬೇಕು. ಭಾರತ ಸಂವಿಧಾನ ಕೂಡ ಮಾಡಿರುವ ಮೂಲಭೂತ ಸ್ವಾತಂತ್ರ್ಯಕ್ಕೆ ಸಂಭಂದಿಸಿದ ಹಕ್ಕುಗಳ ಬಗ್ಗೆ ತಿಳವಳಿಕೆ ನೀಡಬೇಕು.

– ಭಾರತದ ಸಂಸ್ಕೃತಿಯ ಮೂಲಮಂತ್ರವಾದ ವಸುದೇವ ಕುಟುಂಬಕವ್ (ಜಗತ್ತೇ ಮನೆ) ಎಂಬ ಆದರ್ಶವನ್ನು ಸಾಕಾರಗೊಳಿಸಲು ಮಕ್ಕಳಿಗೆ ತರಬೇತಿ ನೀಡಬೇಕು.

– ವ್ಯಕ್ತಿ ಗೌರವವನ್ನೂ ಬೆಳೆಸುವ ವಿವಿಧ ಅಂಶಗಳು ವಿವಿಧ ತರಗತಿಗಳ ಮೂಲ ವಿಷಯಗಳೊಂದಿಗೆ ಹಾಸು ಹೊಕ್ಕಾಗಿ ಬೆಸೆದುಗೊಂಡಿರುವಂತೆ ಪಠ್ಯವಸ್ತುವನ್ನೂ ರೂಪಿಸಬೇಕು.

– ಅನಕ್ಷರತೆಯನ್ನು ಹೊಗಲಾಡಿಸಿ, ಶಿಕ್ಷಣವು ಸಂಪೂರ್ಣವಾಗಿ ವ್ಯಕ್ತಿಯ ವಿಕಸನ ಪ್ರಕ್ರಿಯೆಯ ಕಡೆಗೆ ನಿರ್ದೇಶಿತವಾಗಿರುವಂತೆ ಗಮನಹರಿಸಬೇಕು.

– ಮಾನವನ ಘನತೆಯನ್ನು ಉಳಿಸಿ ಬೆಳೆಸುವುದೇ ಶಿಕ್ಷಣದ ಧ್ಯೇಯ ಎಂಬ ಆಲೋಚನೆಯ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಶಿಕ್ಷಣದ ಗುರಿಗಳನ್ನು ರೂಪಿಸಬೇಕು.

– ಹಿಂದುಳಿದವರ ಶಿಕ್ಷಣಕ್ಕೆ ಗಮನಕೊಡಬೇಕು.

– ಭಾರತ ಸಂವಿಧಾನ ಕೊಡ ಮಾಡಿರುವ ಪ್ರಾವಧಾನಗಳನ್ನು ಸಾಧಿಸುವತ್ತ ಪ್ರಯತ್ನಿಸಬೇಕು.

– ರಾಜಕೀಯ ಹಾಗೂ ಸಾಮಾಜಿಕ ಜೀವನದ ಎಲ್ಲ ವಿಷಯಗಳಲ್ಲಿ ಪ್ರತಿಯೊಬ್ಬರು ಜವಾಬ್ದಾರಿಯುತವಾದ ಕ್ರಿಯಾತ್ಮಕ ಪ್ರಜ್ಞೆಯೊಂದಿಗೆ ಭಾಗವಹಿಸುವ ಶಕ್ತಿ ಬೆಳೆಸಬೇಕು.

– ಶಿಕ್ಷಣದ ಮೂಲಕ ಶಾಂತಿ ಮೂಡಿಸುವ ಹಾಗೂ ಶಾಂತಿಯನ್ನು ರಕ್ಷಿಸುವ ಮಾರ್ಗೋಪಾಯಗಳನ್ನು ಕಂಡುಕೊಳ್ಳಬೇಕು.

– ಶಿಕ್ಷಣದ ಫಲವಾಗಿ ಎಲ್ಲರೂ ಸಂತಸದ ಹಾಗೂ ವಿವೇಕದ ಬಾಳು, ಬಾಳಲು ಅನುವು ಮಾಡಿಕೊಡಬೇಕು.

ಉಪಸಂಹಾರ

ಮಾನವ ಹಕ್ಕುಗಳು ಎಂಬ ಪರಿಕಲ್ಪನೆಯೂ ಜಗತ್ತಿನ ಅತೀ ಅತ್ಯಗತ್ಯ ಪ್ರಚಲಿತ ವಿಷಯಗಳಲ್ಲಿ ಒಂದಾಗಿದ್ದು ಸವಾಲಿನದಾಗಿದೆ. ಹಾಗಾಗಿ ಮಾನವ ಹಕ್ಕುಗಳು ಜಾರಿಗೆ ಬರಲು ಸಾಕಷ್ಟು ಪ್ರಯತ್ನಗಳು ನಡೆಸಿ ಅದನ್ನು ನಮ್ಮ ಜೀವನದಲ್ಲಿ ಸತ್ಯವಾಗಿ ಸ್ವೀಕರಿಸಬೇಕಾಗಿದೆ. ಅದೊಂದು ಊಹಾತ್ಮಕ ಸೃಷ್ಟಿ ಎಂದು ಭಾವಿಸಬೇಕಾಗಿಲ್ಲ. ಮಾನವ ಹಕ್ಕುಗಳು ಪುರುಷರು, ಸ್ತ್ರೀಯರು ಮತ್ತು ಮಕ್ಕಳು ಗೌರಯುತವಾಗಿ ಬಾಳಲು ಸಹಕರಿಸುತ್ತದೆ ಅಲ್ಲದೆ ನಮ್ಮ ಸಮಾಜಕ್ಕೆ ಶಾಂತಿ ಭದ್ರತೆಯನ್ನು ತಂದುಕೊಡುತ್ತದೆ. ಪ್ರಕೃತಿಯ ಮುಂದೆ ಸರ್ವರೂ ಸಮಾನರು ಎಂಬ ತತ್ವಭಾವವನ್ನು ಬೆಳೆಸುತ್ತದೆ. ಆದುದರಿಂದ ಸಮಾಜದ ಪ್ರತಿಯೊಬ್ಬರೂ ಮಾನವ ಹಕ್ಕುಗಳ ಬಗ್ಗೆ ಅರಿವನ್ನು ಬೆಳೆಸಿಕೊಂಡು ಪರಸ್ಪರ ಸಹಕಾರ ಮನೋಭಾವನ್ನು ಬೆಳೆಸಿಕೊಂಡು 'ಸುಖೀರಾಜ್ಯದ ಪರಿಕಲ್ಪನೆಯನ್ನು ಸಾಕಾರಗೊಳಿಸಬೇಕಾಗಿದೆ.'.

ವೇದ ಹೇಳುವಂತೆ : ಸರ್ವೇಜನೋಃ ಸುಖಿನೋ ಭವಂತು, ಲೋಕಸಮಸ್ತಾ ಸುಖಿನೋ ಭವಂತು, (ವಿಶ್ವದ ಎಲ್ಲಾ ಜನರು ಸಂತೋಷವಾಗಿರಲಿ.

ಅಧಾರಗ್ರಂಥಗಳು :

1) ಮಾನವ ಹಕ್ಕುಗಳು ಮತ್ತು ಪರಿಸರ : – ಹೆಚ್. ಸಿ. ಲೋಹಿತಾಶ್ವ,
2) Edu track Oct. 2004
3) ಶಿಕ್ಷಣ ಸಭೆ – ಅಕ್ಟೋಬರ್ ನವೆಂಬರ್ 2003

LIST OF AUTHORS

VOTE OF THANKS

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Dr. Y. S. GAYATHRI
Treasure, SVAK & Working President, Matru Vedike