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Editorial

Advancement in Science and technology has improved the physical quality of human life and has come to dominate every sphere of human activity. At the same time development without virtues has been posing threat to humanity and challenges to its ethical foundations. "Journal of Current Studies" provides a solid forum to discuss developments in science and humanities and literature, and its impact on modern society; contributing to the progress and extent of knowledge in a discipline (or disciplines). The journal analyses the implications of science policies, evaluates the environmental issues involved in the application of technology without human face and suggest alternatives. It also provides opportunity for academics to interact and evolve sustainable developmental strategies for a better society.

It is thus with great pleasure and gratitude, S.N.M. College Maliankara is presenting the 6th issue of our Inter disciplinary / multi disciplinary research journal. The objective of the journal is to provide a venue for academic research scholars, post graduate students in universities / colleges and other centres of research to publish current and significant research as well as other publication activities. Authors are encouraged to submit complete unpublished and original works, which are not under review in any other journals. Research papers, short communications, review articles and books reviews will be published. The journal insists strict guidelines for papers submitted for publication. Therefore, it is highly necessary that in future, research papers are to be submitted sufficiently earlier for the timely publication of the journal. Manuscripts submitted strictly in accordance with the style prescribed shall only be accepted for publication.

Looking forward to the future we can assure that the journal will continue to deliver the best of recent developments in different disciplines and publish good quality findings of high significance and relevance. On this happy occasion I wish to express my sincere appreciation to research & Journal committee for their enthusiastic support and co-operation to this academic venture. I also extend sincere appreciation of the college management and the principal, to the valued readers and authors for their continued interest

in JCS, and to every member of the editorial board to this scientific endeavour. We further gratefully acknowledge the enthusiasm and support of the college PTA who provided the financial support for the publication of the journal.

We also welcome valuable suggestions and criticisms of the readers for improvement and augmentation in this regard.

With warm regards

Dr. Jeeju P P
Chief Editor

CONTENTS

ESTIMATION OF DEFECT STATES AND DETERMINATION OF URBACH ENERGY IN BIOSYNTHESIZED SEMICONDUCTING COPPER OXIDE NANOPARTICLES

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Abstract

Semiconducting nanoparticles of copper oxide were prepared through biosynthetic methods using leaf extracts of kayyonni plant (Eclipta alba) as reductant. UV-visible spectroanalysis resulted into two prominent absorption peaks at 222 nm and 295 nm corresponding to elemental absorption of copper. The band gap of the material is estimated using Tauc's plot from one that corresponding to direct allowed transition, which is found to have the best fitted linear portion. The existence of defect states in the crystal structure and Urbach tail energy corresponding to the low absorption region in the absorption spectrum were estimated to predict the transition probabilities and intensity of lines across the band edges.

Keywords: *Kayyonni plant, reductant, allowed transition. Defect states*

I. Introduction

The utility of a particular sample for various semiconducting device applications such as LEDs, solar cells etc., depends specifically on the nature of band gap of the active materials. In this work, the nanoparticles were synthesized through biogenic routes under the pursuit of their utility as active materials in above said devices. The UV-visible spectrum analysis opens up wide possibility in determining the nature of band gap of each material samples. The electrons in a solid occupy allowed energy bands separated by forbidden energy gaps. Two types of band-to band transitions are suggested [1]: (1) Direct transitions (allowed), which occurs, when the participation of a phonon is not required to conserve the momentum, whereas direct transitions (forbidden) take into account the small but finite momentum of photons and are less likely to occur. (2) Indirect transitions occur when at least one phonon participates in the absorption or emission of one phonon to conserve the momentum. It is obvious that indirect and direct transitions can occur in all semiconductor materials.

The width of optical band edges determines the emission frequency in the case of direct allowed types. In the case of semiconducting nanoparticles, they are featured with diffused clusters of defect structure at the surfaces which can introduce localized states at or near the conduction band

levels, which may act as electron capturing centers for excited electrons from the valence band levels. Thus, the probability of exciton generation in the conduction levels get diminished which in fact, results to the lower intensity of emission from conduction levels. The emission from localized defect states contributes different photon energy as well. The density of localized states in the optical energy gap is determined by the band tail width, so called Urbach energy, E_U. The Urbach exponential part generally appears in the absorption coefficient curve near the optical band edge of low crystalline, poor crystalline, the disordered and amorphous materials due to the extended localized states in the band gap [2, 3]. The optical absorption spectra of the semiconductor is divided into three main regions; a weak absorption region, which arise from defects and impurities, an absorption edge region, which arise due to perturbation of structural and disorder of the system and the region of strong absorption that determine the optical energy gap. In fact, in the low photon energy range, the spectral dependence of the absorption coefficient (α) and photon energy ($h\nu$) is known by an Urbach empirical rule [2,3].

In this context, our study is concentrated on the analysis of UV-visible spectrum recorded for the biosynthesized oxide nanoparticles based on copper.

II. Experimental

In this work copper oxide nanoparticles were synthesized through biogenic green method by the reduction of copper sulphate pentahydrate precursor salt using the leaf extract of Kayyonni [4, 5]. The leaves of kayyonni (*Eclipta alba;* family: Asteraceae) found in Punalur region were collected and washed several times using de-ionized water and dried in the sun shade. The dried leaves were then crushed into fine powder using the mortar and pistol. The weighed powders were added to 130 ml of de-ionized water and heated under stirring until boiling. The solution was kept overnight and the filtrate obtained, so called the leaf extract was centrifuged for further use.

Figure 1: From left, kayyonni leaves (*Eclipta alba*), aqueous solution of Copper sulphate penta hydrate, the leaf extract and the formation of Cu-NP-KYN [5]

Then, the given amount of $CuSO_4.7H_2O$ was dissolved in 50 ml of de-ionized water and added drop wise into the leaf extract and stirred under warming for almost one hour. The pH of the solution was kept low and the formation of nanoparticles was noted through color change. The mixture was kept overnight, filtered and dried to obtain the fine powders of copper based nanoparticles. The sample was referred to as Cu-NP-KYN.

The UV-visible spectrum was recorded at CEPCI Laboratory, Kollam, Kerala using the instrument: UV-visible spectroscopy (Model: Lamda-45, Perkin Elmer make).

III. Results and Discussion

Figure 2 shows the UV-visible spectrum recorded for the biosynthesized copper oxide nanoparticles. The absorbance is plotted as a function of wavelength, λ (nm) range from 200 nm to 700 nm at a scan speed of 480 nm/min. A good quality optical response was observed with two prominent peaks at 222 nm and 295 nm with absorbance 2.036 and 1.280 were observed respectively, indicative of the elemental absorption of copper in copper oxide nanoparticles.

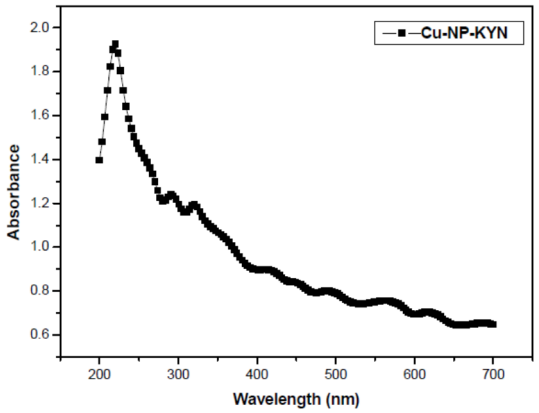

Figure 2: UV-visible spectrum obtained for Cu-NP-KYN sample [5]

The band gap, E_g corresponding to the transition between valance and conduction band is obtained by fitting the experimental absorption data corresponding to the high absorption region using Tauc's relationship, as follows [6,7]:

$$\alpha h\nu = A (h\nu - E_g)^n \quad (1)$$

Where hν is the photon energy, α is the absorption coefficient, E_g is the band gap energy and A is the characteristic parameter independent of photon energy. n = 2 for an indirect allowed transition (plotted $(\alpha h\nu)^{1/2}$ versus E); n = 3 for an indirect forbidden transition (plotted as $(\alpha h\nu)^{1/3}$ versus E); n = 1/2 for a direct allowed transition (plotted as $(\alpha h\nu)^2$ versus E); n = 3/2 for a direct forbidden transition (plotted as $(\alpha h\nu)^{2/3}$ versus E). The n value for the specific transition can be experimentally determined from the best

linear fit in the high absorption region of the spectrum using the different equations.

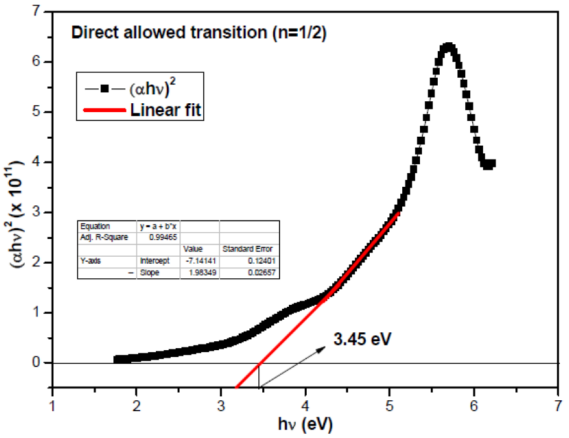

Figure 3: Tauc's plot corresponding to direct allowed transition (n=1/2)

Figure 3 represents the plot corresponding to direct allowed transition (n=1/2). It could be seen that a linear segment fitted with best regression coefficient (R-square=0.99465) is obtained. Thus, the copper oxide nanoparticles sample obtained by the reduction of copper sulphate penta hydrate using leaf extract of kayyonni plant is direct allowed in its band to band transition. Extrapolating the slope to α=0 gives the band gap energy (E_g), which is estimated to be 3.45 eV.

Near the optical band edge, the Urbach empirical rule is given by the exponential equation [2, 3]:

$$\alpha = \alpha_0 \exp(h\nu/E_U) \quad (2)$$

$$\ln \alpha = \ln \alpha_0 + (h\nu/E_U) \quad (3)$$

where α_0 is a constant and the Urbach energy, E_U is weakly dependent upon temperature, which can be obtained from the slope of the straight line by plotting ln (α) against the incident photon energy (hν). The sample under investigation here has been confirmed for the tail region observed in the spectral behavior of the absorbance (Figure 2). This may be due to the surface defects in the nanoparticles wherein vacancy clusters diffused over the surface forming an amorphous layer as modeled by Berkowitz *et al.* [8].

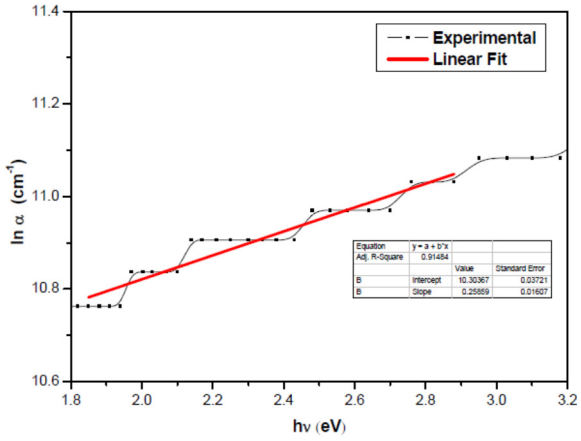

Figure 4: Representation of ln (α) as the function of hν in the range of absorption Urbach tail

Figure 4 shows the graphical representation of ln (α) as a function of hν in the range of the Urbach tail that yields a straight line with slope equal to ($1/E_U$). The calculated value of E_U equal to 3.86 eV cm indicates the evidence for definite probability of existing localized defect states near the

optical band edges. This energy is in fact, affect the band to band transition, and hence the intensity and emission wavelength.

Conclusions

The UV-visible spectrum recorded for biosynthesized copper oxide nanoparticles using leaf extract of kayyonni plant could be analyzed successfully. It could be found that the sample exhibits semiconducting behaviour with direct allowed band to band transition with energy gap equal to 3.45 eV. The definite probability of defect states near the band edges could be investigated through estimating Urbach tail energy. Thus, the sample can find application as active semiconducting material for LED, as photo electrode for dye and quantum dot sensitized solar cells etc.

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ADSORPTION AND RELEASE STUDIES ON CHITOSAN BASED POLYMER MATRIX

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Abstract

Molecularly imprinted polymers (MIPs) are synthetic polymeric materials with specific recognition sites complementary in shape, size and functional groups to the template molecule, involving an interaction mechanism based on molecular recognition. In the present study molecular imprinted and non-imprinted polymer matrices (MIP's and NIP's) were prepared using chitosan flakes and bovine serum albumin (BSA). Adsorption experiments includes adsorption equilibrium study using MIP and NIP polymer matrix by varying BSA concentration, The effect of pH on the loading efficiency of BSA, Effect of ionic concentration and Buffer on loading capacity of BSA on MIP matrix, Role of different porogens on pore properties of MIP matrix, Effect of cross linking density on BSA release kinetics and also Eluent effect on release kinetics.

Keywords: *Chitosan, Bovine serum albumin, Release kinetics*

1. Introduction

Molecular imprinting is a powerful technique for designing and producing artificial binding sites in a synthetic polymer that exhibits selective rebinding of the template used during polymerization [1]. Chitosanpoly-β-(1→4)-2-amino-2deoxy-D-glucose) is an aminopolysaccharide, which is a cationic polymer produced by the N-deacetylation of chitin [2]. Chitosan displays interesting properties such as biocompatibility, biodegradability and its degradation products are non- toxic, non-immunogenic and non-carcinogenic [3]. Therefore chitosan has prospective applications in many fields such as biomedicine (drug delivery system, as anti-microbial agent, tissue engineering etc) wastewater treatment, functional membrane, and flocculation [4].

Drug delivery has been a very active area, especially for chitosan as a carrier for various active agents including drugs and biologics due to its physicochemical and biological properties. In this study batch mode experiments were carried out to determine the loading of BSA and release profile at variable pH, ionic concentration and concentration of drug and porogenic effect. A series of

preliminary batch experiments were performed with varying amounts of the drug, cross linker and different porogens and also at different temperatures.

2. Experimental

2.1 Materials

The chemicals used throughout the study were of analytical grade. Chitosan obtained from Sigma-Aldrich Chemic, Glutaraldehyde obtained from Fluka, Switzerland was used as the cross linking agent. Bovine Serum Albumin (BSA) from Merck, India was also used as the model drug. The other entire chemicals used in the experiment were of analytical reagent grade and were used without further purification.

2.2 Methods

Batch mode experiments were carried out to determine the loading of BSA and release profile at variable pH, ionic concentration, and concentration of drug and porogenic effect. A series of preliminary batch experiments were performed with varying amounts of the drug, cross linker and different porogens and also at different temperatures.

The first set of the experiments conducted for the study of the effect of pH on the loading of BSA on GA-C-CTS/PVA matrix. For this 50, 100, 150 and 200 mg/L solution of BSA was prepared from the stock solution. 50 mL of each of the solution were taken in different stoppered bottles (100 mL) each containing 0.05 g of adsorbent.

The pH of each sample was adjusted between 3.0 and 6.0. The stoppered bottles containing the sample were kept for agitation time of 4 h in a water bath shaker to optimize the maximum loading capacity of GA-C-CTS/PVA matrix. The quantity of BSA present in the supernatant liquid was determined using a UV–Visible Spectrophotometer at a wavelength of 730 nm. Effect of drug concentration on the release profile was carried out by taking GA-C-CTS/PVA matrix containing different concentrations of BSA. Then leaching procedure is carried out by using 50 mL of leaching agents. The rate of release was studied by using batch kinetic experiments. The effect of concentration of cross linking agent in release profile was carried out by taking equal weight of polymer containing different concentrations of glutaraldehyde and release studies were carried out.

In order to investigate the influence of ionic strength on the adsorption behavior of BSA on to the GA-C-CTS/PVA polymer studies were carried out using NaCl

solutions. The effect of porogens on the sorption of BSA on to GA-C-CTS/PVA polymer matrix was also investigated.

3. Result and Discussion

3.1 Effect of pH

The isotherms were plotted as qe versus Ce for each initial concentration of BSA at various pH values. The experimental results are shown in **Figure1.**BSA adsorption had a steeper increase with increasing Ce values at pH 4.0. The BSA has a negative value above the isoelectric point and a positive value below the isoelectric point. GA-C-CTS/PVA polymer matrix carries a negative charge above pH_{PZC}(3.7).When loading pH <pI, the positively charged BSA molecule was encapsulated on the polymer matrix due to the presence of charge-charge interactions. At loading pH approached to pI value electrostatic repulsion between BSA and polymer matrix would be minimized [5]. On the other hand near the pI value more binding sites are available for the BSA molecule in the polymer matrix. This would result in a higher loading capacity at pH 4.0.

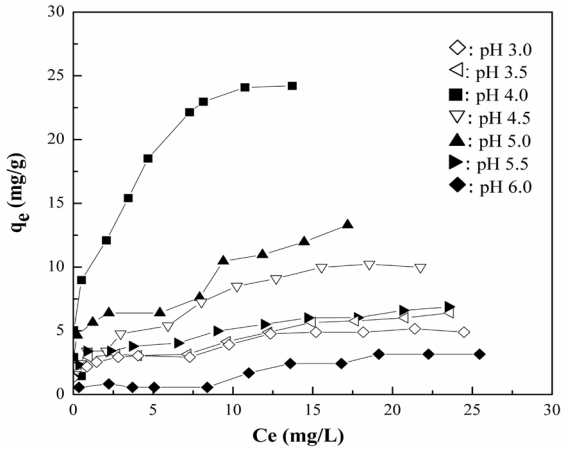

Figure1. Effect of pH on loading efficiency of BSA onto GA-C-CTS/PVA Polymer Matrix

3.2.3 Effect of Ionic strength

It was observed that when the ionic strength increased from 0.001 to 1.0 M, the amount of BSA loading decreased from 424.5 to 300.5 mg/g at an initial BSA concentration of 450 mg/L. Similarly when the concentration of buffer solution increased from 0 to 100mM, the amount of BSA loading decreased from 400 to350 mg/g and 250 to200mg/g and at an initial BSA concentration of 400 mg/L and 250mg/L. Increase of buffer and salt concentrations, corresponding to increase the ionic strength or conductivity of the liquid phase lead to a decrease in electrostatic interactions, resulting in a lower binding capacity .The modification of the BSA species may also lead to a decrease in adsorption with increase in ionic strength.

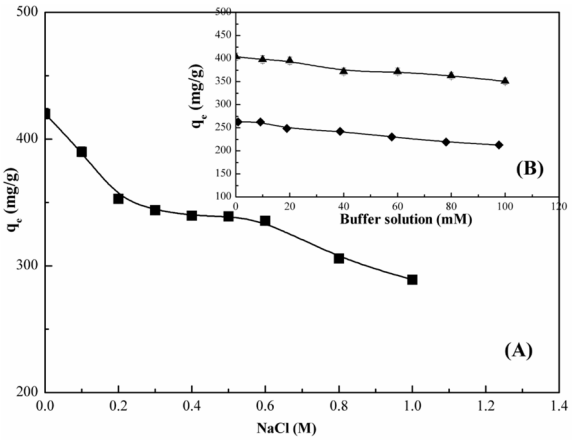

Figure 2(A) Effect of ionic concentration on loading capacity of BSA on MIP Figure 2(B) Effect of buffer on loading capacity of BSA on MIP matrix.

3.2.4 Effect of Porogen

MIPs are prepared using PVA, chitosan and glutaraldehyde (as cross linker). Imprinted with model drug BSA and using polar (dimethyl formamide), moderately polar (dichloromethane) and non-polar (n–hexane) porogenic solvent. **Figure 3** shows the effect of porogen. From the experiment it is seen that the pore forming capacity varies as follows: moderately polar solvent > polar solvent >non polar solvent. The taken monomer mixture is moderately polar, so among the porogens taken dichloromethane has more solubility in the monomer mixture so it shows high pore forming capacity. The porogenic agent used in the polymer matrix preparation having high porous forming capacity and hence the polymer prepared have high loading efficiency.

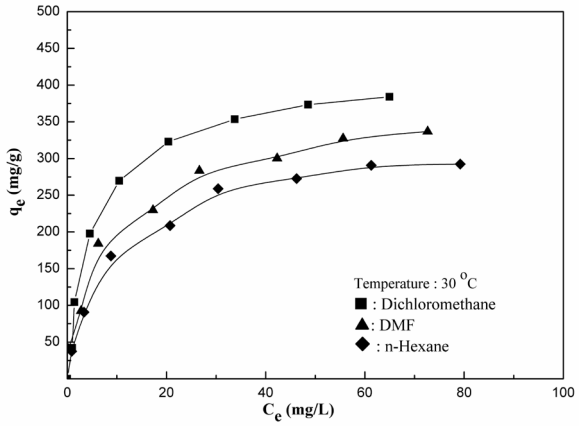

Figure 3 Effect of different porogens on pore properties of BSA-loaded-GA-C-CTS/ PVA (MIP matrix)

3.2.5 Effect of Cross linking Density on BSA Release kinetics

From the experiments it is clear that when the polymer matrix prepared using greater amount of glutaraldehyde may result more extent cross linking reaction which made the polymer matrix exhibited a tighter and firmer structure,i.e., greater structural strength and durability. As the density of the cross linking agent increases, rate of release decreases. It was shown in **Figure 4**. This may be due to the fact that diffusion of the drug from the Polymer Matrix depends up on the pore size of the polymer network, which will decrease with increasing cross linking density [6]. The fractional drug release was calculated as,

$$M_t/M = 4\left(\frac{D_E t}{\pi\delta^2}\right)^{0.5} \quad (1)$$

Where Mt/M is the fractional drug release,

D_E is the early time diffusional coefficient, t is the release time and δ is the diffusional distance. The values of D_E were determined from the plots of Mt/M versus $t^{1/2}$ at different cross linking density. The results indicate that the values of D_E decreases with increase of crosslinking density, i.e., fractional release decreases.

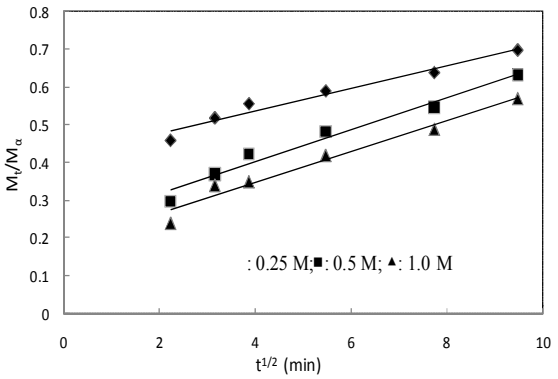

Figure 4 The plots of Mt/M versus $t^{1/2}$ for BSA release from MIP matrix

3.2.6. Effect of Eluents on release kinetics

In order to study the effect of eluent on release kinetics, different eluents such as tris-HCl, sodium acetate buffer, sodium lauryl sulphate solution (SDS) and sodium carbonate were used. **Figure 5** shows the release percentage variation. From the observations it is clear that SDS solution shows the high leaching capacity. The leaching capacity depends upon pH. Among the eluents used SDS solution has high pH. While sodium carbonate is highly basic and it has low leaching capacity.

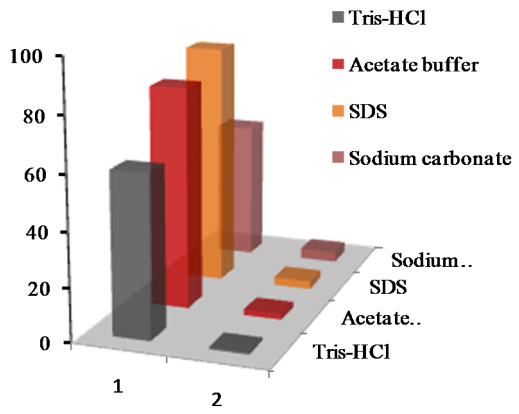

Figure 5 Eluent effect on release kinetics of BSA from MIP matrix

4. Conclusion

Investigations show that GA-C-CTS/PVA Polymer Matrix has high drug loading capacity and also pH, nature of the eluent and cross linking agent density etc affect its leaching capacity. So this particular Polymer Matrix can be effectively used in drug delivery systems.

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PHYSICO-MECHANICAL PROPERTIES OF NITRILE RUBBER-ALUMINATE NANOCOMPOSITE

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Abstract

This paper presents the findings of a study on incorporating nano zinc aluminate spinel into nitrile rubber for physical and mechanical property improvement. The cure characteristics and mechanical properties of modified nano composites were determined and compared with those of unmodified samples. Cure time and scorch time were found to be decreased with filler content. Mechanical properties increase with filler content on modification.

Keywords: *Nitrile rubber, nano zinc aluminate, spinel*

1. Introduction

Acrylonitrile butadiene rubber, known as nitrile rubber (NBR) shows no self reinforcing effect, as it cannot undergo stress induced crystallization on stretching. Since gum vulcanizate have very low tensile strength, NBR are used in combination with reinforcing fillers to obtain vulcanizate having excellent mechanical properties. NBR is a polar rubber and is generally considered as a special purpose rubber being used for applications requiring oil and solvent resistance. Presence of acrylonitrile makes it polar and provides special features to the polymer. The following discussion starts with the general field of elastomers. Relevant literatures have been cited wherever necessary.

1.1 Acrylonitrile Butadiene Rubber (NBR)

Nitrile rubber is a copolymer of butadiene and acrylonitriie. These rubbers fall in to the class of special purpose, oil - resistant rubbers. Due to this resistance to oils and solvent resistance, they are widely used in products like oil seals, pipe protectors, blow out preventers, etc. NBR shoes no self-reinforcing effect, as there is no crystallinity. The service temperature in presence of oxygen is estimated to be 130° C.

1.2 Zinc Aluminate as filler

One important aluminium spinel is zinc aluminate. Zinc aluminate possesses a unique combination of desirable properties such as high thermal stability,high mechanical resistance, low temperature sinterability, better diffusion and ductility and low surface acidity(17). Due to these properties it was used as high temperature materials, catalysts and optical coatings. It was widely used in many catalytic reactions, such as dehydration and hydrogenation. Zinc aluminate is one of the most important functional oxides with a direct, wide band gap (3.37eV) and large excitation binding energy (60meV), exihibiting many interesting properties including transparent

conductivity and piezoelectricity. Zinc aluminate is also a candidate material for optical coating applications and is currently employed in catalysis for applications such as cracking, saturated alcohol dehydration, methanol and other alcohol synthesis and as a catalytic support. The catalytic functionality of sub-micron particles is strongly affected by microstructure with different facets showing differences in catalytic activity.

The aim of this project is to study the effects of nano zinc aluminates on the physicomechanical properties of nitrile rubber aluminate nano composites.

2. Experimental

2.1 Materials

Zinc nitrate, Aluminium nitrate, propane diol, *Acrylonitrile butadiene rubber(NBR)* N553 grade, *Zinc Oxide* (activator) *Stearic acid* (co-activator), *MBTS* (accelerator) and *Tetramethyl thiuram disulphide* (*TMTD*) (accelerator) *Sulphur* (crosslinking agent).

2.2 Synthesis of nano zinc aluminate

Zinc aluminate was prepared by sol gel method and characterized by XRD and FTIR.

2.3 Compounding and curing

The mixes were prepared on a laboratory size two roll mill (16x33cm) at a friction ratio 1:1.25. The mixing was done according to ASTM D 3184-89(2001). The nitrile rubber was initially masticated well on the mill. Then the compounding ingredients were added in the following order: activators, accelerators, filler and sulphur. After mixing, the stock was passed six times through tight nip and finally sheeted out. Both gum and filled NBR compounds were prepared. The formulations of the mixes are given in Table 1

Table 1 NBR formulation for varying filler content

Sample	NBR (phr)	$ZnAl_2O_4$ (phr)	ZnO (phr)	St.acid (phr)	MBTS (phr)	TMTD (phr)	S (phr)
1	100	0	4	2	0.8	0.2	2.5
2	100	1	4	2	0.8	0.2	2.5
3	100	2	4	2	0.8	0.2	2.5
4	100	3	4	2	0.8	0.2	2.5
5	100	4	4	2	0.8	0.2	2.5
6	100	5	4	2	0.8	0.2	2.5

Cure characteristics of the mixes were determined at 150^{o}C and vulcanization to optimum cure time was carried out in an electrically heated hydraulic press at 150^{o}C**.** The moldings were cooled quickly and stored in a cool dark place for 24 hours prior to physical testing.

2.4 Quality evaluation

The following evaluation methods were adopted for the NBR vulcanizates.

a) Cure characteristics

Cure characteristics of the mixes were determined at 150^{o}C using Rubber Process Analyser, RPA 2000 supplied by Alpha Technologies, USA as per ASTM Standard, D 2084-01.

b) Tensile properties

The tensile properties were measured using Shimadzu Autograph AG-1 Series' Universal Testing Machine (UTM) with a grip separation of 40mm, using a crosshead

speed of 500mm/min as per ASTM D 412-1998 (Method A). All the tests were carried out at 28±2°C. Dumb bell specimens were punched out of the moulded sheet along the mill grain direction using a dumb bell die (C-type). The thickness of the narrow portion was measured using a digital thickness gauge. The sample was held tight by the two grips or jaws of the UTM, the lower grip being fixed. The tensile strength, elongation at break and modulus were evaluated and printed out after each measurement by the microprocessor.

c) Tear strength

This test was carried out as per ASTM D 624-1998 using unnicked, 90° angle test pieces. The samples were cut from the compression moulded sheets parallel to the mill grain direction. The test was carried out on Shimadzu Autograph AG-1 Series' Universal Testing Machine (UTM) with a grip separation of 40mm, using a crosshead speed of 500mm/min. The test temperature was 28±2°C.

d) Hardness

The hardness (Shore A) of the moulded samples was determined using Zwick 3114 Hardness Tester in accordance with ASTM D 2240-1997. The tests were performed on unstressed samples of 30mm diameter and 6mm thickness. The readings were taken after 10 seconds of indentation since firm contact had been established with the specimen.

e) Abrasion loss

The abrasion resistance of the samples was determined using a DIN Abrader (DIN 53516). Samples having a diameter of 6±0.2mm and 12mm thickness were prepared as per ASTM D 3183 and the abrasion loss was measured as per ASTM D 5963-04. The samples were kept on a rotating sample holder and a 10N load was applied. Initially a pre-run was given for the sample and its weight taken. The weight after final run was also noted. The difference in weight is the weight loss on abrasion. The volume loss on abrasion was calculated using the equation

Volume loss on abrasion = weight loss on abrasion/ specific gravity of the sample

Abrasion resistance is the reciprocal of volume loss on abrasion. The density of the sample was measured using Archimedes principle.

3. Results and discussions

3.1 Cure characteristics

Cure parameters are given in Table 2. Scorch time decreases with filler content. This indicates that zinc aluminate has an accelerating effect on cure reaction. Cure time decreases with zinc aluminate. This also indicates the accelerating of the cure reaction. Minimum torque, which is a measure of the viscosity of the compound, is found to decrease with filler content. It can be considered as a measure of the stiffness of the

unvulcanised compound, indicating that filler facilitate the processability of the compound.

Table 2 Cure characteristics of NBR compound with Zinc aluminate

Sample	NBR (phr)	$ZnAl_2O_4$ (phr)	ZnO (phr)	St.acid (phr)	MBTS (phr)	TMTD (phr)	S (phr)
1	100	0	4	2	0.8	0.2	2.5
2	100	1	4	2	0.8	0.2	2.5
3	100	2	4	2	0.8	0.2	2.5
4	100	3	4	2	0.8	0.2	2.5
5	100	4	4	2	0.8	0.2	2.5
6	100	5	4	2	0.8	0.2	2.5

3.2 Mechanical properties

The properties and performance of a rubber product depend on many factors including the chemical nature of the rubber, the amount and kinds of ingredients incorporated into the rubber compound, processing and vulcanizing conditions, design of the product and service conditions. Among different ingredients, fillers play an important role in determining the final vulcanizate properties. Fillers can be either reinforcing or non reinforcing. The reinforcing capability of the fillers depends on the size, shape and surface area.

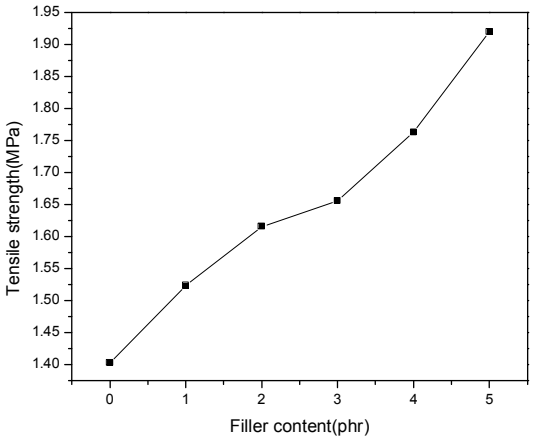

Fig.3.1 Variation of tensile strength with filler content

Fig.3.1 shows the variation of tensile strength on addition of zinc aluminate. Tensile strength increases with filler loading. This increase may be due to the reinforcing nature of the filler and better interaction between the NBR and zinc aluminate and also due to the larger surface area of the filler. As the particle size decreases, the interface area between the filler and the rubber increases which leads to better reinforcement characteristics.

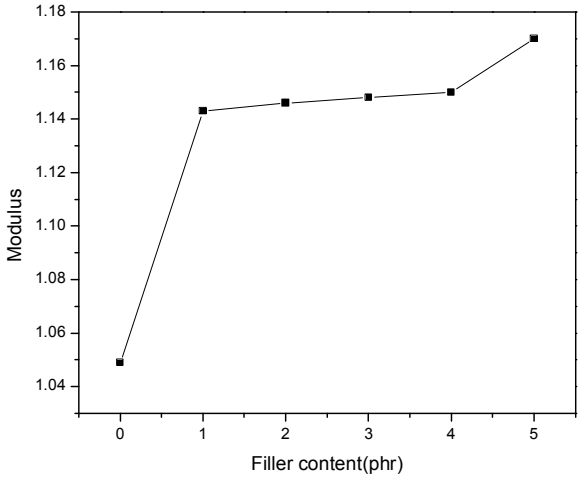

Fig.3.2 Variation of 300% modulus with filler content

Modulus at 300% elongation is plotted in figure 3.2. Modulus is found to increase gradually with filler loading. The increase in modulus is due the increase in rubber filler interaction. Bridging of rubber chains between the filler particles, results in an enhancement in modulus. Initially there is a stiffening of the rubber chains resulting in an improvement in modulus, the trend reverses on adding higher amounts of filler.

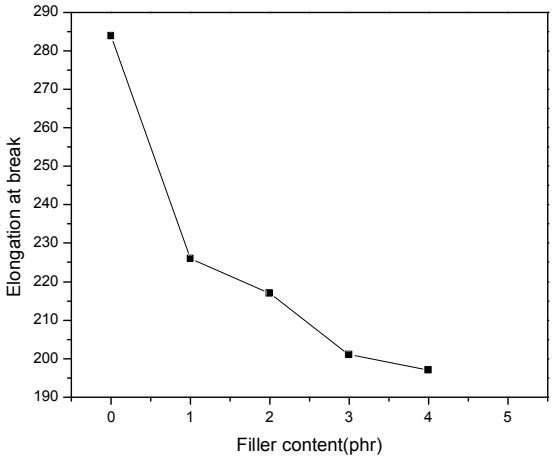

Fig.3.3 Variation of elongation at break with filler

Elongation at break (Fig.3.3) is governed by the extent of crosslinks present at the time of rupture. Elongation at break decreases with filler loading.

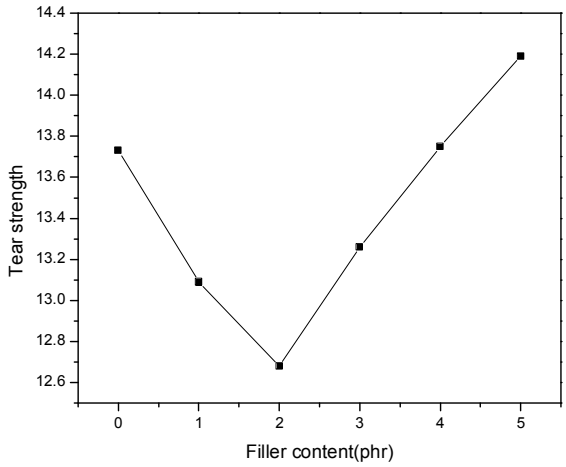

Fig.3.4 Variation of tear strength with filler content

Tear strength (Fig.3.4) is decreased initially upto 2 phr of filler and after that it is found to increase with filler. In a matrix containing fillers, the filler interacts with the elastomer chains and create a barrier for the tear path. Filler particles present at the propagation tip arrest the propagating cracks and thus increase the tear strength.

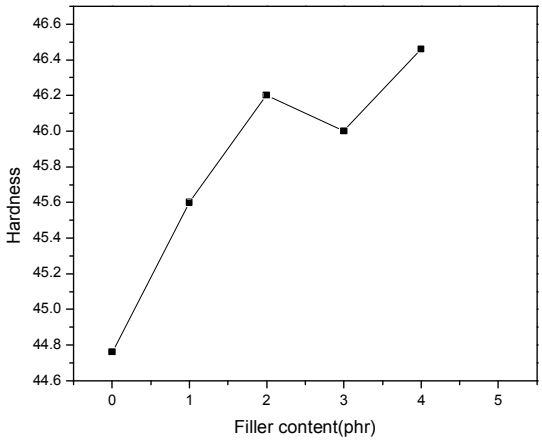

Fig.3.5 Variation of hardness with filler content

Figure 3.5 shows the variation of hardness with filler content. Hardness also shows improvement with filler content. Hardness represents a measure of modulus at low strains. This may be due to the decreased mobility of the rubber chains.

Figure 3.6 shows the variation of abrasion loss with filler content. Upto 3phr abrasion loss decreases after that it shows a slight increase. It may be due to higher interaction between rubber and filler.

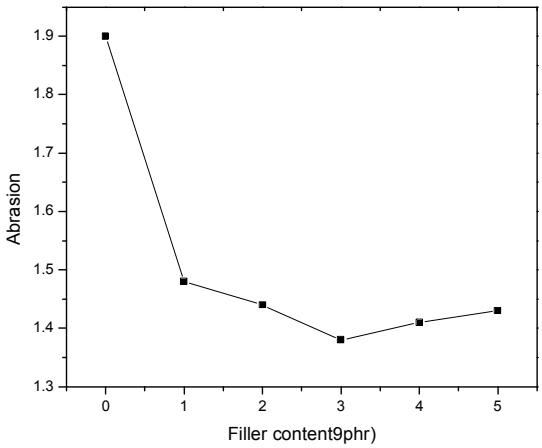

Fig.3.6 Variation of abrasion loss with filler content

4. Conclusion

Nano zinc aluminate can be successfully prepared by sol gel method. The particle size was calculated to be 15 nm from the XRD results. NBR aluminate composites were prepared by incorporating zinc aluminate at varying proportions into NBR matrix. Studies on cure characteristics in NBR composites indicated that addition of zinc aluminate facilitated the cure reaction and processability. Tensile strength, modulus, tear strength and hardness were enhanced with filler loading. Abrasion resistance was increased with the addition of zinc aluminate.

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A STUDY ON RELATIONSHIP BETWEEN NON LITERATE WOMEN AND THEIR CHILDREN IN TRICHY DISTRICT

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Abstract

The present paper is made an attempt to cull out the ground reality of non-literate women and significant relationship with their children in this article the author highlights significance of the research problem by way of using various parameters like to study the reasons for illiteracy, to study the income of the family and their children's education level and to know the health benefit availability of them. Women are the asset to a family and nation and she can use her efficiency and potential in the right manner. Non literate women have little interest in children's education and voluntarily agreed to send their children to a job to seek a hand with them for the financial position. The poor people are not affording education to their children because of the poverty. In this paper the above mentioned three objectives made an empirical verification in the Trichy in three wards by way of personal interview method with the help of structured and well defined interview schedule.

Keywords: *Illiteracy, health benefit, poverty, education level*

Introduction

With more than 1.29 billion of population, India signifies female population of 6.26 billion along with the sex ratio of 943. As per 2011 census illiteracy rate of India 25.96 percent, especially female illiteracy ratio is 34.64 percent. It shows that the gender gap never ends with enormous initiatives of the government. Non literate female population plays a crucial role in more than one third of population in India. Being heavily dependent on agriculture, their livelihood nature is not providing sustainable income to them. Women are the solo ultimate victim for all the non developmental activities of them. In the absence of regular employment their livelihood pattern will force and push them to live under the poverty line. The merely solution to their problem is behind the concept of education. As per 2011 census, in India non literate women population with the ratio of 47.3 percent, 46.7 percent and 43.8 percent holds the first three rank of respectively Rajasthan, Bihar and Jharkhand for the women population. In Tamilnadu non literate ratio of women is 26.1 percent and the total non literate of 19.7 percent of population. Under Tamilnadu state first three positions of non literate women category grabbed by Dharmapuri, Ariyalur & Viluppuram with the ratio of 39.7 percent, 38.77 percent and 36.49

percent respectively. In Trichy 22.86 percent of non literate women are exists as per 2011 census.

Education is the weapon which strengthens the personality and makes one confident, when women are not afforded with this weapon they are mentally and physically are not contented. Women are the asset to a family and nation and she can use her efficiency and potential in the right manner. Non literate women have little interest in children's education and voluntarily agreed to send their children to a job to seek a hand with them for their poverty. Nowadays, the non literate women have got the awareness with help of their unsafe livelihood pattern and the government schemes which provide a consequential and enlightening their children's life. In this phenomenon the authors study's the significant relationship of non literate women and their children.

Research problem background

It is often argued that education is a powerful tool in the emancipation and empowerment of women. Indeed, the different organs of United Nations and exports on women's liberation argue for women's education as the basic step in women's equality. Education is often used as an agent of basic change in the status of women. In order to neutralize the accumulated advantages of the past, there will be a well conceived edge in favour of women. The national education system will play a positive, interventionist role in the empowerment of women. Education is a mile stone for women empowerment because it enables them to respond to opportunities, to challenge their traditional roles and to change their lives. Since, 1975-76, the government of India has been actively implementing, improving and expanding a most ambitious and comprehensive scheme to increase the survival rate and enhance the health, nutrition and learning opportunities of per-school children and mothers with the help of the Integrated Child Development Services scheme is India's gift to the future of her own children. The non literate people are still getting more struggles in their entire livelihood pattern and forced to live at the lower level status. The government should emphasis the importance of education both in urban and rural areas.

Research gaps found

In Tiruchirappalli District the non literate women has participating indirectly to the national income. The specific objective is to study the significant relationship between

non literate women and their children in Trichy District.

Objectives

The main aim of this present paper is to study the significant relationship between non literate women and their children in Trichy District. Based on this objective to have scientific investigation with empirical validity the researcher split the broad objectives into the specific objectives, they are

- ✓ To understand the reasons for illiteracy of women
- ✓ To analyse the income of the family with their children's education level
- ✓ To find the health benefits available for both non literate women and their children

Methodology

The present study undertaken by the researcher based on the primary data as well as secondary data. To have scientific and meaningful inferences the researcher employed sampling technique to collect primary data from the sample respondents. The study purposely selected Tiruchirappalli City Corporation due to examine the non literate women population in the selected area of the present study. The study area has been identified by the researcher based on the research issue of significant relationship between non literate women and their children in Trichy District of the target population. At Tiruchirappalli City Corporation have 60 corporation wards of which researcher selected three wards i.e. 5 percent of the total wards in the Tiruchirappalli city. Of the three selected wards researcher has given equal weightage to each wards to select samples. The size of the sample consists of 20 from each ward, in total there are 60 samples have been identified. The sample respondents detail consists of personal profile, social profile, and economic profile.

Limitations

The present study was restricted to three wards. It is due to geographical profile and non availability of authentic records about the non literate women in study area the researcher conducted a micro level study with small size of samples.

Hypothesis

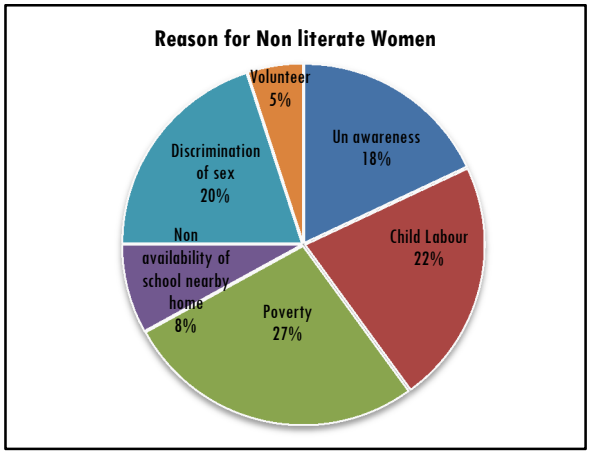
- There is significant difference between non literate women's income and their children's level of education.
- There is no significant difference between non literate women's income and their children's level of education.

Results and discussion

Table 1: Reason for Non Literate women

Reasons for Non literate Women	No of Respondent	In percent
Un awareness	11	18
Child Labour	13	22
Poverty	16	27
Non availability of school nearby home	5	8
Discrimination of sex	12	20
Volunteer	3	5
Total	60	**100**

Source: Primary data



The above diagram depicts the factors responsible for illiteracy. It clearly indicates that non literate people are mostly suffered by the poverty, child labour, discrimination of sex and unawareness.

Monthly Income and Children Education:

Table 2: Monthly Income of the Family

	Observed N	Expected N	Residual
3000-5000	50	40.0	6.0
5000-8000	25	40.0	1.0
9000-12000	5	40.0	-3.0
13000-16000	5	40.0	-3.0
>16000	15	40.0	-1.0
Total	100		

Source: Primary data

Table 3: Children Education

	Observed N	Expected N	Residual
Preschool	40	50.0	3.0
Primary	25	50.0	.0
Secondary	20	50.0	-1.0
Higher Education	15	50.0	-2.0
Total	100		

Source: Primary data

The monthly income of the family and children's education level has shown in the tables that, there is a significant relationship between the two variables at 5 percentage level of significance. It depicts that, all the children are getting free education at the preschool & primary level. The major reason was free education with mid-day meal scheme and issuing of free books. The higher income people are educating their children for higher education. Hence, hypothesis has been proved.

Health benefits of non literate women and their Children

Table 4: Three time meals per day

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	70.0	70.0	70.0
	No	18	30.0	30.0	100.0
	Total	60	100.0	100.0	

The above table explains that 70 percentages of the respondents are getting three time meals per day whereas the 30 percentage of the respondents not getting three times meals per day because of their poverty.

Table 5: Maternal mortality

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	25.0	25.0	25.0
	No	45	75.0	75.0	100.0
	Total	60	100.0	100.0	

The above table explains that 25percentages of the respondents have suffered from maternal mortality whereas the 75 percentage of the respondents not suffered from maternal mortality because they avail nearby hospital facilities for regular check-ups.

Table 6: Children with access to immunization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	54	90.0	90.0	90.0
	no	06	10.0	10.0	100.0
	Total	60	100.0	100.0	

The above table explains that 90 percentages of the respondents are aware of the immunization because the awareness created by the government hospital.

Findings

- The majority of the non literate people were affected by poverty, child labour, discrimination of sex and unawareness about the education.
- With the help of the Chi-square test analysis it was revealed that there is a significant relationship between the income of the family and children's level of education.
- The majority of the non-literate respondent's awareness about the health facilities.

Suggestions

- Educating a woman makes a healthy family and nation. It is the basic key to open the locker of removal of poverty and all obstacles.
- The educational awareness has to be inculcated through various awareness government schemes.
- As immunization to the children given importance the mother's antenatal nutrition has to be given important to improve the mother's health.

Conclusion

Education is evolving at a rapid pace in India. Although the government schemes have been making an effort to bring about the awareness of education among the people it's not reaching due to the loop holes in execution part. Thus, to promote upgraded India there is a need to improve the standard of our nation by educating all without any discrimination. It is fact that large numbers of non literate women are contributing to

informal income to boost the economy. They have poor accessed of modern banking and financial, in many cases, policies discouraged them for providing credit facilities. However the government has to revise policies and working mechanism to persuade for development process.

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GOODS AND SERVICES TAX (GST) - THE ADVANTAGES AND CHALLENGES

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Abstract

With a two-thirds majority, the Rajya Sabha passed the Bill to amend the Constitution paving the way for the roll-out of the Goods and Services Tax (GST) on 3thg August, 2016. Later Lok Sabha was also passed the bill on 8th August, 2016 by two-third majority with all the 443 members present in the Lok Sabha voting in favour of the GST Constitution Bill. The Union Government is trying to implement goods and services tax from April 1, 2017. The Constitutional amendment will enable both the Centre and the States to simultaneously levy the GST, which will subsume all indirect taxes currently levied, including excise duties and service tax. It will be levied on consumption rather than production. The GST will have two components keeping in mind the federal structure of the country: the Central GST (CGST) and the State GST (SGST). The shift to the GST regime, one of the most significant tax reforms in recent history, will lead to a uniform, seamless market across the country; it will be a uniform rate, will check evasion, and boost growth rates. It is believed that the GDP growth rate will soon be in double digit with the unified tax system. A study done by NCAER that explores the impact on growth due to reduction in direct cost and cost reduction on capital inputs pegged the improvement in growth rates between 2 and 2.5 per cent. Some others have estimated that Indian economic growth will be 1.5 to 2 per cent faster under the new tax regime. This paper is an attempt to assess the significance of GST and the possible advantages and disadvantages of it.

Keywords: *Goods and Services Tax (GST), Direct Taxes, Indirect Taxes, Value Added Tax (VAT) and foreign direct investment (FDI).*

Introduction

While there has been considerable discussion around GST for the past few years, its introduction has been pushed back several times, making some quarters doubt the need for GST in India. The fact remains that many of the advanced economies across the globe including EU countries, Canada, Australia and Singapore have implemented GST many years back and have benefited from it. In this light, It is essential to understand the need for GST in India and the various benefits that it will bring in for all the stakeholders. The Goods and Service Tax or GST is a tax system where there is a single tax levied in the economy for goods and services. This taxation system is to create a single taxation system in the entire country for all goods and services. Introduction of GST is much more essential in the growing environment of the Indian Economy.

India has a well-developed tax structure. Taxes are the government's way of earning an income which can then be used for various projects that the government needs to indulge in to help boost the country's economy or its people. Taxes in India are decided on by the central and state governments with local governments, such as municipalities, also deciding on smaller taxes that can be levied within their jurisdiction.

The Department of Revenue of the Finance Ministry of the Government of India is responsible for the computation; levy as well as collection of most the taxes in the country. However, some of the taxes are even levied solely by the Local State Bodies or the respective governments of the different states in the nation.

The Republic of India has got a tax structure, which is quite simplified as well as developed. The taxation system in India is featured with a 3 tier federal structure that comprises of the following:

- The Union Government
- The State Governments
- The Rural and Urban Local Bodies or Municipal Jurisdictions

According to the provisions of the Constitution of India, these three tiers are empowered with the imposition of the different duties and taxes, which are prevalent in the country. The Central Government is mainly responsible for levying Income Tax. However, they do not impose taxes on the income that is earned from agriculture. The agricultural income tax can be imposed by the government of a respective state. –

Taxes are of two distinct types, direct and indirect taxes. These taxes are levied directly on an entity or an individual and cannot be transferred onto anyone else. Some of these acts are: (a) Personal Income Tax (Tax on income of a person, except tax on agricultural income, which the State Governments can levy), (b) Banking Cash Transaction Tax, (c) Capital Gains Tax, (d) Corporate Income Tax, (e)Fringe Benefit Tax and (f) Securities Transaction Tax.

Indirect taxes are those taxes that are levied on goods or services. They differ from direct taxes because they are not levied on a person who pays them directly to the government; they are instead levied on products and are collected by an intermediary, the person selling the product. The most common examples of indirect tax can be **VAT (Value Added Tax), Taxes on Imported Goods, Sales Tax, etc.**

Features of GST

The GST bill leads to the economic integration of India. The main function of the GST is to transform India into a uniform market by breaking the current fiscal barrier between states. Thus the GST will facilitate a uniform tax levied on goods and services across the country.

Framework of the GST:

The GST will have a 'dual' structure, which means it will have two components:-

(A) The Central GST and

(B) The State GST.

They will both have separate powers to legislate and administer their respective taxes.

Amalgamation of taxes:

Taxes such as excise duty, service, central sales tax, VAT (value added tax), entry tax or octroi will all be subsumed by the GST under a single umbrella. With passing of the GST bill, we can expect a climate of improved tax compliance.

The GST will basically have only three kinds of taxes, Central, State and another called the integrated GST to tackle inter-state transactions.

The first mention of the bill was in 2009 when the previous UPA government opened a discussion on it. They were successful in introducing the bill but failed to get it passed. On December 17, 2014, the present government made slight changes to it and redefined it in the Lok Sabha (indiatoday.in).

Significance of Good and Services Tax (GST).

It has been long pending issue to streamline all the different types of indirect taxes and implement a "single taxation" system. This system is called as GST (GST is the abbreviated form of Goods & Services Tax). The main expectation from this system is to abolish all indirect taxes and only GST would be levied. As the name suggests, the GST will be levied both on Goods and Services.

The Constitutional Amendment (122nd) Bill, 2014 for amendment of the Constitution of India to introduce GST was introduced in the Lok Sabha on December 19, 2014. As the current Government had ample majority in the Lok Sabha, the bill was passed by the lower house on May 6, 2015. However, due to lack of majority in the Rajya Sabha, the GST has hit a roadblock at the Upper House of the Parliament. GST still has a long way to

go before it is finally enacted. After the Bill is passed in both the Houses of Parliament by two thirds majority, the Bill will be sent to the State Legislatures for ratification. The ratification by at least 50 per cent of the State Legislature will be required before the proposed Constitution amendments are brought into effect. Thereafter, the Parliament would be required to legislate laws pertaining to CGST and IGST. The State Legislatures would legislate laws relating to SGST (business-standard.com).

Goods and services tax is India's most ambitious indirect tax reform plan, which aims to stitch together a common market by dismantling fiscal barriers between states. It is a single national uniform tax levied across India on all goods and services. The indirect tax system is currently mired in multi-layered taxes levied by the Centre and state governments at different stages of the supply chain such as excise duty, octroi, central sales tax (CST) and value-added tax (VAT), among others. In GST, all these will be subsumed under a single regime. GST, if adopted, can dramatically alter tax administration. Then, the Centre and states will tax goods and services in identical rates. For instance, if 20% is the agreed rate on a certain good, the Centre and states will collect 10% each on the good. The proceeds would be shared on the basis of the devolution formula recommended by the Finance Commission (hindustantimes.com).

India's Finance Minister has stated that GST is a destination-based, indirect tax that will be levied on manufacture, sale and consumption of goods and services. Will subsume all central and state indirect taxes and levies, including excise duty, additional excise duties, service tax, additional customs duty (countervailing duty, special additional duty of customs), surcharges and cesses, value added tax, sales tax, entertainment tax (other than the tax levied by local bodies), central sales tax (levied by the centre and collected by states), octroi, entry tax, purchase tax, luxury tax, and taxes on lottery, betting and gambling.

Currently, tax rates differ from state to state.

GST will bring uniformity and reduce the cascading effect of these taxes by giving input tax credit. Will have a comprehensive tax base with minimum exemptions — will help industry, which will be able to reap benefits of common procedures and claim credit for taxes paid. This is expected to reduce the cost for consumers.

The GST is basically an indirect tax that brings most of the taxes imposed on most

goods and services, on manufacture, sale and consumption of goods and services, under a single domain at the national level. In the present system, taxes are levied separately on goods and services. The GST is a consolidated tax based on a uniform rate of tax fixed for both goods and services and it is payable at the final point of consumption. At each stage of sale or purchase in the supply chain, this tax is collected on value-added goods and services, through a tax credit mechanism.

A dual GST system is planned to be implemented in India as proposed by the Empowered Committee under which the GST will be divided into two parts:

I. State Goods and Services Tax (SGST)

II. Central Goods and Services Tax (CGST)

Both SGST and CGST will be levied on the taxable value of a transaction. All goods and services, leaving aside a few, will be brought into the GST and there will be no difference between goods and services. The GST system will combine Central excise duty, additional excise duty, services tax, State VAT entertainment tax etc. under one banner.

The GST rate is expected to be around 14-16 per cent. After the combined GST rate is fixed, the States and the Centre will decide on the SGST and CGST rates. At present, 10 per cent is levied on services and the indirect taxes on most goods are around 20 per cent. GST will be levied on the place of consumption of Goods and services. It can be levied on :a. Intra-state supply and consumption of goods & services, b. Inter-state movement of goods and c. Import of Goods & Services.

The Current Taxation System in India

The current system is referred to as "taxes on taxes". It is simple to illustrate – say A sells goods to B after charging sales tax, and then B re-sells those goods to C after charging sales tax. While B was computing his sales tax liability, he also included the sales tax paid on previous purchase, which is how it becomes a tax on tax.

a. Price=100+tax@10%=110

b. Purchase Price=110+Tax@10%=121

c. Purchase Price=121+Tax@10%=133

The Proposed GST system:

The illustration shown below indicates, in terms of a hypothetical example with a manufacturer, one wholesaler and one retailer, how GST will work. Let us suppose that GST rate is 10%, with the manufacturer making value addition of Rs.30 on his purchases worth Rs.100 of input of goods and

services used in the manufacturing process. The manufacturer will then pay net GST of Rs. 3 after setting-off Rs. 10 as GST paid on his inputs (i.e. Input Tax Credit) from gross GST of Rs. 13. The manufacturer sells the goods to the wholesaler. When the wholesaler sells the same goods after making value addition of (say), Rs. 20, he pays net GST of only Rs. 2, after setting-off of Input Tax Credit of Rs. 13 from the gross GST of Rs. 15 to the manufacturer. Similarly, when a retailer sells the same goods after a value addition of (say) Rs. 10, he pays net GST of only Re.1, after setting-off Rs.15 from his gross GST of Rs. 16 paid to wholesaler. Thus, the manufacturer, wholesaler and retailer have to pay only Rs. 6 (= Rs. 3+Rs. 2+Re. 1) as GST on the value addition along the entire value chain from the producer to the retailer, after setting-off GST paid at the earlier stages. The overall burden of GST on the goods is thus much less. This is shown in the table below. The same illustration will hold in the case of final service provider as well.

Stage of supply chain	Purchase value of Input	Value addition	Value at which supply of goods and services made to next stage	Rate of GST	GST on output	Input Tax credit	Net GST= GST on output ++ Input tax credit
Manufacturer	100	30	130	10%	13	10	13-10 = 3
Wholesaler	130	20	150	10%	15	13	15-13 = 2
Retailer	150	10	160	10%	16	15	16-15 = 1

(Source: www.taxindiaonline.com)

Features of GST

One tax: The common base for charging GST for Centre and the state will consist of an amalgamation (subsuming) of several Central Taxes and state taxes which will enable them to give one tax rather than giving about 16 taxes.

1. **Common market:** There will be a common market in the absence of CST and entry tax. At present, goods are being sold mostly within the state in order to avoid paying the CST which is not credited at the stage of manufacture or in course of trading. Good quality products being manufactured in one part of the country will find more market in the farthest part of the country because there will be no CST and no entry tax
2. **Distinction between goods and services will go:** In some cases, there is a distinction between goods and services when they are sold as a package. These controversies will go.
3. **Invoicing will be simpler:** At present, the invoices are more detailed since taxes on goods and services are written separately for one transaction. With the

introduction of GST only one rate will be written.

4. **No entry tax:** The Economist November 8, 2014 has reported (page 67) that India's long distance truckers are parked 60 per cent of the time. This also leads to delaying of delivery of goods at destinations. The abolition of entry tax will be a great boon for the movement of goods by road transport.

5. **Common exemptions between Centre and states:** Now the exemptions given by the Centre and the states being different, the final price becomes different in different states. In the GST regime, exemptions will be common between the Centre and the states which will make the rates of duty same all over India.

6. **Big central excise tariff will go:** I will be the happiest to see when this big and fat central excise tariff goes away. It has got eight digit classifications like 44079990, 76069110. They attract different rates many times. All these will be replaced by one rate. What a relief!

7. **Concept of manufacture will go:** Manufacture is a highly complicated concept. It is defined mostly by judgements of Supreme Court and high courts. It is a den of controversy. The concept of manufacture will be replaced by the concept of value added which is numerically measureable and is not controversial.

8. **Classification controversies will go:** Now, classification controversies are galore since there are so many rates of duty. This problem will also go if the exemptions are limited.

9. **Problem of identification will go:** At present, identifying a commodity like whether it is rubber or resin, paper or board, ash, or dross dominate the proceedings since rates of duty are different. These controversies will be over.

10. **Undue enrichment law will go:** At present, there is a law in central excise and service tax which provide for refusing refund of higher duty paid in case the burden of higher rate of tax imposed already has not been passed on to the consumer. This is a highly litigated law which will necessarily have to go because GST will be a combination of so many taxes apart from these two taxes. And these taxes do not have the same provision.

Moreover, if the unjust enrichment of law is made to apply to GST as a whole, the purpose of seamless movement of goods and services will be defeated.

11. **Zero rating will be more comprehensive and easier:** Even without GST, zero rating (giving relief for the input duty) is possible, but it does not give relief for some of the duties. With GST, zero rating will be more comprehensive.

The taxes to be replaced:

As the name suggests, the GST will be levied both on goods (manufacturing) and services. It will convert the country into unified market, replacing most indirect taxes with one tax. It would have a dual structure - a Central component levied and collected by the Centre and a state component administered by states.

At the Central level, it will subsume Central excise duty, service tax and additional customs duties while at the state level it will include value-added tax, entertainment tax, luxury tax, lottery taxes and electricity duty. Central sales tax (CST) will be completely phased out. Entry tax or octroi would be subsumed from the start. But state taxes on petroleum products will continue for a few years after GST is introduced, as per the deal brokered between the Centre and states on Monday. State taxes on alcohol and tobacco, too, would remain.

As with VAT, the tax will be charged on each stage of value addition. At each stage, a supplier can off-set the levy through a tax credit mechanism. This means, the consumer pays GST added on by only the last dealer in the supply chain.

The rate for GST is as yet undecided, but it would be in a range that would make exports competitive. A sub-committee of the Empowered Committee of state finance ministers had proposed revenue-neutral rates (RNR) for the Central and state components at 12.77 per cent and 13.91 per cent, respectively, taking the effective GST rate to 26.88 per cent. This is much stiffer than the 14-16 per cent in most countries as well as the recommendation of a taskforce of the Thirteenth Finance Commission of 12 per cent (7 per cent for state GST and 5 per cent for central GST).

Advantages of introducing a GST in India:

The rationale behind GST is that it simplifies the indirect tax regime with a single tax. A study by the National Council of Applied Economic Research estimated that roll out of the tax would boost the GDP

growth by anywhere between 0.9-1.7 per cent. A Crisil report had also said GST was the best way to mobilise revenue and reduce the fiscal deficit. Removal of cascading taxes makes the manufacturing sector more competitive and cut down on the tax compliance burden. With cascading taxes gone, over a period of time the lower tax burden would translate into lower prices for goods, which is of course, dependent on what the GST rate would be. Apart from full allowance of credit, there are several other advantages of introducing a GST in India:

a. Reduction in prices: Due to full and seamless credit, manufacturers or traders do not have to include taxes as a part of their cost of production, which is a very big reason to say that we can see a reduction in prices. However, if the government seeks to introduce GST with a higher rate, this might be lost.

b. Increase in Government Revenues: This might seem to be a little vague. However, even at the time of introduction of VAT, the public revenues actually went up instead of falling because many people resorted to paying taxes rather than evading the same. However, the government may wish to introduce GST at a Revenue Neutral Rate, in which case the revenues might not see a significant increase in the short run.

c. Less compliance and procedural cost: Instead of maintaining big records, returns and reporting under various different statutes, all assessees will find comfortable under GST as the compliance cost will be reduced. It should be noted that the assessees are, nevertheless, required to keep record of CGST, SGST and IGST separately.

d. Move towards a Unified GST**:** Internationally, the GST is always preferred in a unified form (that is, one single GST for the whole nation, instead of the dual GST format). Although India is adopting Dual GST looking into the federal structure, it is still a good move towards a Unified GST which is regarded as the best method of Indirect Taxes.

The Goods and Services Tax or GST is a form of Value Added Tax which is predisposed to include all the indirect taxes and would be the same for every region of the country unlike the VAT. Simply put, the GST will allow the state government to get a share that was earlier entitled only to the centre in the form of Central Sales Tax. The Goods and Services Tax, if and when approved will

benefit the textile industry in more than one ways, and hence it is only just to study the importance of GST in this context.

The first and foremost aspect that will make the GST act as a boon to the industry will be the fact that the tax burden would shift from the manufacturers to the consumers since it is a consumption tax. Needless to say, it will give manufacturers the freedom to enhance their business models, which will in turn lead to a better GDP.

The implementation of GST would mean that all input taxes will be rebated, pertaining to the zero-rating which will be not just be confined to textiles, but will extend to capital goods as well as textile related machinery. Moreover, this would also enhance the transparency in the taxation system, which will be a welcome change. Again, the zero-rating will be applicable to all exports, which in-turn will boost the exports without any need of introduction of subsidized schemes to the industry.

One of the most beneficial aspects of the GST lies in its uniformity, which implicates that the same rate of taxes will be applicable throughout the various segments of textiles. It will thus ensure that the present classification of fabrics vis-à-vis garments will be eliminated. This will in turn facilitate the use of new mixes and blends thus leading to better quality and increased variety of products! Since, there would be no tax implications, even new experimentations in this regard will become viable. Moreover with implementation of GST goods movement within the states will also be much easier as lot of local state taxes which are levied on the borders of states which inhibit free movement of goods will be removed. This will help in improving the productivity & efficiency of the textile industry as now more factories/ manufacturing units can be set up in various textile hubs across India without worrying for various state taxes which were earlier levied indirectly. The current rate of taxes in all developed countries varies from 10 % as in Australia to 20 % as in UK. The Indian textile industry is looking forward to a tax rate of 12 % which is neither too ambitious nor unassuming. In fact it is supposed to prove rather effective since it is in tandem with the current rate of taxes across the world.

With all of the above mentioned benefits, it is more than just to come to the judgement that GST will bring about an elevated level of efficiency in production, thereby resulting in a decrease in the retail prices of all related items. Needless to say, the implementation of GST will play a far

bigger role in bringing consistency and organisation to the textile industry than any other measure has ever brought along.

Major Beneficiaries of GST:

It is clear that GST would be beneficial for all the stakeholders and would provide a much needed boost to the reform agenda of the Government. However, it would be preferable to keep it simple and uniform without many statewise variations. It is also preferable that anti-profiteering measures are built into the legislation in order to ensure that the benefits of tax reduction are passed on to the ultimate consumers. Let us discuss some of the major beneficiaries of GST if implemented immediately.

The report of Care Ratings has stated that Logistics industry is projected to grow at a compounded annual growth rate of 15-20 per cent between 2015-16 and 2019-20 that will get a further boost if GST is rolled out from this year, which can trim costs by 20 per cent. GST rollout could help boost the GDP by 100-200 bps as this will help faster and cheaper movement of goods across the country with a uniform taxation structure

GST and FDI

The World Investment Report 2016 by the United Nations Conference for Trade and Development (UNCTAD) has reported that India continues to be among the top ten countries in terms of foreign direct investment (FDI) inflows globally and the fourth in developing Asia, India's FDI inflows have increased to $44 billion in 2015 as compared to $35 billion in 2014, and the growth has been across the board.. A surge in investments in the first four months of 2016 is mainly on account of the Make in India initiative, along side liberalization measures and reforms, which make India an attractive investment decision, The huge potential offered by India, the fastest growing major economy, is also one of the main reasons. In terms of outflows, there has been a decline in most developing and transition regions. However, China is one of the exceptions.

Ranil Manohara Salgado, Chief of Regional Studies Division, Asia and Pacific Department of IMF "Nonetheless, implementation of GST is a priority, as it would create a single national market, enhance the efficiency of intra-Indian movement of goods and services, and boost GDP growth further," a more conducive business environment is necessary to attract greater FDI into the manufacturing sector and help the success of make in India initiative"

1) The tax structure will be made lean and simple.
2) The entire Indian market will be a unified market which may translate into lower business costs. It can facilitate seamless movement of goods across states and reduce the transaction costs of businesses.
3) It is good for export oriented businesses, because, it is not applied for goods and services which are exported out of India.
4) In the long run, the lower tax burden could translate into lower prices on goods for consumers.
5) The Suppliers, manufacturers, wholesalers and retailers are able to recover GST incurred on input costs as tax credits. This reduces the cost of doing business, thus enabling fairer prices for consumers.
6) It can bring more transparency and better compliance.
7) Number of departments (tax departments) will reduce which in turn may lead to less corruption.
8) More business entities will come under the tax system thus widening the tax base. This may lead to better and more tax revenue collections.
9) Companies which are under unorganized sector will come under tax regime.

The proposed Goods and Service Tax (GST) is a destination based indirect tax that will be levied on supply of goods and services, which is set to subsume the various indirect taxes currently levied by the Centre and the states including excise duty, service tax, value added tax (VAT), Central Sales Tax (CST), purchase tax, octroi, entry tax etc. These taxes are levied at various stages such as manufacture, sale, entry of goods, rendition of services etc.

The proposed GST structure is two-tiered, whereby tax would be levied by both Centre and state on intra-state supply of goods or services viz. the Central Goods and Service Tax (CGST) and State Goods and Service Tax (SGST) respectively. Credit of the above taxes would available throughout the entire supply chain and the ultimate burden would be borne by the customer. In case of inter-state transactions, Inter-State Goods and Service Tax (IGST) would be levied by the Centre. Also, the Constitutional Amendment Bill provides for creation of a GST Council comprising all the stakeholders across the Centre and the state. The GST

Council would recommend the rate of tax with bands (business-standard.com).

The implementation of GST would result in abolition of multiple taxes and would bring the much needed uniformity and certainty in tax rates. GST would also ensure that tax at each stage is creditable thereby avoiding double taxation. Also the manufacturers need to deal with only three laws that are Central law for CGST and IGST and State law for SGST.

The current indirect tax regime is clearly one of the biggest hindrances which have adversely impacted the domestic manufacturing sector as well as flow of foreign investment to the sector and introduction of GST is important to alleviate the situation. GST would reduce the cost of manufacturing both from a tax perspective as well as on compliance front (business-standard.com).

Introduction of a GST is very much essential in the emerging environment of the Indian economy.There is no doubt that in production and distribution of goods, services are increasingly used or consumed and vice versa. Separate taxes for goods and services, which is the present taxation system, requires division of transaction values into value of goods and services for taxation, leading to greater complications, administration, including compliances costs. In the GST system, when all the taxes are integrated, it would make possible the taxation burden to be split equitably between manufacturing and services.

GST will be levied only at the final destination of consumption based on VAT principle and not at various points (from manufacturing to retail outlets). This will help in removing economic distortions and bring about development of a common national market.

It will also help to build a transparent and corruption-free tax administration. Presently, a tax is levied on when a finished product moves out from a factory, which is paid by the manufacturer, and it is again levied at the retail outlet when sold.

According to experts, by implementing the GST, India will gain $15 billion a year. This is because; it will promote more exports, create more employment opportunities and boost growth. It will divide the burden of tax between manufacturing and services.

In the GST system, taxes for both Centre and State will be collected at the point of sale. Both will be charged on the manufacturing cost. Individuals will be benefited by this as prices are likely to come down. According to a study by the National Council of Applied Economic Research (NCAER), full implementation of the GST could expand India's growth of gross domestic product by 0.9-1.7 percentage points

GST and GDP

How an Exporter and Importer can take more advantages from This GST system that we will teach you in our practical Export and Import Classes.

People who are planning to export but don't know how to export and how to import the products from different international markets, can join our course of export and import management with Practical knowledge and all its practical documentation. We will teach you the procedures of export and import also we will guide you how you can obtain the Export and Import licenses in a less period of time without paying extra and heavy Charges.

a. GST is a transparent Tax and also reduce numbers of indirect taxes. With GST implemented a business premises can show the tax applied in the sales invoice. Customer will know exactly how much tax they are paying on the product they bought or services they consumed.
b. GST will not be a cost to registered retailers therefore there will be no hidden taxes and the cost of doing business will be lower. This in turn will help Export being more competitive.
c. GST can also help to diversification of income sources for Government other than income tax and petroleum tax.
d. Under Goods and Services Tax, the tax burden will be divided equally between Manufacturing and services. This can be done through lower tax rate by increase Tax base and reducing exemptions.
e. In GST System both Central GST and State GST will be charged on manufacturing cost and will be collected on point of sale. This will benefit people as prices will come down which in turn will help companies as consumption will increase.
f. Biggest benefit will be that multiple taxes like octroi, central sales tax, state sales tax, entry tax, license fees, turnover tax etc will no longer be present and all that will be brought under the GST. Doing business now will be easier and more comfortable as various hidden taxation will not be present. According to Dutt Majumder, former Central Board of Excise and Customs chairman, GST is a system which is largely going to benefit business entities. For manufacturers and service-providers, GST means a pan-India market. Overall, the compliance cost of business will go down. Hence, prices will also go down". But this chain process will take 4-5 years to reach out to consumers.

The soul of GST is its unique credit share. There would be a credit chain that wouldn't be broken. Anyone who pays tax on the inputs of either goods or services will

have it set off against tax liability on the finished goods and final service. This is called input tax credit or ITC. Service tax, which constitutes 60% of the economy, may jump from 14-18% till GST is implemented.

Conclusion

GST is expected to be a critical reform in spurring growth in the economy. When introduced, GST will not only make the tax system simpler, but will also help in increased compliance, boost tax revenues, reduce the tax outflow in the hands of the consumers and make exports competitive. The GST or the Goods and Service Tax is a long pending indirect tax reform which India has been waiting for, and which is hoped to iron out the wrinkles in the existing tax system. This comprehensive tax policy is expected to be one of the most important reforms in contributing to the India growth story. The GST, as mentioned above is an indirect tax and will be borne by the customer. There will be a standard rate of GST across various goods and services, which could broadly be in line with international rates.

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REFORMING THE TERTIARY EDUCATION: A MULTIMEDIA APPROACH

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Abstract

There is a growing dissatisfaction about the general standards of college education in Kerala. The fresh graduates are perceived to be wanting in higher order thinking and communication skills. Their knowledge of the content subjects does not come to the operational level. To make matters worse the demands of the world of work is going sky high. One of the primary causes of this limitation lies with the method of teaching followed in colleges. Currently, a lot of teaching time is used to teach basic concepts in college classrooms while activities that really need assistance are done at home as assignments. This pedagogical issue can be solved with remarkable degree of success by skillful application of ICT. One instructional application of ICT is the selective use of multimedia in classrooms.

Application of ICT at the college level sill remains hesitant at the entry level. Power point presentations and videos are used sparingly but they are not revolutionary enough to make desirable changes. The PPT is a more efficient replacement for conventional blackboard and videos eat up a considerable part of the teaching time. Application of these technology based tools does not alter the conventional process of teaching and learning in college classrooms. They can make the lessons more interesting but not effective or efficient.

The paper investigates the innovative and effective ways in which the multimedia tools can be used so that If the learners can come to the classroom prepared for debates and discussions. In such a situation the teacher can devote his/her valuable teaching time to develop higher order thinking and debating skills of the learners.

Keywords: *Communication skill, pedagogical issue, application of ICT, debating skills*

Introduction

The department of collegiate education, Kerala launched a massive upskilling programme for the college students in 2012. The programme was entitled "Additional Skill Acquisition Programme" which intended to select gifted final year degree students who have the aptitude, skills and commitment to become soft skill trainers. SNM College Maliankara had a roll strength of 325 final year students in 2012. Out of these 325 students only fifty (50) were confident enough to participate in the selection programme. Eventually, only twelve out of the initial fifty came out successful. This result was an eye opener to the teaching faculty of the college. The employability of the graduating students of the college even after the sincere didactic efforts of the teachers was below four percentage (4%).

Though there has not been any statistical evidence to establish the very low

level of the employability standards of the college students especially of the ones in rurally placed colleges in Kerala, it is a generally agreed fact beyond any dispute that the quality of output is disturbingly poor. In the national perspective the situation appears to be slightly better but still far from satisfactory. NASCOM, an organization for promoting IT and IT-enabled industries in India conducted a survey with the aid of an internationally famed consultancy firm based in America McKinsy. The findings published way back in 1985 displayed the miserable condition of Indian graduates in terms of quality.

India also confronts a potential shortage of skilled workers in the next decade or so, particularly in the BPO industry. Currently only 25% of technical graduates and 10 – 15 % of general college graduates are suitable for employment in the offshore IT and BPO industries respectively. (16).

The decline of quality in education in general and higher education in particular is not a regional phenomenon. It has got national and even global dimensions. Even in America, which enjoys a worldwide reputation as the center of quality education, about 45% of the students in the sector of tertiary education are reported to be 'academically adrift' (Arun and Roksa, 2001). Ever since the educational designs all over the world set equity and access as the guiding principles the quality has started to decline. The greatest challenge of the modern democratic systems of education is to make the three ends meet and it is too tough an acrobatic exercise to perform. When the access increases its quality goes down. When deliberate attempts are made to increase the quality, it becomes impossible without increasing the cost. The ideal situation is where the access rate and the quality of education go up together while there is no inflation of the educational expenses. The Indian system of education is far off from this ideal condition.

New challenges

In this era of globalization the system of education in any nation should be efficient enough to meet two emergencies. One is the demand for a wide exposure to information and the second is the basic necessity of excellent skills of thinking and communication.

Around 2000 the world brisk- walked into a whole new era. The unique feature of this third phase of globalization is the growing power and freedom of individuals. Sitting with a lap top computer or a smart phone, the access potential of the modern man is enormous irrespective of where he lives. Living in USA is not an advantage and living in a remote village in India is not a

disadvantage either. The world has become flat (Friedman 2006). This was not the condition of the learners in Kerala a decade ago. Not long ago they heard English only in the classroom and teacher's English was the only spoken variety they could listen to. It is perfectly reasonable to presume that this limitation of exposure to good English could be one of the major reasons for their low exposure to information. In the latest phase of globalization that began in twenty first century, however, Indian learners have the best opportunity for excellent exposure they ever had. The number of English TV channels available in India has shoot up to eighty. The Wikipedia enumerates the number of English dailies in India as thirty nine. Six major dailies among them are widely subscribed in Kerala too. Moreover, the You Tube is full of informative and entertaining videos. The OER (Open Educational Resources) is another fast expanding educational support system, which offers a large number of lectures and teaching videos from the leading universities around the world. The catching motto of OER is to give education for every one everywhere for free'. Khan Academy, the most popular teaching web site in the world, is a store of thousands of short teaching videos on an immensely wide range of subjects from History to Calculus. Time is not far away when the whole world start working like a single industry in shifts. The job opportunities will be offered globally and sought globally. The outsourcing facility has opened up a world of vocational opportunities for the youth of Asia. But it also brought in sheer competition at global level. The graduates in India have to compete with their counterparts in Europe and USA. Globalization has flattened the world with equal opportunities to learn and develop. However, these opportunities are not utilized fully, the gap between the students of the developing and developed nations in terms of employability will widen further. To avoid such a disturbing situation in the era of global promises the learners are to be encouraged to learn from all the resources offered by the ICT. Unfortunately, only a few undergraduate learners of Kerala make use of these resources. The primary limitation of the learners in the state is their self imposed lack of exposure to English while English is excessively present in the social environment. Only five percentage of the undergraduate students of SNM College Maliankara, which is a rural educational institution, browse internet regularly for

reference. The situation in institutions based in similar rural settings cannot be very much different. If highly invasive methodological interference is not attempted our graduates may wander about ignorant in a knowledge based world.

Communication challenges of the current century are not just confined to inter personal communication needs alone. They are rather related to the discourses based on higher order thinking skills. The contexts and the content of communication are being redefined according to the new cognitive demands of the time. The modern world is described as the 'knowledge based world'. Knowledge has always been very important ever since the true history of human civilization began. But now a lot more people are involved in knowledge creation and innovation and creativity has become the watch word of every vocation. The rapid and luxurious development of knowledge is logically explained by Johnson (2014). He argues that knowledge creation is no longer the exclusive cognitive business of a single individual. Great ideas do not come from a sudden stroke of inspiration. On the contrary, they take a long time to evolve and a lot of intellectual communication and sharing of ideas are involved in it. The greatest discovery of our time the World Wide Web, for example, was first conceived by Arther C Clark. Later in 1980 a British engineer Tim Berner-lee gave it a feasible description. It took a few more years till Berner-Lee worked collaboratively with Robert Cailliau, a Swedish computer scientist, that the network of computers with a search engine to look for specific information came into a practical reality. The best creative ideas, thus, evolve through sharing and collaboration. A lot of people may be thinking about the same idea. But their ideas may not be complete. They remain as incomplete hunches. One person may have an incomplete hunch and needs a particular turn of thought to make the breakthrough. The missing link of his thought may be with someone else. When they communicate the hunches collide and unite to become original creative ideas which are much bigger than their parts. During the period of enlightenment in Europe creative people like writers, painters, thinkers, sculptors and business men came to coffee shops in the evening to talk. The exchange of ideas in these coffee shop conversations, argues Johnson (2014), generated great creative energy which made the literature, art and commerce of the time immensely rich and enormously varied. Internet and search engines with all the communication channels and social and

professional networks give unlimited opportunities for the likeminded people to communicate and exchange ideas. So, the excellent skills of thinking and communicating have become essential abilities for individual success and social development.

Limitations of the present teaching / learning process at college level

No system of education has ever been truly satisfactory to its stake holders. The Indian education is not truly Indian in its cultural core. It was given to the people of India by the British about one hundred and fifty years back and has been maintained without any fundamental change to its skeletal structure till the present. When the adventurers like Columbus and Vasco Da Gama set sail for exploring the eastern part of the globe, industrialization was in its cradle in Europe. Industrialization reshaped the western society from toe to tip and its education was no exception. As Robinson (2015) has put it, the system of public education that emerged in the west was conceived, designed and structured by the intellectual culture of the enlightenment and the economic circumstances of the industrialization. Schools were very much organized in factory lines. The students were educated in batches, different subjects were taught in subsequent periods. The curriculum was standardized and standardized testing procedures were followed. This system of education that spread during colonialism and got consolidated during different phases of globalization remained by and large unchanged all over the world. In India conservative forces have kept this industrial model of education almost intact in spite of the repeated far cry for reforms. However, the information communication revolution has now posed new challenges to the current system. Our students are now live in the most intensive and stimulating period in the human history. The fascinating learning tools around them like computers, mobile phones, tablets, I phones and a big bunch of TV channels captivate their attention. The richness of experience the learners are exposed to in the world outside is in stark contrast with the boring stuff of 'chalk and talk 'of college classes. In our classrooms the students are not permitted to share ideas. Sharing is generally perceived as copying and cheating. But in the real world outside the classroom most of the learning happens in groups letting everyone to work on the idea of others. Thirdly, the learning in undergraduate classes in general and the learning of arts in particular is at the best an aesthetic experience. The learners

have to remain fully alive and alert during the lesson. Their senses operate at their peak and the brains resonate with the experience they receive. The lecture method, the method of teaching followed in colleges in India ever since the first universities were found in Bombay, Madras and Calcutta in 1857, where the teacher demonstrates all the cognitive activities like explaining, analyzing and synthesizing, keeping the learners as passive listeners creates an anesthetic atmosphere. "The anesthetic is just the opposite experience of the aesthetic where one puts his senses off" (Robinson 2015).

The instruction at the college level is confined by other limitations too that are practical in nature. The student community in colleges is perceived as having very shallow knowledge of their content subjects and poor language skills. So a lot of teaching time is spent in imparting basic knowledge and skills needed in every discipline. The application of higher order thinking skills like analysis, synthesis and problem solving are done at home without the help of the teacher as assignments. This is the current paradox of college education in Kerala. The basic things that the learners can learn by themselves are taught in detail in the classrooms and the phase of learning that necessarily need the guidance of an expert if often done as homework.

New ICT based approach

Information Communication Technology has emerged as the great problem solver of the current century. Education is not the only system that has been unresponsive to its customer needs. Banking was another system that retained for a long time its conservative resistance towards change. Ever since the first commercial bank came to existence in Italy in fourteenth century, the banking sector worked from ten to five. This made it difficult for its customers, who would be working at the same time, to approach the banks for daily business. However, this system continued for centuries until the ICT intervened with IT solutions. In the same way ICT can change the world of education too.

The UGC and its assessment and accreditation wing NAAC have tried to make blended learning or integration of ICT into college education the new pedagogical practice of colleges. The guidance and invasive efforts of such agencies not withstanding, the classroom interaction in colleges remains more or less the same till now. The world is constantly inventing and reinventing the ways to improve education at all levels and there have been creative

suggestions to achieve it through the use of multimedia materials for learning. The current application of ICT in college classrooms is not revolutionary in the true sense of the term. This does not make the process any different. The power point presentations and interactive whiteboards replace conventional black boards but can do very little beyond that. The use of videos in the classrooms can make teaching interesting to the learners but it consumes a lot of teaching time. Likewise, the classroom climate will remain emphatically teacher centered. What is currently suggested is the flipping of the classroom activities (Khan 2014). Conventionally the basic things are taught in the classroom and the application is done as home work. In the new concept of reinventing education through videos the learners learn the necessary concepts at home through simple videos and come to the classroom for the exercise of higher order thinking skills like application and problem solving under the guidance of the teacher. Unlike a live lecture a video can be played again and again until the learners completely comprehend the content. That will also give the learners an immersion like exposure to good variety of English which can be an added advantage. The interaction or negotiation element may be lacking in such learning situations. But a carefully prepared audio-visual material anticipating the learner difficulties could overcome that limitation. Additionally, the negotiation or discussion element is more desirable at the application level of the lesson that will be carried out in the classroom in the presence of the teacher. The learning from videos can have other developmental advantages too. Their consistent use can, in course of time, encourage the learners to refer to other sources of information available in the web for learning. If this habit of independent learning continues for some time they will slowly develop the confidence and necessary skills to grow into autonomous learners, which is the ultimate aim of higher education.

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A STUDY ON THE PERFORMANCE OF IMPORT COMMODITIES THROUGH INTERNATIONAL CONTAINER TRANSSHIPMENT TERMINAL (ICTT) KOCHI

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Abstract

Container terminal is a facility where the cargo containers can transshipped. The transhipment may be between container ships and land vehicles like trains or trucks. International Container Transshipment Terminals are major plays in the shipping industry. ICTT commissioned in 2011 at Vallarpadam, Kochi with the announcement of huge prospects and facilities for the Indian Importers But, there are some problems for the good performance of import goods. The study is mainly tries to find out what the reason Mother Vessel can't berth at the Transshipment Terminal. The following are the important objectives of the study, to understand the procedural formalities of Import goods, to study the influence of Terminal Handling Charge in ICTT on the Import business and finally to know which commodity is importing through ICTT in large quantity , trend of pattern of coffee imports and to understand the different kinds of Import Customs duties.

Keywords: *ICTT, IGM, THC, TEUs, Import commodity, Customs Duty*

1. Introduction

International Container Transhipment Terminal (ICTT) locally known as Vallarpadam Terminal is a Container Transhipment. International Container Transhipment Terminal (ICTT) commissioned by Dr . Manmohan Singh, the Prime Minister of India on 11th February, 2011. International Transhipment Terminal is the only transhipment Port in India and first Container Terminal operates in a Special Economic Zone (SEZ). This terminal is situated in the state of Kerala. It was on 16th February, 2005 Dubai Port World (DPW) singed an agreement with the Cochin Port Trust construct, develop and operate an International Container Transhipment Terminal – An India Gateway Terminal at Vallarpadam, Cochin. International Container Transhipment Terminal is presently being operated by Dubai Port World (DPW) which will operate it for 30 years after which control of this operation will come back to the Cochin Port Trust. DP World is a global leader in Container terminal operation and large investments in ports along with the Indian coastlines. DP World has developed ICTT in a Build Operate and Transfer (BOT) agreement with Cochin Port Trust. The Ports are the major players in the transport industry.

2. Objectives of the Study.

1. To understand various procedural formalities in connection with Import of

goods through International Container Transshipment Terminal (ICTT)

2. To study the influence of Terminal Handling Charge (THC) on the Import business done through International Container Transshipment Terminal.
3. To make a detailed study of the trend of pattern of Coffee Imports from out side India through ICTT, to know the top performer of importers and main problems faced by the Importers.
4. To know about various kinds of Customs Import duties.

3. Arrival of Vessels statutory Provisions & Procedures.

The formalities that are required to be complied with by the masters of vessels (ships) when the vessels enter or leave the port. When a vessel is expected to arrive in a port, the steamer agents has to file an intimation in the Customs House giving notice of arrival of the vessel and furnishing general particulars of the vessel such as the name, nationality, tonnage purpose for which the vessel arrives (e.g loading or unloading or for any other purpose) number of crew on board, number of passengers etc., Prior to the arrival of the vessel, the master of the vessel or the seamer agent has to delivers in the Customs House an Import General Manifest (IGM) relating to the vessel in the prescribed format under the Import Manifest (Vessels) Regulations 1971, covering all the goods carried on board the vessel. If the Import Manifest or any part is not delivered to the to the proper officer within the time specified and if the proper officer is not satisfied that there was sufficient cause for such delay the persons in charge shall be liable to a penalty. The Import manifest shall cover all the goods carried on board a vessel. It consists an application for entry inward in form I, a general declaration in form II, a cargo declaration in form III, vessel's store list in from IV, and private property list of the Master, officers and crew in form V. list of crew on board the vessel, list of passengers if any on board, maritime declaration of health are also required to be submitted with the IGM. As soon as IGM is delivered to the proper officer, he grants the entry inwards after satisfying that the vessel is ready in all aspects to unload the cargo.

4. Customs Law & Procedure

Customs as a source of revenue has been known for many centuries. It known to have its origin in the ancient practice of customary payments made by international traders to kings or local chieftains of places they visited to sell their wares and in return enjoyed their protection. In India the system is known to have been in existence from ancient times as seen from Kautilya's Arthashastra, which has specific provisions for collection of duties and

even penal action for violation of related laws in force. Customs is one of the major source of revenue for the Central Government, he other being Central Excise, Income Tax and the comparatively new Service Tax. In India the Sea Customs Act was enacted in 1878, but the Central Excise Act was passed in 1944, though certain specific items like cotton yarn had been brought under excise levy earlier under specific Rules – Service Tax was introduced by the Finance Act 1994. Direct taxes are like Income Tax and Corporate Tax, Customs duties are collected form importers and exporters Central Excise duties collected from manufactures and service tax is collected from service providers. The authority for collection of Customs duties is under entry no. 83 of list 1 of the Seventh Schedule of the Constitution of India. The Customs Act 1962 (Which replaced the erstwhile Sea Customs Act of 1878) that came to effect from 1st February 1963 authorizes such collection at the rates specified under another legislation known as Customs Tariff Act 1975. Though essentially the Customs is revenue department, it has also to engage itself in prevention of smuggling and enforcement of various other laws of the Country such a Foreign Trade (Development and Regulation) Act 1992, Foreign Exchange Management Act (FEMA) 1991, Indian Explosives Act, etc., The Customs Act is comprehensive act covering all aspects relating to import and export. There are specific provisions for declaring ports and airports where only imports/exports can be effected for imposing restriction/prohibition for regulating and formulating the legal formalities for ship/aircrafts to come to leaving the country from/to abroad, warehousing of non-duty paid goods, baggage clearance, penal provision for violation of the legal requirements etc. The procedure for clearance of goods on import/export through specified documents known as bill of entry for import and shipping bill for export are also laid down in the Act.

It also attends to the work of collecting trade statistics, which is important in framing the economic policies of the Country. The laws relating to the collection of revenue and other function of the customs are regulated and implemented by the Central Board of Excise & Customs, under the Ministry of Finance, Government of India. through the Commissionerates of Customs set up at different ports. The Commissioner of Customs is the Officer in charge of the Commissionerates, who has vide powers under the Customs Act in matters relating to import/ export. He is assisted by other officers like Additional Commissioner, Joint Commissioner, Deputy Commissioner and Assistant Commissioner. The Customs has two main wings, One for collection of revenue called the Appraising department and the other for prevention of smuggling and control over the

movement of goods and conveyance in the Customs area called the Preventive department. There is customs establishment at the port is known as Customs House. The Customs house can go by the manufactures literature or analytical report. Goods are normally tested by the Customs House Laboratory or in any of the national laboratories in the country.

5. Significance of the Study

The existing Terminal Handling Charge (THC) is quite high at Cochin (ICTT) when we compared to other ports of India. (Table I - THC for Import containers and Table II for Export Containers) Even though THC is very high in ICTT, Terminal arranged High level Handling facilities in this area. Not only that ICTT has attained an average move of 30 gross crane rate per hour in 2015. Importers can use this terminal and transit-time and transit charge can save.

Table 1: Terminal Handling Charges (THC) (Rupees) at Major Ports – Import Containers

Import (Size/Type)	Cochin ICTT	Mangalore NMPT	Tuticorin PSTL	Vizag VCTPL	Chennai CCTL	Goa MPT
20'Dry	7451	5720	4400	4912	4500	8000
40'Dry HC	10555	6800	5700	7118	6500	11500
20' Reefer	14487	13300	4400	12400	10000	13500
40' Reefer	20197	15700	5700	18400	14500	15000
20' Hazardous Cargo	9313	5720	5500	6140	5625	8000
40' Hazardous Cargo	13194	6800	7125	8898	8125	11500

Source: Customer Advisory – DELMAS – (CMA CGM Group) Steamer Agent

Table 2: Terminal Handling Charges (THC) (Rupees) at Major Ports – Export Containers

Import (Size/Type)	Cochin ICTT	Mangalore NMPT	Tuticorin PSTL	Vizag VCTPL	Chennai CCTL	Goa MPT
20'Dry	7451	5720	4400	4912	4500	6500
40'Dry HC	10555	6800	5700	7118	6500	8700
20' Reefer	14487	13300	4400	12400	10000	13500
40' Reefer	20197	15700	5700	18400	14500	15000
20' Hazardous Cargo	9313	5720	5500	6140	5625	6500
40' Hazardous Cargo	13194	6800	7125	8898	8125	8700

Source: Customer Advisory – DELMAS – (CMA CGM Group) Steamer Agent

The significantly higher THC at ICTT is one of the major problems for the slow growth of ICTT. While other reasons include labour problems at ICTT and inconvenience caused due to a distance of about 15 K, between ICTT and Cochin Port CFS which is situated on Willingdon Island. Major Clearing and Forwarding (C & F) Agents, Steamer Agents, Office of the Customs etc., also situated on Willingdon Island, Kochi at a distance of about

15 Kilo meter from ICTT. So these offices are forced to vacate Willingdon Island so as to relocate themselves in the Vallarpadam area the place where ICTT is located.

6. Import through ICTT – An Analysis of the Trend in Performance till 2015

The total imports through ICTT, including product-wise break-up of such imports, during the period 2012-2015 is shown below in Table III.

Table 3: Product-wise Imports through ICTT (2012-2015)

Product	2012	2012	2013	2013	2014	2014	2015	2015
	TEUs	Kilograms	TEUs	Kilograms	TEUs	Kilograms	TEUs	Kilograms
Raw Cashews	15950	269051585	13600	230508218	12470	207548092	9792	162760001
News Print	8965	113142074	9714	121589780	10236	126278120	9282	116815184
Waste Paper	5750	66512000	5524	65067363	6641	78521233	4814	58022878
Heavy Melting Scrap	8112	200671246	4773	120137990	4815	120891179	4573	135276647
Vitrified Tiles	3354	87596716	2536	66330735	4102	109043707	6269	168480141
Furniture	1929	12015946	2068	12459319	1732	10680619	1510	9769101
SYN/Natural Rubber	1835	32066930	1565	29038260	2275	39415095	1245	25598455
PVC Panels	1457	13670347	1670	15373322	2085	20148121	2157	21372911
Carbon Black	1353	15103735	789	8317036	450	4648166	315	3197802
Pepper	1219	14112155	1046	12504386	1229	14555665	1204	14393812
HD Polyethylene	1105	14291051	1120	14934276	1370	18436803	2137	27941757
Chrysotile Fibre	1106	23128919	212	11245046	75	1718626	361	8389105
Coffee	**12**	**126110**	**6**	**109381**	**32**	**488378**	**NIL**	**0000000**
Miscellaneous	40664	1445868060	40507	1396173985	43095	1874174830	53847	1872804725
Total	**92811**	**2269810794**	**85130**	**2103789097**	**91607**	**2626548634**	**97506**	**2624822519**

Source: Statistical Report of Cochin Chamber of Commerce & Industry, Cochin-3

In respect of the major commodities imported through ICTT, Raw Cashews, News Print, waste Paper, Heavy Melting Scraps, Tiles, Furniture, Synthetic Rubber, PVC Panels, Carbon Blacks, Pepper HD Polyethylene Chrysotile Fibre have registered a generally importing goods. It is noted that a small quantity of coffee has imported last three years (2012-2014) But, In 2015, No one has imported coffee from any country. Table IV indicates that Indian Products Ltd, Unilever India Exports, Tata Coffee Ltd, and S.L.N Coffee India P. Ltd have imported coffee beans from Dijbourti (Ethiopia) Ho chi minh City (Veitanam) Santos, (Brazil), Yangon (Burma). This view is very useful for the researcher, because he is dealt in PhD thesis of Impact of ICTT on the export of Coffee through Cochin Port Trust.

Table 4: Nation-wise Coffee Imports through ICTT (2012-2015)

Importer	Country	2012	2012	2013	2013	2014	2014	2015	2015
	Port of Loading	TEUs	Kilograms	TEUs	Kilograms	TEUs	Kilograms	TEUs	Kilograms
Indian Products Ltd	Dijbourti	10	107318	NIL	NIL	NIL	NIL	NIL	NIL
Unilever India Exports	Santos	2	18792	NIL	NIL	NIL	NIL	NIL	NIL
S.L.N. Coffee India. P. Ltd	Ho chi minh City	NIL	NIL	6	109381	NIL	NIL	NIL	NIL
Tata Coffee Limited	Yangon	NIL	NIL	NIL	NIL	5	78261	NIL	NL
Unilever India Exports	Santos	NIL	NI	NIL	NIL	2	18782	NIL	NIL
Total		**12**	**126110**	**6**	**109381**	**32**	**488378**		

Source: Statistical Report of Cochin Chamber of Commerce & Industry, Cochin-3

Table V. Top 12 *Performers* of Imports during 2012-2015

Importer	2012	2012	2013	2013	2014	2014	2015	2015
	TEUs	% Share	TEUs	% Share	TEUs	% Share	TEUs	% Share
Malayala Manorama Co. Ltd	4753	9.7210	5557	13.0287	5722	12.7077	5606	11.2692
Sree Sakthi Papper Mills Ltd	4323	8.8416	4139	9.7041	4461	9.8292	2605	5.2366
Mathrubhumi P &P Co., Ltd	3409	6.9722	3594	8.4263	4169	9.1859	3307	6.6478
MRF Ltd	3008	6.1521	3213	7.5331	3862	8.5094	3050	6.1311
K.V.N. Impex (P) Ltd	1793	3.6671	1758	4.1217	2648	5.8345	3619	7.2750
Apollo Tyres Ltd	3271	6.6900	2155	5.0525	2235	4.9245	1904	3.8274
Hindustan News Print Ltd	343	0.7015	588	1.3786	1207	2.6595	1185	2.3821
Synthite Industries Ltd	743	1.5196	993	2.3281	1180	2.6000	1187	2.3861
Thai Impex P Ltd	925	1.8918	876	2.0538	1125	2.4788	786	1.5800
Peekay Rolling Mills P Ltd	912	1.8653	521	1.2215	897	1.9764	516	1.0373
Plant Lipids. P. Ltd.,	526	1.0758	483	1.1324	591	1.3022	879	1.7670
St. Mary's Cashew Factory	864	1.7671	576	1.3505	867	1.9103	774	1.5559
Others	67941	49.1349	60677	42.6687	62643	36.0816	72088	48.9045
Total	92811	100%	85130	100%	91607	100%	97506	100%

Source: Statistical Report of Cochin Chamber of Commerce & Industry, Cochin-3

Table V: indicates that Malayala Manorama Co., Ltd., Sree Sakthi Papper Mills Ltd and Mathrubhumi Printing & Publishing Co., Ltd stands Top three importers during the period of 2012 to 2015. Three of the above Company deals with Newsprint. So we can identify that newsprint is the major commodity of imports through ICTT during the period of 2012-2015.

8. India's Import Policy: Procedures and duties

The Import and export of goods is governed by the Foreign Trade (Development & Regulation) Act, 1992 and India's Export Import (EXIM) Policy. Directorate of General of Foreign Trade (DGFT) is the principle governing body responsible for all matters related to EXIM policy. Importers are required to register with the DGFT to obtain Importer Exporter Code Number (IEC) Indian Trade Classification-Harmonized System (ITC-HS) allows for the free import of most goods without a special import license. Restricted and prohibited goods (Under section 11 of Indian Customs Act 1962) are strictly restricted and prohibited to import from other countries. The Imported goods are levied with Basic Customs Duty (BCD) on the assessable value. On the value thus arrived an

additional duty or Counter vailing Duty (CVD), which is equivalent to the excise duty on like products is levied. Further an Additional CVD of 4% is charged to countervail sales tax in India. A cess of 3% is charge on BCD & CVD. In addition other duties like anti-dumping, safe guard duties are applicable in specific case. Anti-dumping duties means government imposes on Foregine imports that it believes are priced below market value. Safe guard duty are temporary measures in defense of domestic industry which injured due to sudden surge in imports. There are two types of rates of duty of customs. One is Ad valurem rate, the duty charged on the basis of value. Other is specific rate, the duty on the basis of Quantity/numbers/ Volume or Weight of the goods. The Total duty payable generally comes to 29.44% w. e. f 1st March 2015.

Calculation of customs duty payable is as follows w.e.f 1-3-2015, If assessable value of a goods = Rs 10,000/-

Seq.	Duty Description	Duty%	Amount	Total Customs Duty
(A)	Assessable Value Rs		10000	
(B)	Basic Customs Duty	10%	1000	1000
(C)	Sub-Total for Calculating CVD (A+B)		11000	
(D)	CVD 'C" excise duty rate	12.5%	1375	1375
(E)	Sub-total for edu cess on customs B+D		2375	
(F)	Edu Cess of Customs-2% of 'E'	2%	45.50	47.50
(G)	SAH Education Cessof Customs- 1%of 'E'	1%	23.75	23.75
(H)	Sub-total for Spl CVD "C+D+F+G		12446.25	
(I)	Special CVD under section 3 (5) – 4% of H	4%	497.85	497.85
(J)	Total Customs Duty			2944.10
(K)	**Total duty rounded to**			**2944**

Source: Customs House

9. Effective utilization of ICTT and Its Enhanced Performance

ICTT is the first and only one transhipment terminal in India, and all the facilities are coming under this International Terminal, there are many reasons for the poor performance of ICTT vis-vis other ports. Mother vessel (large ships) is not berthing frequently at ICTT. If there is chance to berth mother vessel once or twice in a week, the importers can save transit time and freight charges. More effective and frequent dredging of the port to be ensured in a cost-effective manner so as to attract more mother vessel to ICTT Government must take action Simplify the Procedural formalities: Procedures like examination by the customs authorities, obtaining their reports, and completion of other customs formalities. Terminal Handing Charges (THC) is very important for the importers as they have to spend considerable amounts in the regard. Because of THC has a direct bearing on the operational efficiency and profitability of the imports. So THC has to go down at ICTT so as to match with those in other ports like Tuiticorin, Mangalore, Chennai, Goa, Vizag. Similarly

Various expenses related to unloading and such miscellaneous charges being very high at ICTT, these need to be brought down.

10. Concluding Remarks

Given the positive features of ICTT, it has got tremendous potential to come up as the most preferred Import destination in India. ICTT is a transhipment hub in India. By projecting the many International terminal facilities are arranged today at ICTT, importers can use this terminal and save transit–time and freight charge. News Print is the very major commodity imports through ICTT during the period of 2012-2015. Importers can also imports specified goods without payment of Import customs duty if they made an agreement in South Asian Preferential Trade Agreement (SAPTA) or Association of South East Asian Nation (ASEAN). Basic Customs Duty (BCD), Counter vailing Duty (CVD), Additional CVD, Anti Dumping Duty, Safe Guard Duty, Educational Cess are imposing on Import goods as per the Customs Rules.

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ENVIRONMENTAL DEGRADATION AND BIODIVERSITY LOSS IN THE WESTERN GHATS: CONCERNS FOR CONSERVATION AND SUSTAINABILITY

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Abstract

Western Ghats is one of UNESCO's World Heritage Sites. The heritage Status has implications on development and prescribes creation of additional buffer zones around it. Western Ghats also is the home for several endangered species. It is also a treasure trove of bio-diversity. The government has appointed an expert committee under the chairmanship of Madhav Gadgil to look into the various issues of protecting the Western Ghats. The committee has made several recommendations for protecting the bio-diversity of Western Ghats. Another committee under the chairmanship of Kasturirangan was appointed in 2012 to look further into the issues of protecting the environment. The implementation of the recommendations of the committees will go a long way in protecting the environment and biodiversity of the region.

Keywords: *Western Ghats, Bio-diversity, Environment, Sustainable Development, Gadgil Committee, Kasturirangan Committee*

Introduction

The Western Ghats, also known as Sahyadri Hills, are well known for their rich and unique assemblage of flora and fauna. The Western Ghats is home to thousands of animal species including at least 325 globally threatened species. It is a treasure house of exotic varieties of plants and the major vegetation types are tropical evergreen forests, moist deciduous forests, dry deciduous forest, scrub jungles, Sholas, Savannas including high rainfall Savannas, Peat bogs and Myristica swamps.

The Western Ghats is a hill chain extending from 80^0N to 21^0N latitude and stretching between 73^0E and 77^0E longitude. The Western Ghats runs through six states in India extending from the Dang District in Southern Gujarat to Kanyakumari in Tamil Nadu. All the major rivers flowing through the Southern Sates originate in the Western Ghats. It is one among the four watersheds of India and form the catchment area for complex riverine drainage systems that drain almost 40 percent of India. Western Ghats harbours some of the most bio diverse, endangered and unique habitats in the peninsular India. It is an

area of rich biodiversity exhibiting high degree of endemism.

Even though Western Ghats holds only less than 6 percent of the land area of India it holds more than 30 percent of all plant, fish, bird, hepeto-fauna and mammal species in the country. Scientist had drawn attention to the distinct flora of the Western Ghats. Four thousand species of flowering plants are known from the Western Ghats. The Western Ghats receive an average of 3000 mm rainfall per annum and this is one of the important reasons for the existence of wide exotic varieties of plants. It is also the home for numerous medicinal plants and important genetic resources such as wild varieties of grains (barley, rice), spices (pepper, cardamom, cinnamon etc.), and fruits (banana, jack fruit, mango and garcinias). It is also estimated that around 1500 plants are endemic to the Western Ghats.

The Western Ghats region also supports a large and diverse fauna also. The largest number of known species is birds (508), fishes (218), amphibious (126) and mammals (1370). It is to be noted a large number of species are endemic to the region. Nilgiri Tahr, Malabar Gray Hornbill, Lion Tailed Macaque, Flying squirrel are some of the rare fauna found in the Western Ghats. Among the invertebrate groups, about 350 (20% endemic) species of ants 330 (11% endemic species) of butterflies, 174 (40% endemic) species of donates (damselflies and dragonflies) and 269 (76% endemic) species of mollusks (land snails) are from the Western Ghats. The Western Ghats is also famous for its amphibian fauna with about 220 species of which 78 percent are endemic to the region. Out of the 225 described species of reptiles 65 percent are endemic.

Of the nearly 650 tree species found in the Western Ghats, 54 percent are endemic to the region. The Western Ghats harbours approximately 4000 species of flowering plants and it is estimated that about 1500 are endemic to the region. The biological diversity is also reflected in the cultural diversity of the people. In lot of instances their entrance is tied to the continued maintenance and sustainable use of biological resources.

Even though a lot of measures are taken for the protection, conservation and sustainable use of bio diversely many ecosystems and species are seriously threatened. A variety of reasons led to the

threatening of biodiversity in the Western Ghats. Human pressures like conversion of forests to agricultural land, growth of area under plantations like rubber, tea, oil palm, coffee, wattle and eucalyptus, construction of roads and railways, increase in the livestock population, building of hydroelectric projects and reservoirs, extraction of forest produce and forest based industries, mining, pollution due to unrestricted use of agro chemicals etc. have caused environmental degradation and biodiversity loss in the Western Ghats.

At least 20 percent of the original forest cover has lost in the last 25 years in the Western Ghats. During the past 40 years the plant and animal life in the Western Ghats has also been degraded. Many animals and plants have become extinct or are in danger of being extinct. Biodiversity loss in the Western Ghats is also linked to the human habitation in the region. Urbanization and industrial development has increased the number of people in the region. This has put extra pressure on the forest and mineral resources. An increase in the population has led to an increase in the cultivation of rice and cash crops like tea, rubber etc. These factors affect soil degradation and erosion. This change in the land use is also detrimental to biodiversity. Increased mining activity also destroys forests. Another factor that led to the submergence of forests is the construction of various hydroelectric and irrigation projects in the Western Ghats region.

Another threat is the loss of domesticated biodiversity. Traditional farmers have developed an array of crops and livestock. Thousands of traditional crop strains and domesticated livestock are being replaced by genetically modified varieties. Construction of resorts, farmhouses and townships has resulted in the cutting of hills and modification of topography and hydrological patterns.

Rapid urbanization and industrial development are taking a toll on the fresh water species of the Western Ghats. Due to water pollution from urban sources and agricultural fields and due to over harvesting approximately 16 percent of the fresh water fish, dragonflies, damselflies, aquatic plants and mollusks are threatened with extinction. Out of the 1146 fresh water taxa assessed 1.9 percent species were found to be near threatened.

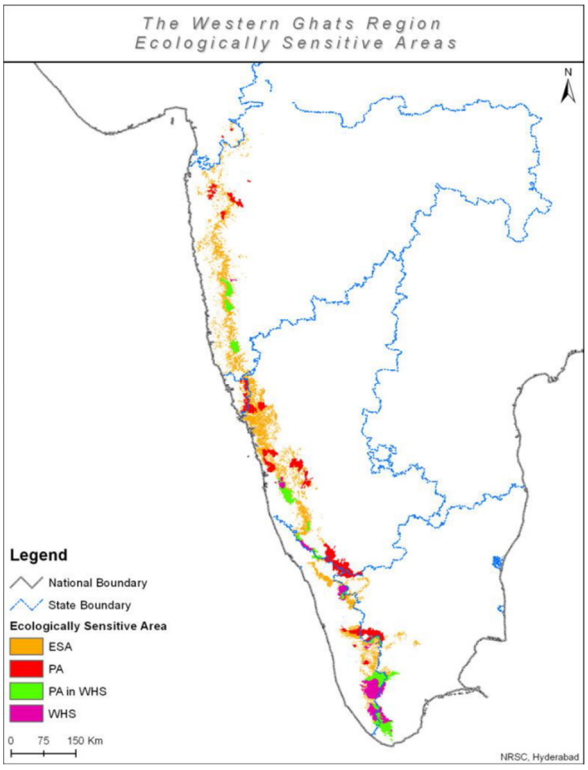
Majority of the rivers in the Western are threatened or polluted because of

industrial effluent disposal, deforestation, dam construction, sand mining and inefficient land use practices. These also led to the shrinking and sickness of rivers. It is to be mentioned that Western Ghats form one of the three important watersheds in the country.

Environmentalists and biodiversity experts increasingly recognize the social and environmental dimensions of mining now. A significant part of the mineral deposits fall in eco sensitive regions and profuse river systems. Mining of bauxite, establishment of quarries, sand mining etc. have initiated environmental degradation in the region due to biodiversity loss, soil erosion, deforestation, noise and air pollution and wasteland generation.

An analysis of the different varieties of species indicates that 332 globally threatened species occur in the Western Ghats. Out of the 332 threatened species found in the Western Ghats 129 are vulnerable, 148 are endangered and 55 are critically endangered. Studies have shown that 229 plant species, 15 bird species, 52 amphibian species, one fish species, four reptile species and 31 mammal species are in the threatened category.

Figure 1. Ecologically Sensitive Areas of Western Ghats



Source: Report of the High Level working on western Ghats, 2013, Available at the India Environmental Portal at http://www.indiaenvironmentalportal.org.in/files/HLW/G-Report-Part-I_pdf

Government Initiatives for Conservation and Protection of Western Ghats

There were several initiatives by the government of India to stem the environmental degradation of the Western Ghats. One of the recent initiatives was the appointment of an expert panel in 2010 under the Chairmanship of Madhav Gadgil to look into the various issues of protecting the Western Ghats. The Western Ghats Ecology Expert Panel ((WGEEP) has designated the entire Western Ghats region as an Ecologically Sensitive Area (ESA). Further the committee has classified

the 142 talukas in the Western Ghats boundary into Ecologically Sensitive Zones (ESZ) 1,2 and 3. In the ESZ-1 (high priority area) almost all development activities including mining and thermal power plant establishment are banned or restricted. Besides, it was recommended that no new dams should be constructed in the ESZ 1. The committee also suggested a change in the present system of governance in the hill ranges. It suggested a bottom to top approach and recommended an important role for Grama Sbhas for protecting the environment in the Western Ghats Areas. Another major recommendation of the committee is the establishment of a Western Ghats Ecology Authority (WGEA) under the Ministry of environment and Forests with powers under section 3 of the Environment Protection Act, 1986. It is to be mentioned that when the report was made public it drew severe criticism from various state governments and farm organizations. The whole issue was shelved until 2012 and another committee headed by Kasturirangan was appointed to look again at the issues of the region. The committee submitted its report on April 13, 2013. Kasturirangan committee has earmarked only 37 percent i.e. about 60,000 sq.km of the total area under ESA. The committee distinguished between cultural and natural landscapes. According to the recommendations of the committee 90 percent of the natural landscape should come under ESA. Cultural landscapes are the regions occupied by human settlements, agricultural fields and plantations. The committee recommended that the current mining in the ESA should be phased out within the next five years or at the expiry of the mining lease, whichever is earlier. No future thermal power plants and hydroelectric projects will be allowed in the region. A total of 123 villages fall under the ESA purview. Kasturirangan report also evoked strong criticism from farm organizations and political parties. They argue that the use of remote sensing and aerial survey methods of zonal demarcation of land in Western Ghats is not based on ground reality and has caused many errors. Many farmers fear that they get evicted if the Kasturirangan report is being implemented.

Kasturirangan report has evoked strong protest from farm organizations and South Indian States, especially from Kerala. Government of Kerala appointed another committee under the Chairmanship of Oommen V Oommen. OOmmen committee recommended to make changes in the clauses of environmentally fragile land (EFL) in the

Western Ghats. The committee pointed out that the satellite survey adopted by Kasturirangan had many errors and estates and plantations are included as EFL. It made recommendations for the exclusion of inhabited regions and plantations from the purview of ecologically sensitive areas. It also recommended that a field survey should be conducted to identify ESA's in lands demarcated by Kasturirangan and Gadgil reports.

The reports of Gadgl , Kasturirangan and Oommen V Oommen have evoked a lot of debate on the various issues facing the protection and conservation of Western Ghats. Most of the protests against the first two committees are due to the fear of eviction or loss of livelihood. The new NDA government has given an affidavit in the National Green Tribunal that only Kasturirangan report will be implemented.

Conclusion

The debate on protecting the Western Ghats is an eye-opener for protecting the biodiversity and flora and fauna of the Western Ghats. It is a fact that forest cover in the Western Ghats have deteriorated due to deforestation, human settlements, plantations, mining and due to a variety of other factors. The Western Ghats, older than the Himalayas, is among the worlds most biologically exciting regions holding at least a quarter of all Indian Species. It is true that the region has faced a constant assault due to sand and bauxite mining, power plant projects, water pollution, unregulated farming and loss of habitat due to human settlements. Studies have shown that at least 25 percent of the forests have vanished which is now the home to more than 325 of the world's threatened species of fish, amphibians, reptiles, birds and plants. Kasturirangan report also has acknowledged that Western Ghats cannot be protected without the cooperation of the tribal and village people in the Western Ghats region. Thus a more pragmatic and scientific policy is required to protect the eco sensitive areas and regions of Western Ghats. For protecting the Western Ghats it is better to divide the mountain ranges into Northern and Southern areas. In the Western Ghats, mining is a potential future threat and should be addressed with preemptive measures.

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WORK LIFE BALANCE OF WOMEN IN SCHOOLS WITH SPECIAL REFERENCE TO TRICHIRAPPALLI

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Abstract

The main objectives of this paper is to study the work life balance of working women in school. This paper analyses the work life of the women faculty members through personal, family and work domain variables.

Keywords: *Work- Life Balance, Women in Teaching Profession, Causes of Imbalance, Stress, Achieving Work Life Balance.*

Introduction:

Work Life Balance means the competence to schedule the hours of an individual Professional and Personal life so as to lead a healthy and peaceful life. It emphasizes the values, attitudes and beliefs of women regarding their age to work in organizing and balancing their work and personal life. The role of working women has changed throughout the world due to economic conditions and social demands. Women of the early centuries were mostly confined to their kitchens and those who were employed worked in factories, farms or shop works. Very few women had the access to higher education and they were forced to be at the mercy of their fathers' or husbands' attitudes towards women and work. The fast developing knowledge economy has given place for more number of women to be enlightened by higher education. The issue of work-life balance is increasingly becoming important in India as more and more women are joining the workforce; and there are more and more working professionals feel the need to balance their work and family life.

Benefits of Work Life Balance

1. Improved work-life balance–a reduction in the impact of work on home and family life
2. Reduced stress levels
3. Control over time management in meeting work-life commitments
4. Autonomy to make decisions regarding work-life balance
5. Increased focus, motivation and job satisfaction knowing that family and work commitments are being met

6. Increased job security from the knowledge that an organisation understands and supports workers with family responsibilities

Objective of the study

1. To study the family and work life of the women faculty members through personal, family and work domain variables.
2. To examine the relative importance of career and family roles to women faculty members.
3. To identify the factors that enables or constrains women faculty members' performance in both these roles.
4. To examine the issue of dual role conflict among the women faculty in Tiruchirappalli.
5. To study the inability to achieve WLB & frequency of stress experienced.
6. To find out ways to achieve WLB.

Methodology

The study is based on both primary and secondary data. Information regarding the work life balance of the teacher was collected from 3 schools, comprising 50 teachers in the schools. Tiruchirappalli district has been selected among the three schools such as Annai Girls higher secondary school, Government Higher Secondary School and Divine School.

Limitation of the study

- Due to time and resources constraints this study has been limited to 50 respondents of Trichy area.
- Some teachers were hesitation to fill the questionnaire in spite of the investigators encouragement.

The unwillingness and the non-co-operation on the part of the respondents` prevent the researcher to collect complete information.

Analysis and Interpretation

Table 1.1 Distribution of respondents based on Nature of School

Sl. No	Nature of School	No. of Respondents	Percentage
1.	Government school	24	48
2.	Private School	26	52
	Total	50	100

Source: Compiled from Primary Data.

Table 1.1 Shows that Majority of them (52 percent) are working in Private school and 48 percent of the respondents are working in Government school.

Table 1.2 Distribution of respondents based on family type

Sl. No	Family type	No. of Respondents	Percentage
1.	Nuclear	33	66
2.	Joint	17	34
	Total	50	100

Source: Compiled from Primary Data.

Table 1.2 Shows that 34 percent of the respondents are living in a joint family system due to traditional customs and benefits. 66 percent of the respondents are living in nuclear family. Nowadays most of the families are followed nuclear family method.

Table 1.3 Distribution of the respondents based on Educational Qualification

Sl. No	Educational Qualification	No. of Respondents	Percentage
1.	Under Graduate	6	12
2.	Post Graduate	44	88
	Total	50	100

Source: Compiled from Primary Data.

Table 1.3 reveals that 88 percent of the respondents are completed Post Graduate education and 12 percent had completed their Under Graduate education. Nowadays Most of the women are educated.

Table 1.4 Distribution of the respondents based on the Work Experience

Sl. No	Years of Experience	No. of Respondents	Percentage
1.	Less than 5 years	19	38
2.	Between 5 to 10 years	14	28
3.	Between 10 to 15 years	9	18
4.	Above 15 years	8	16
	Total	50	100

Source: Compiled from Primary Data.

Table 1.4 Shows that majority of them (38 percent) have less than five years' experience. 28 percent of respondents have between 5 to 10 years' experience. 18 percent of respondents have between 10 to 15 year experiences. 18 percent of respondent have above 15 years' experience.

Table 1.5 Distribution of the respondents based on Monthly Income

Sl. No	Monthly Income	No. of Respondents	Percentage
1.	Less than 10,000	20	40
2.	Between 10000 to 20000	8	16
3.	Between 20000 to 30000	18	36
4.	Above 30000	4	8
	Total	50	100

Source: Compiled from Primary Data.

Table 1.5 Shows that Majority of them (40 percent) are earning less than Rs.10,000 and 16 percent of the respondents are earning between Rs.10,000 to 20,000, 36 percent respondents are earning between Rs.20,000 to 30,000, and 8 percent of the respondents are earning more than Rs.30,000 because they working in Government school and they earn more income compared to Private school teachers.

Table 1.6 Distribution of the respondents based on factor that motivates to work

Sl. No	Factors of Motivation	No. of Respondents	Percentage
1.	Personal satisfaction	19	38
2.	Financial independence	19	38
3.	Support from family	5	10
4.	Utilization of time	7	14
	Total	50	100

Source: Compiled from Primary Data.

Table 1.6 Shows that 38 percent of the respondents are working for the personal satisfaction and 38 percent of the respondents are working for financial independence because most of the women prefer to live on financially independence. 10 percent of the respondents are working to

support the family and 14 percent of the respondents are working for the use of time.

Table 1.7 Distribution of the respondents based on Job satisfaction

Sl. No	Job Satisfaction	No. of Respondents	Percentage
1.	Highly Satisfied	35	70
2.	Moderately Satisfied	6	12
3.	Undecided	3	6
4.	Unsatisfied	6	12
	Total	50	100

Source: Compiled from Primary Data.

Table 1.7 Shows that Majority of them (70 percent) are highly satisfied with their job because they are working in Government school. 12 percent of respondents are moderately satisfied and 12 percent of the respondents are unsatisfied with their profession due to heavy work load. 6 percent of the respondents are undecided with their profession.

Table 1.8 Distribution of the respondents based on the career enable to satisfy on Rank priority

Sl. No	Rank Priority	No. of Respondents	Percentage
1.	Economic	15	30
2.	Security	10	20
3.	Achievement	15	30
4.	Affiliation	3	6
5.	Self-actualization	7	14
	Total	50	100

Source: Compiled from Primary Data.

Table 1.8 Shows that Majority of them (30 percent) are given priority for Economic aspect and Achievement.20 percent of the respondents are given priority for security. 14 percent of respondents are given the priority for self-actualization.

Table 1.9 Distribution of the respondents based on Comparison between career and family

Sl. No.	Comparison between career and family	No. of Respondents	Percentage
1.	Equally Important	37	74
2.	Career has priority	5	10
3.	Family has priority	8	16
	Total	50	100

Source: Compiled from Primary Data.

Table 1.9 Shows that Majority of them (74 percent) give equally important to career and family and balancing the life between work and family. 10 percent of the respondents give priority to career over family. 16 percent of the respondents give more important to family than career.

Table 1.10 Distribution of the respondents based on Depressed on work

Sl. No.	Depression	No. of Respondents	Percentage
1.	Never	12	24
2.	Rarely	10	20
3.	Sometimes	21	42
4.	Often	5	10
5.	Always	2	4
	Total	50	100

Source: Compiled from Primary Data.

Table 1.10 Shows that 24 percent of the respondents are Never Depressed about work. 20 percent of respondents are rarely depressed about the work. 42 percent of respondents are sometimes depressed about their work. 10 percent of respondent are often affected by depression. 4 percent of respondent are always feel the depressed about work due to stress and heavy work load.

Table 1.11 Distribution of the respondents based on the stress management

Sl. No	Stress Management	No. of Respondent	Percentage
1.	Yoga	7	14
2.	Meditation	6	12
3.	Entertainment	24	48
4.	Others	13	26
	Total	50	100

Source: Compiled from Primary Data.

Table 1.11 Shows that 48 percent of respondents are spending their time for entertainment to reduce stress level. They were using television and cell phone to reduce the stress level. 14 percent of respondents are doing yoga for stress reduction. 12 percent of respondents are doing meditation to reduce stress level. 26 percent of the respondents are doing other things to reduce stress.

Table 1.12 Distribution of the respondents based on the stress level

Sl. No	Stress	No. of Respondents	Percentage
1.	Heavy academic work	14	28
2.	Official work	10	20
3.	Dual Responsibility	10	20
4.	Lack of Recognition	8	16
5.	Lack of Cooperation from staff members	8	16
	Total	50	100

Source: Compiled from primary data.

Table 1.12 Shows that 28 percent of the respondents are felt the stress by stress due to heavy academic work. 20 percent of the respondents are felt the stress because of Official meeting and Dual responsibility. 16 percent of respondents are the felt stress because of lack of and co-operative and recognition.

5.1 Findings

- Teachers agree that their family members are more helpful and co-operative which may be one of the reasons for women employees to balance between their life and work.
- It is found that some of the teachers agree are physically stressed in their job and some of the employees strongly agree that they are mentally pressurized in their job.
- High quality of work life balance will improve the job satisfaction and vice versa.
- Working hours are satisfactory but sometimes extra classes and study interrupts work life balance.
- 88percent of respondents are studied post graduate.
- 40 percent of respondents are earning less than 10,000 because they are working in private schools.
- 38 percent of respondents are working for personal satisfaction and financial independence.
- 70 percent of respondents are highly satisfied with their job.
- 74 percent of respondents give equal important to career and family.

- 48 percent of respondents are spending their time for entertainment to reduce stress level.
- 46 percent of respondents are not affecting by stress due to heavy academic work.
- 28 percent of respondents are felt stress due to heavy academic work.
- 26 percent of respondents are facing the problems unwillingness of student in studies.
- 46 percent of respondents are highly satisfied with their on duty facilities.
- 70 percent of respondents are highly satisfied with job.
- 44 percent of respondents are highly satisfied for spending time with their family.
- 44 percent of respondents prefer WLB enables people to work better.
- 46 percent of respondents are felt that deadlines make them very harder.
- 58 percent of respondents are felt that it is very difficult to take leave.
- 54 percent of respondents are felt that working time is little hard for them.

Conclusion

Every woman should set the goal and excel both in career and family to achieve WLB. Some of the strategies and skills at work such as planning, organizing and setting limits can be used at home and work place for accomplishing a satisfying and fulfilling well balanced life both professionally and personally. Women employee should care the family both physically and financially to satisfy the family needs. Also work for the accomplishment of organizational objectives and individual upliftment to satisfy the career needs.

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HINDI SAHITYA KI SAMAKALEEN CHUNAUTIYAM (KAVITHA KE SANDARBH MEIN)

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Abstract

Samakaleen poetry is depicted in the creation of new poetry. The concept 'Samakaleeen sahithya' is behind in the time and time consciousness and in the field of poetry samakaleen has its own value. Present today the field of samakaleen poetry is filled with the very presence of great poets. The topic of such poets for their writing is closely related to the current society. There is no importance to any arguments or thoughts in samakaleen poetry. The content of samakaleen poems blended with human values .Great poets Dinakar and Sumithranandan Panth had tried to point out the coolies and the common man in their poems. In contemporary poems, there is an effort to see life in its purest form. These poets express their views inspired from a national feeling.

Keywords: *Samakaleen Hindi Sahitya, challenges.*

Introduction

The Hindi word "Samakaleen" simply means contemporaneous or contemporanity in English. About Samakaleen Dr. Krishnakumar Sarma Says- The word or very sound Samakaleen arouses a sense of existence. The word Samakaleen is generally called Samakalik or Samakaleen according to the relative periods or time its arouses; and it enables to realize the consciousness of time. In the field of literature the contemporaries who write, can explain in the sound of Samakaleen. About Samakaleen Prof. Subas Kumar has this much to say - It is essential to realize the society and to fulfill its immediate demands when anything becomes Samakaleen. Whichever is Samakaleen in the true sense, it reflects one's social life in real terms and express it in words. The concept Samakaleen is behinded in time, and time consciousness and in the field of poetry Samakaleen has its own value. Whichever is present today the field of Samakaleen poetry is filled with the very presence of great poets. The topic of such poets for their writing is closely related to the current society

It was in the year 1943 a new generation poetry came in to existence in Hindi literature as per 'Thara Sapthak'. Prominent poets Dhoomil, Leeladhar Jagudi, Kedarnath Sing, Asok Bajpai, Raj Kamal Chowdhari, Raghuveer Sahay began to dream for the buildup of a new revolution in poetry. During the period 1936-40 the poem 'Thodthi Pathar'of Nirala came in to being. The poet tries to raise the might of the people through a stone crushing woman and along with that created certain new morals in life. Through samakaleen poetry the sound of some sort of revolution is heard. It is believed that a blend

of revolution poems that appeared after 1960 is clearly seen in Samakaleen poems. It is seen that there was always an enthusiasm to pictuarise the context of Samakaleen poems blended with human values. At the time of the creation of Samakaleen poems, the addition of surrroundings and ambience etc has a greatness of its own. In the writing of 'Nirala'and 'Mukthibodh' poetry a picture of the inxta position of problems with the temporary society is visible. The creation of poetry will never bear fruit if we turn a blind eye to the temporary problems or turn a vault face to it.

There is no importance to any arguments or thoughts in Samakaleen poetry. In other words any thought or revolution never acts as a centre point. Kedarnath Sing, Lakshmi kanth Varma, Dhoomil, Chandrakanth Devathal, Venugopal such poets had strongly depicted the distress and pains of the common folk. Poets like Sumithranandan Panth and Dinkar had tried to imprint the picture of the downtrodden, the coolis and the common man in their poems. The word of Dinkar -

"Swanom ko milta dooth, vastra, bhooke, akulate he,

Ma ki haddi se chipak titur gade ki rat bitate he" [1]

The honesty of the current society is detailed in the book 'Natak Jari he' published in the year 1972. The gross injustice and the bad faith prevailed in the society is also pictuarised in the book. The reverse sound reflected in Samakaleen poetry is depicted in the creation of new poetry. 'Janathanthra **ke** Sooryoday', 'Akal Darsan', 'Prajathanthra **ke** virudh', 'Patkatha' in such poems, the poet Dhoomil had tried to reveal the true faces of the short comings of Indian democracy and the gross injustices it is posing Dhoomil says

"Jab ki mein janta hu ki inkar se bhari huyi ek cheek
Aur ek samajdar chup
Dono ka matlab ek he
bhavishya gadne mein, 'chup' aur cheek" [2]

The fight between man and man the sound and fury of sorrow and pain, the sound or revolutions these are the real foundation of Samakaleen poetry. The weak and the tormented and their marks are printed in large scale in the society. The poet Arun kamal in his poems has clearly imprinted the sound of commitment to the society. In his poems the power of man also creating its sound -

"Jo admi ko pyar nahi karte
Unki koyi ganga nahi
Koyi mathrubhumi nahi
Koyi apna thara nahi " [3]

It is clearly visible in the creation of these poets, the picture of an effort of blending their poetry with the disturbed honesty of their time. If any of the poets try to

blend the honesty of society with his poems, it will definitely reveal the opportunities of social, political and financial etc. In contemporary poems, there is an earnest effort to see life in its purest form. The sound of social influence is essentially the foundation of their poems. In today's poem literature connected problems are given undue importance of the poets. They are just incapable of expressing their original sounds in respect of their own matters. But at times they express their views inspired from a national feeling. In the present society the relationship between man and man is too little. They simply feel that they have nothing to portray in their own life -

"Kaun karte he parvah
ek manshya ki mrityu ki?
sam dhal chuki he
Kahi koyi kabhi nahi he." [5]

Conclusion

In the field of contemporary literature , especially in the poetry front there are numerous objections prevailing. There are many criticisms in uplifting the distresed society. In this context Dr. Prathibha Mudalyar says- In current Hindi Poem, a bunch of deceived people meted out from the human power owned a philosophy of their own in order to retain their hardships. The Hindi Dalith Critics have studied about several places. Nirmala Puthul, Om Prakash Valmeeki, Thulasee Ram, such poets have already expressed their true experiences while writing poetry or other piece of literature. In their writings they could make a mark about their deep thoughts. There are also creations about the fight for existence in their writings. Revolution, and conflicts have also been created. There were essence of sorrow and pain in their writings. Efforts were also made to replace hatred by love. For Dr. Rishabh Dev Sarma, the great fight of contemporary poems writing is Globalization. As such it was his ability to read and express the immortal fight before poetry. The real duty of poetry is essentially to protect humanity or to awaken the people. For submitting poetry for the benefit of the whole universe and for the safety of the whole world so has to own his forefathers with him. It is certainly the current problem facing them. If the poet assembles with the goodness of the universe there will be spring of greatness in his poetry. In other sense the poetry shall simply express the real nature and manifestation of life. The poet also expresses that the words and literary function of such poems shall be free from any sort of disputes. In other words poetry has to free all that the life has to.

Before the current world of today arrived at modern times an open market culture has grown from the dishonest market system which conveniently ignore the moral value of life and dangers immersed in it and about human beings in general. In order to face such dangerous elements of life creations upholding the morals of life are to be made out; In literature bringing out light putting out darkness. Dr. Ram Ahlad Chowdari has said; today there are many efforts before men of letters in bringing their sorroundings to their favour which were once standing against them. In Indian literature there is a blending of a tradition of history, philosophy etc. But in current literature this blending is on the desending side. For the last twenty years in our thoughts and sorroundings drastic changes have occured. We have defenitely caught up with scientific revolution, gross influence of novelty etc. In the field of literature there is a fundamental element of contemporariness. This can be expressed as about time consciousness and about morals. While expressing contemporariness clear indications are there about the transformation occuring in life. Literature and art are essentially about the drastic changes occuring in life.

As such human relationship and writings of literature are also undergoing transformation. Political, Social and cultural transformation have influenced the public in the country. During these changes the men of letters had to face objections. Social, economical, Political, Cultural, Phychological, in all these fields many problems have to be faced , Political and International atmosphere has created problems to the writers. In this context the big problem facing them is to choose a way of their own. For the writers and poets, they have to face the standard of their creations and thoughts.

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COMMUNITY STRUCTURE OF MEIOBENTHOS IN ARCTIC KONGSFJORDEN ECOSYSTEM, NORWAY

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Abstract

Benthic meiofauna is a critical component regulating the physical, chemical, and biological environment of the marine ecosystem that links the sediment to aquatic food web, through their burrowing and feeding activities. Among benthos, meiofauna play an important role in the marine food chain; production of detritus and recycling of nutrients and as solubilizers of organic matter thereby enriching the coastal waters to support marine production Kongsfjorden, a glacial fjord in the Spitsbergen (Svalbard archipelago) in the Arctic. The study of meiofaunal distribution and composition can be used to assess the effects of natural environmental disturbances on the faunal diversity. A steep environmental gradient in sedimentation and salinity is created by the tidal glaciers along the fjord. The amount of the glacial outflow weakens towards the outer part of the fjord. Glacial related physical stress causes reduced abundance, biomass and diversity among the meiofaunal assemblages in the inner part of the fjord. The results show that meiofauna is affected by natural environmental disturbances. Therefore the meiofaunal analysis can be used in the assessment of the effect of environmental disturbances on the benthic fauna.

Keywords: *Kongsfjorden, Meiobenthos, Nematode, Foraminifera.*

Fjords are glacially deepened semi – enclosed marine basins, with entrance sills separating the deep waters from the adjacent coastal waters with limited water circulation and oxygen renewal. Fjords act as a link between ocean and land through cross shelf exchanges which leads to mixing in fjords (Nilsen et al. 2008). The ecological importance of meiofauna is well-known, and these benthic communities have been studied in detail in many parts of the world. However, in contrast to tropical and temperate latitudes, studies of meiobenthos in Arctic regions have received less attention. This study was conducted within the framework of an extensive survey focused on the Kongsfjorden meiofauanal assemblage. The existing biological and physical data of the Kongsfjorden fjord were summarised by Hop et al. (2002) and Svendsen et al. (2002). Benthic diversity and biomass can significantly change from outer to inner parts of Arctic fjords, as has been well described in the studies of macrofaunal communities (Holte et al. 1996; Wlodarska-Kowalczuk et al. 2005). Gerlach and Höhnk (1965) studied the composition of nematodes species, and that of

copepods of intertidal areas in Spitsbergen by Mielke (1974).

To date only few studies have been undertaken on meiobentic community structure in Arctic system. In this backdrop, this paper describes the meiobentic faunal assemblage, composition, abundance and diversity indices in Konsfjorden system.

Materials and Methods

Study area

Kongsfjorden is an open fjord situated on the north-western coast of Svalbard (120 E 790 N). These areas are predisposed to the inflow of warm and saline Atlantic Water. The fjord is divided into two parts by a chain of islands (Lovenoyane): an inner basin of an average depth of 50-60 m separated with Kongsbreen, a tidal glacier, and an outer basin with average depths of 200 -300 m which open in to the Fram Strait. The average width and length of the fjord is 8 km and 26 km respectively. It is an unsilled fjord influenced by tides, bound by rocky shores and covered by ice during October to June (Svendsen et al. 2002). During summer, freshwater from glaciers enters the coastal areas, where it overlies the marine water. It is directly connected to the North Atlantic Ocean via the Kongsfjord-Renna trough (Bluhm et al. 2001; Jørgensen and Gulliksen 2001; Svendsen et al. 2002). Kronebreen and Kongsvegan are separate glaciers that come together as a single tidewater glacier on the southern side of the head of Kongsfjorden. In Kongsfjorden, external and internal and the mixtures of external and internal water masses occur (Svendsen et al. 2002; Cottier et al. 2005). Inputs from large tidal glaciers create a sharp environmental gradient in sedimentation and salinity along this fjord.

Benthic sediment sample collected from Kongsfjorden system as a part of the Indian Arctic Expedition is the base of this study. The benthic samples were collected from 17th July to 6th August, 2011 on board using the boat "Teisten" of the Kings Bay. The facilities were provided by the Indian research base "Himadri Station" at Spitsbergen, Svalbard, Norway; which is a part of the International Arctic Research base, Ny-Ålesund. Samples are collected from seven selected transects of depths, ranging between 40m and 303m from 7:00 am to 4:30 pm. Based on the depth, the fjord stations were divided into two regions representing the outer and inner parts of the fjords. Stations 1, 2 and 3 were considered as inner fjord whereas 4, 5, 6 and 7 as outer (Fig.1, table 1). The samples were collected during the Summer Phase III of the Expedition and during that period the

Kongsfjorden fjord was influenced by the warmer and more saline Atlantic waters. Samples were collected with using a Van Veen grab with a 0.09 m^2 catching area. A glass corer with an inner diameter of 3.6 cm was pushed into a depth of 5 cm. The desired slices of the obtained sediment were then taken. Then the samples from seven stations were fixed and preserved in buffered formalin diluted to 4% by filtered seawater. The fixed samples were stained with l% Rose Bengal (Pfannkuche and Thiel, 1988) for efficient faunal extraction and further processing. Rose Bengal staining was adopted for separating live meiofauna and foraminifera from dead at the time of sample collection (Walton 1952; Boltovskoy and Wright 1976).

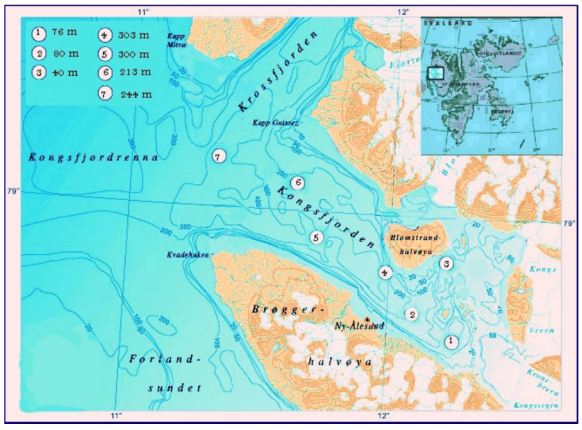

Fig. 1 Location of sampling stations in Kongsfjorden

Table.1 Details of sampling stations in Kongsfjordenof phase III Arctic Expedition,2011

Station	Depth(m)	Latitude	Longitude
1	76	78◦54.299'	12◦13.665'
2	80	78◦55.019'	12◦04.499'
3	40	78◦57.216'	12◦10.527'
4	303	78◦56.462'	11◦57.295'
5	300	78◦58.530'	11◦41.487'
6	213	79◦00.580'	11◦36.479'
7	244	79◦00.594'	11◦25.471'

Data Analysis

The software Plymouth Routines in Multivariate Ecological Research, Version 6.1.6 (PRIMER v 6.1.6) (Clarke and Gorley, 2006), was used for univariate and multivariate analysis of data. Multivariate analyses available in the PRIMER package were performed on the foraminiferal abundance and sediment data. The data was square root transformed which reduced the influence of the most numerous taxa and gave a more balanced view of the community structure. Before analysis, the environmental data were normalized. The ANOSIM procedure was applied to Bray–Curtis similarities (for faunal samples) and Euclidean distance (for environmental samples).

Results

Water and Sediment characteristics

The sediment texture of different stations showed marked variations in the percentage composition of sand, silt and clay. Silt (2–63 mm) was the dominant grain size fraction over fjord, ranging from 74.33% to 60%. In station 1, the percentage composition of silt was maximum (74.33%) and percentage composition of sand was minimum (3.37%). The percentage composition of clay is maximum in station 4 and minimum in station 7. Sand fraction was maximum in station 7 (22%). The mean percentage of silt during the study period was 63.33 %. The mean percentage of silt in the inner fjord was 70.33% and that of outer fjord was 63.33%. The mean percentage of clay fraction during the study period was 20.83% with 21% in the inner fjord and 20.71 % in the outer fjord. The mean sand fraction in the Kongsfjorden system during the study period was 12.83 %. The mean percentage of sand fraction in the inner fjord was 8.66% and that of outer fjord was 15.96%. The variation in granulometric composition of the sediment in seven stations during the study period was given in Fig 2.

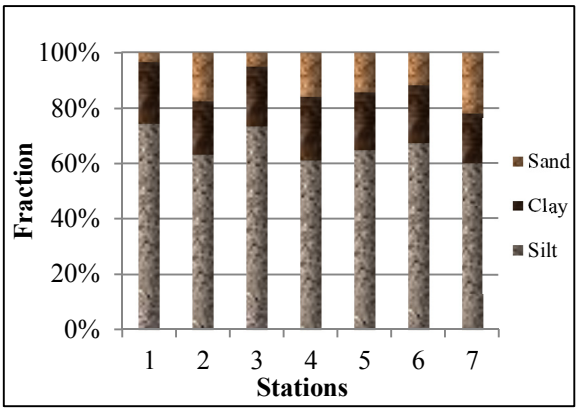

Fig. 2 Variation in Granulometric composition of the sediment in Arctic Kongsfjorden system during 2011

The phosphate content of the Kongsfjorden system during the study period was 0.086µmol/l. The nitrate values varied from 0.68 µmol/l in station 7 to 0.45 µmol/l in station 5. During the study period, the average value of nitrate was 0.53µmol/l. Nitrate showed an average value of 0.53µmol/l in outer fjord and that of inner fjord was 0.52µmol/l. The mean value of nitrite in the Kongsfjord was 0.034µmol/l. The nitrite values varied from0.07µmol/l in station 1 to 0.01µmol/l in station 5. The mean value of nitrite in the outer fjord was 0.018µmol/l and that of inner fjord was 0.057µmol/l.

During the sampling period, the salinity showed a gradual increase from inner fjord to outer fjord. At station 1, minimum 31.42 ppt salinity was recorded and at station 7 and 5 maximum salinity of about 33.65 ppt was recorded. Average salinity at the inner station

was 31.43ppt and that of outer station was 33.61ppt. Salinity also showed an increasing trend towards the outer fjord.

The percentage of organic matter was found to be maximum at station 4 and 6 with 3.25% each. Least percentage of organic matter was found at station 1. Mean percentage of organic matter present in the Kongsfjorden system was found to be 2.73%. In the inner fjord, the organic matter occurred with a mean percentage of 2.16 %. In the outer fjord, the mean percentage of organic matter was found to be 3.15%. There is an increasing trend of organic matter towards the outer fjord. The total organic carbon varied from a lowest value of 8.69 g/kg in station 1 to a highest value of 16.49 g/kg in station 7. The mean value of total organic carbon in the Kongsfjorden system during the study period was 12.79g/kg. The mean value of total organic carbon in the inner fjord was 9.47g/kg and that of outer fjord was 15.28g/kg. Sediment pH varied from a lowest value of 6.66 in station 1 to a highest value of 7.39 in station 7. The mean value of sediment pH in the Kongsfjorden system during the study period was 7.12. The mean value of pH in the inner fjord was 6.92 and that of outer fjord was 7.27.Abiotic parameters of the sampling sites donot show much variation. (table.2).

Table.2 Abiotic parameters of sampling sites

Stations	Alkalinity (mg/l)	TOC (g/kg)	Moisture (%)	pH	Clay (%)	Sand (%)	Silt (%)
1	99	10.55	4.56	6.66	22.3	3.37	74.33
2	120	8.69	3.38	7.24	19.2	17.48	63.32
3	80	9.18	7.02	6.86	21.5	5.15	73.35
4	118	16.49	5.13	7.1	23	15.84	61.16
5	102	15.24	5.29	7.34	20.9	14.26	64.84
6	109	15.12	4.86	7.26	20.94	11.74	67.32
7	124	14.25	10.72	7.39	18	22	60

Meiofauna- Composition, abundance and diversity

The principal meiofauna groups recorded in the present study were Nematoda, Harpacticoid copepoda, Foraminifera, Polychaeta, Gastrotricha, Oligochaeta, Nauplii, Bivalvia and Ostracoda. Nematoda were the most dominant component in the collection followed by foraminifera.

Nematodes were the numerically dominant taxon at every station, constituting a minimum of 80.36% of total meiobenthic abundance. The abundance of other subdominant taxa, in the order of their abundance were, Foraminifera (13%), harpacticoids (up to 2%), Gastropoda (1 %), polychaetes (1%), bivalves, ostracods, nauplii and oligochaeta. The rest of the 4 taxa and the invertebrate eggs all had an average < 1 % (Fig. 3).

The relative abundance of the nematodes in the inner fjord was found to be

79.13% in the inner fjord and 80.67% in the outer fjord. In the case of foraminifers the inner fjord showed a relatively less number of live individuals as compared to the outer fjord. The relative abundance of foraminifers in the inner fjord was 11.61% and that of the outer fjord was 12.81%. The rest of the meiofauna was constituted by 9.24% in inner fjord and 6.50% in the outer fjord.

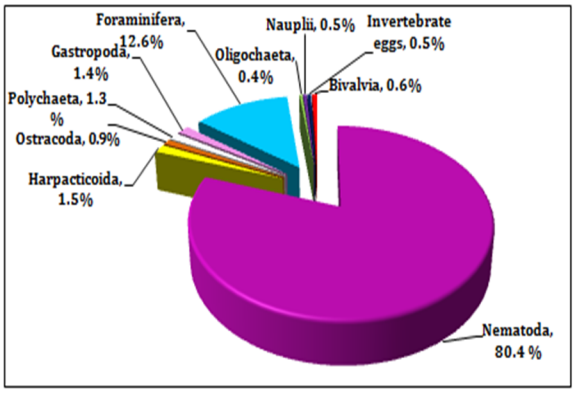

Fig.3 Mean percentage abundance of different meiofaunal taxa in Kongsfjorden fjord

Meiobenthic community structure and dynamics were analysed by means of number of taxa and density (mean number of individuals per 10 cm2). Average density of meiofaunal taxa in the inner fjord was found to be 64.86 ind. /10 cm2. As compared to that of the inner fjord, the mean density of the outer fjord was relatively higher with a mean value of 191.7 ind./ 10 cm2. Average density of nematodes in the inner fjord was 51.33 ind. /10 cm2 and that of outer fjord was 154.65 ind./ 10 cm2. Average density of foraminifers in the inner stations and outer stations are found to be 7.53 ind./ 10 cm2 and 24.51 ind./ 10 cm2 respectively. Among the remaining groups, only benthic harpacticoids had a mean density >2 ind./10 cm2 in the inner fjord. In the outer fjord, harpacticoid copepods, ostracods, polychaetes, and gastropods showed a mean density >2 ind./ 10 cm2.

The relative percentage abundance of meiofauna in each station was calculated. Out of the investigated areas, station 4 was comparatively most populated site followed by station 6. About 26.10% of the total meiofauna was collected from station 4 and about 25.24% of meiofauna was from station 6. The least populated sites were station 1 followed by station 2. Shannon diversity index (H) was highest in the station 5 (1.46) and lowest in the station 4 (0.869). Mean value for H' in the inner fjord was 1.12 and that of the outer fjord was 1.07. A decrease in the Shannon index values was found in stations 4 and 6. Evenness was more in the station 5 and less in station 6 with values 0.46 and 0.28 respectively. During the study period the average value for the species richness at the fjord was 1.29 with mean abundance 1.28 in the inner fjord and 1.3 in the outer fjord.

Bray Curtis analysis with SIMPROF grouped the samples clearly separated from each other, although the similarity between

the sites was greater than 65.73% in all cases. The stations 1 and 3 agglomerated in one main cluster with similarity level 88.64 %. (Fig.4). Station 4 and 6 clustered together at 88.77 % similarity. Station 5 formed a cluster with station 4 and 6 with 83.09% similarity. A distinct group of stations having similarity 81.53% (7 and 2) together formed a cluster with stations 4, 6 and 5 with similarity with 73.78%. The stations 2, 7 and stations 4, 6 and 5 were linked to the main cluster as separate groups. The cluster analysis showed that all stations close to the outer fjord are grouped together (4, 5, and 6). A similar shallow water stations near the glacial fjord (3 and 1) are clustered together. The grouping of stations observed in cluster analysis was in agreement with structure revealed by MDS (Kruskal and Wish 1978).

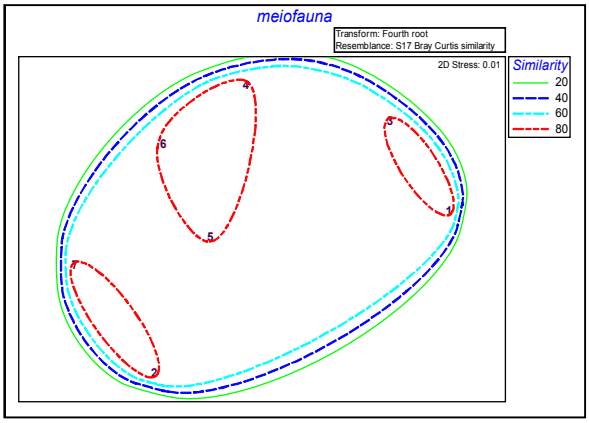

Fig. 4 MDS plot of Bray Curtis similarities of fourth root transformed data of meiofaunal abundance of Kongsfjorden fjord

The rank correlations of the biological (Bray-Curtis similarity) and environmental (Euclidean distance) matrices, were measured using the BIO-ENV procedure in Primer 6. Ten environmental variables were matched with the meiofaunal data. The measured environmental variables were: silt, clay and sand, total organic matter, sediment pH, water temp, salinity, organic matter, alkalinity and depth.

In this case clay, sand, pH, organic matter and alkalinity were featured as the major influential factors that control the distribution and abundance of meiofauna in the fjord systems. The associated coefficient of environmental to biotic similarity was 0.913 (table.3).

Table. 3 Best combinations of environmental variable with faunal distribution in Kongsfjorden fjord

S L no	No of variables	Spearman's Correlation	Best combinations
1	5	**0.913***	Clay, Sand, Sediment, pH, Organicmatter, Alkalinity
2	6	0.894	Silt, Sand, Sediment pH, Organic matter
3	4	0.887	Clay, Sand ,Sediment pH, Salinity
4	5	0.886	Clay, Sand, Sediment pH, Salinity,Organic matter
5	5	0.882	Silt Clay Sediment pH Organic matter Alkalinity

Discussion

A decrease in the diversity patterns of meiofaunal taxa in the study stations along the glacial bay was found. Meiofauna were largely composed of nematodes and foraminifers. Nematodes dominated about three fourth of the collected samples. Comparatively low abundance in the station

1 and 2 reflects that these stations are under the direct influence of freshwater outflow.

Nematoda, Harpacticoid copepoda, Foraminifera, Polychaeta, Gastrotricha, Oligochaeta, Nauplii, Bivalvia and Ostracoda were the nine taxa recorded in the present study. Malinga et al., (2005) recorded that nematodes, oligochaetes and turbellarians were numerically dominant among the meio benthic taxon throughout the fjord. The study by Pawlowska et al., (2011) revealed that in the Adventfjord, Spitsbergen (an arctic fjord) more than 90% of all individuals were represented by nematodes. Harpacticoids and polychaete larvae were other permanent components of the meiofauna, in that area. Similarity analyses grouped the fauna into inner fjord and outer fjord community. About 79.14% of the total meiofauna in the inner fjord was nematodes and 11.61% was foraminifers. Similarly about 80.67% of the fauna of outer fjord was nematodes and 12.82% foraminifers. The lowest meiofaunal density was recorded in the inner basin and the average meiofaunal abundance in the inner basin was relatively low and the abundance of meiofauna was high in the outer fjord during August 2011. In Kongsfjorden, Kotwicki et al. (2004) observed a similar decrease in the biodiversity and abundance towards the glacial bay.

Higher relative abundance was found at station 4, which was located in the transitional site between the inner and outer fjord. Similar patterns of decreasing density, biomass and biodiversity towards the active glaciers were observed by Gorlich et al. (1987) in the glacial bay of Hornsund (West Spitsbergen) and by Wlodarska-Kowalczuk et al. (1996) in the Skoddebukta (Franz Josef Land) as well as Tikhaia Bay (West Spitsbergen). These areas differ in the nature of basic environmental gradients driving the biotic pattern and processes.

The Kongsfjorden sediment is found to be a mixture of sandy clay and silt. According to Hop et al. (2002), glacial input of sediments into the fjord creates comparable changes in different areas in the fjord. Sediment instability in the fjord may influence their distribution. The BIOENV multivariate correlation procedure indicated that distribution and abundance of meiofaunal taxa were positively related to the clay, sand, sediment pH, organic matter and alkalinity. The density of meiofaunal community was found to be high in station 4 compared to other stations. The high faunal density may also have occurred because of

the high amount of organic detritus that settles on the sediment. Many studies have indicated that quantity and quality of the available food in the sediment and water has a direct influence on the density of meiofaunal communities (Mc Lachlan 1977; Montagna et al. 1983; Moreno et al. 2006). The concentration of total organic matter was also found to be higher in station 4. The highest faunal densities were observed in a transitional association between the glacial bay and the central basin (Wlodarska-Kowalczuk and Pearson 2003). A similar pattern of increasing density was found in the present study also.

In the glacial bay of Kongsfjorden, the density of the meiofauna is comparatively low with that outer basin with a value of 1 to 64 ind./10 cm2. It was also characterized by the low organic matter values. The decrease in the organic matter content in the inner fjord area may be associated with the intensive outflow from the Kongsbreen glacier (Grzelak and Kotwicki 2012). The studies of Zajaczkowski (2008) also agree with the above finding in that, the concentrations of the suspended mineral solids from the Kongsbreen is about 400 mg/l. The drastic accumulation and deposition of fine sediments containing very little organic matter reduced the meiofaunal population in the inner bay of Kongsfjorden.

The BIO-ENV analysis in relation to the environmental parameters showed the affinity of the meiobenthic communities towards the clayey sandy sediment, organic matter and alkalinity. Studies done on the anthropogenic area by Somerfield et al. in 1995 reported that meiofauna are more sensitive to sediment structure. Sedimentation has been shown to have a structuring effect on the distribution of macrobenthic communities (Gorlich et al. 1987; Wlodarska-Kowalczuk and Pearson, 2004; Wlodarska-Kowalczuk et al. 2005). Studies on the effect of environmental parameters and density of the meiofauna by Shirayama (1984) shown that, the organic carbon content (OC) has a significant effect on the density of meiobenthos. Studies conducted by Bijoy Nandan et al. 2013 indicate that the major functional groups of benthic fauna like nematodes, polychaetes and foraminifers play an important role in the community structure, organic enrichment and mineralization process. The results reported in the study support the hypothesis that environmental disturbances and sediment characteristics affect the meiofaunal distribution and thus can

be used as indicators of environmental changes.

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A STUDY ON MUDRA BANK AND ITS IMACT

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Abstract

The Micro Small Medium Enterprises (MSME) segment plays a significant role in the emergence of the Indian economy. In order to strengthen the MSME sector. In India known as MUDRA Bank will spur the growth of Indian MSME Sector and help them increase their contribution to Indian GDP from its current level of 38%. This bank will increase the confidence of educated or skilled youth who would now be able to aspire to become successful entrepreneurs. The paper highlights the importance and the role of MUDRA bank towards the MSME sector. The main objectives of MUDRA Bank are, to encourage entrepreneurs and small business units to expand their capabilities and operations, to reduce over indebtedness and to provide formal system of credit.

Keywords: *MFI's, MSME's, MUDRA, PMJ*

Introduction

The development of a nation depends on the development of entrepreneurship. Entrepreneurship is a distinct factor of production which contributes to the economic development of an economy. The economic progress of a country depends primarily on the successor failure of the entrepreneurial development in that country .In India most of the enterprises are belongs to micro small and medium enterprises .In the MSME sector there are a lot of scheduled castes, scheduled tribes and other backward class of entrepreneur. It is very difficult for them to get finance from the scheduled banks as they have to go through a tight scrutiny .So majority of them are forced to land with moneylenders..As a remedial measure for the situation our finance minister declared MUDRA YOJANA in parliament during union budget for the FY2016.The research paper stress on the study of MUDRA BANK and its impact on Indian economy.

Objectives

1. To study about MUDRA YOJANA

Methodology

The study is mainly descriptive in nature. Secondary data are used for the purpose of the study. Secondary data was collected from websites various articles, books and press releases

Limitations of the study

1. It mainly depends on secondary data.

Theoretical Framework

Micro-finance is an important tool in an economy like India where a million new workers are added to workforce every month especially in small businesses. These

businesses comprise about 5% of the economy. The performance of India's microfinance institutions is quite dismal. These institutions do not give loans beyond Rs.50,000 to a single person and the average amount given per account by Non-banking Financial Institution-Micro-finance institutions is Rs. 16,194. This figure is far below the funding requirements of first generation small entrepreneurs who are looking for amounts upto a few lakhs. India already has agencies which are involved in providing microfinance. These are:

National Housing Bank: It was set up in 1988 to refinance home loans and regulate housing finance companies

National Bank for Agriculture and Rural Development: It was set-up in 1982 by a law to regulate credit support, institutional development and encourage innovative initiatives in rural sector. It also promotes sustainable agricultural practices.

Small Industries Development Bank of India: It was set-up in 1990 to promote, finance and develop small and medium enterprises and provide them easy finance upto a limit of Rs. 1 Crore. Small Industries Development Bank of India is an independent financial institution aimed to aid the growth and development of micro, small and medium-scale enterprises (MSME) in India. Set up on April 2, 1990 through an act of parliament, it was incorporated initially as a wholly owned subsidiary of Industrial Development Bank of India. Currently the ownership is held by 33 Government of India owned / controlled institutions. Besides, it has been playing the development role in several ways such as support to micro-finance institutions for capacity building and on lending. It is the Principal Financial Institution for the Promotion, Financing and Development of the Micro, Small and Medium Enterprise (MSME) sector and for Co-ordination of the functions of the institutions engaged in similar activities.[2]

The business domain of SIDBI consists of Micro, Small and Medium Enterprises (MSMEs), which contribute significantly to the national economy in terms of production, employment and exports. MSME sector is an important pillar of Indian economy as it contributes greatly to the growth of Indian economy with a vast network of around 3 crores units, creating employment of about 7 crore, manufacturing more than 6,000 products, contributing about 45% to manufacturing output and about 40% of exports, directly and indirectly. In addition, SIDBI's assistance also flows to the service sector including transport, health care, tourism sectors etc.

In its endeavor towards holistic development of the MSME sector, SIDBI

adopts a 'Credit Plus' approach wherein, besides credit, the Bank also provides grant support for the Promotion and Development (P&D) of the sector to make it strong, vibrant and competitive. The P&D activities of the bank include Micro Enterprise Promotion, Entrepreneurship Development, Cluster Development, Capacity Building of the MSME Sector, promoting Responsible Finance among Micro Finance Institutions, Sustainable Finance to MSMEs including Energy Efficiency, Environment Protection, etc.

SIDBI also functions as a Nodal/ Implementing Agency to various ministries of Government of India viz., Ministry of MSME, Ministry of Textiles, Ministry of Commerce and Industry, Ministry of Food Processing and Industry, etc.

MUDRA Bank MUDRA stands for Micro Units Development and Refinance Agency. The MUDRA Bank will be set up through as statutory enactment. The lending priority will be given to SC/ST enterprises. The bank has been allotted a Refinance Fund of Rs. 20,000 crores from the shortfalls of Priority Sector Lending. It will regulate and refinance all MFI who lend to MSME engaged in small manufacturing, trade or services. It will partner all state/regional level coordinators to provide easy finance to even the remote investors

MUDRA Bank

Micro Units Development and Refinance Agency Bank (**MUDRA Bank**), is a new institution setup by the Government of India for development of micro units and refinance of MFIs to encourage entrepreneurship in India & provide the funding to the non corporate small business sector.

MUDRA Yojana had announced by the Finance Minister in Parliament during Union Budget for FY 2016.

MUDRA Bank will need two type of product like refinance for the micro units having loan requirement from Rs 50 thousands to 10 lakhs and support of Micro Finance Institutions (MFI) for on landing. MUDRA will refinance to micro business under the scheme of Pradhan Mantri MUDRA Yojana.

MUDRA Scheme/ Yojana

Under the guideline of Pradhan Mantri MUDRA Scheme, MUDRA Bank has launched its three initiative product and its name is SHISHU, KISHOR & TARUN to signify the stage of growth and funding needs of the micro units or entrepreneur.

MUDRA Bank is refinancing through State level institutions, MUDRA will deliver the loan through NBFCs, MFIs, Rural Banks, District Banks, Nationalize Banks,

Private Banks, Primary Lending Institutions and other intermediaries. Banks are charging around Base Rate + 1% to 7% minimum. The interest rate can be higher according to risk and customer profile and it can be different in all banks

There is no subsidy for the loan given under PMMY. However, if the loan proposal is linked some Government schemes, wherein the Government is providing capital subsidy, it will be eligible under PMMY also.

Eligible persons for MUDRA Bank Loan

Any Indian Citizen who are involve in income generating activity such as manufacturing, processing, trading or service sector and whose credit need is less than 10 lakhs can approach either a Banks, MFIs, Financial Institutions or NBFC for availing of MUDRA loans under Pradhan Mantri Mudra Yojana (PMMY). MUDRA Bank is not refinancing agriculture sector under PMMY but traders of vegetables & fruits covers under MUDRA Bank Schemes.

Recently Central Government decides to provide an additional fund of One Lakh crore to the market and it will be allocate according to below list.

40,000 Crore Rupee for Mudra Bank Shishu Loan Scheme.

35, 000 Crore Rupee for Mudra Bank Kishor Loan Scheme.

25, 000 Crore Rupee for Mudra Bank Tarun Loan Scheme.

List of Documents require for MUDRA LOAN

Proof of Identity:- Voter ID Card, Passport, Driving License, PAN Card, Signature identification from present bankers of proprietor, partner of director (if any company)

Proof of Residence:- Recent telephone bills, electricity bill, property tax receipt, Passport, Voter's ID Card of proprietor, partner of Director (If any company)proof of business of last three years (Audited or Unaudited) balance sheets of the units along with Income Tax/ Sales tax returns etc.

Objectives of the MUDRA Bank

1. Regulate the lender and the borrower of microfinance and bring stability to the microfinance system through regulation and inclusive participation.
2. Extend finance and credit support to Microfinance Institutions (MFI) and agencies that lend money to small businesses, retailers, self-help groups and individuals.
3. Register all MFIs and introduce a system of performance rating and accreditation for the first time. This will help last-mile borrowers of finance to evaluate and approach the MFI that

meets their requirement best and whose past record is most satisfactory. This will also introduce an element of competitiveness among the MFIs. The ultimate beneficiary will be the borrower.

4. Provide structured guidelines for the borrowers to follow to avoid failure of business or take corrective steps in time. MUDRA will help in laying down guidelines or acceptable procedures to be followed by the lenders to recover money in cases of default.
5. Develop the standardised covenants that will form the backbone of the last-mile business in future.
6. Offer a Credit Guarantee scheme for providing guarantees to loans being offered to micro businesses.
7. Introduce appropriate technologies to assist in the process of efficient lending, borrowing and monitoring of distributed capital.
8. Build a suitable framework under the Pradhan Mantri MUDRA Yojana for developing an efficient last-mile credit delivery system to small and micro businesses.

Mudra Loan Mela

The government is organising MUDRA loan melas in different parts of the country. These melas are organised for few days where loans for small business funding could be applied. In the melas, loans are granted ranging from Rs. 50,000 to Rs. 10 lakh.

Benefits of MUDRA Yojana

First off, no necessary collateral or loan application fee is required to place an application for loan. Apart from this, another key feature of this scheme is that its interest rate is only 1%. With such key features , easy access, systematic guidelines and low cost of finance, this will indeed help the small businesses and entrepreneurs from lower income groups to develop and grow and increase their social upward mobility and in turn develop the country's economy as well.

Impact of government on Mudra bank

The Government of India with the launch of the MUDRA bank regulate micro-finance institutions, promote their growth, add to the country's output and create jobs. It would allocate Rs 20,000 crore through Micro Units Development Refinance Agency (MUDRA) Bank for the SME sector and will enhance credit facility to boost the growth of small businesses and manufacturing units. The government has proposed and launched numerous initiatives which focus solely on small scale enterprises. Recognizing the

national imperative of financial inclusion, the government introduced the Micro Units Development and Refinance Agency (MUDRA) Bank during the budget announcement of 2015-16. With only 4 percent of micro, small and medium enterprises (MSMEs) falling within the purview of the Indian banking system, the Bank has been launched with the aim of funding the unfunded across the country. Budget 2015-16 has proposed to create a Micro Units Development Refinance Agency (MUDRA) Bank, with a corpus of Rs. 20,000 crore, and credit guarantee corpus of Rs. 3,000 crore to enhance credit for SMEs. "MUDRA Bank to be set up for small and medium enterprises (SMEs) in lending priority was given to SC/ST enterprises," MUDRA Bank will refinance Micro-Finance Institutions through a Pradhan Mantri Mudra Yojana. In lending, priority will be given to SC/ST enterprises. Rs 1,000 crore also allocated for National skills Mission for more job creations which will also lead young generations to be first generations entrepreneurs.

Conclusion

When coming to the culmination of the study it can be noted that Mudra bank provides a great encouragement and support to, helping in uplifting them and paving the path for the entrepreneurs ,which also can be presented as great and valuable role model for other countires in the world truely provides an honest belief to us that the Mudra bank will achieve its objectives in the near future.

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HOW PEPPER CULTIVATION IN KERALA CAN BE COST EFFECTIVE IN THE POST LIBERALISATION PERIOD?

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Abstract

Kerala enjoys certain geographical advantages for the cultivation of black pepper. Pepper is rightly known as the 'King of Spices' and is one of the best known spices in the world. Cultivation of black pepper directly and indirectly stood as a major source of income to a large majority of rural farmers in the state. Trends in production, export and export unit price of black pepper can influence the well being of the cultivators. The extent of our export earnings is also significantly influenced by our pepper exports and its unit prices. Pepper is a perennial crop and the initial cost of pepper cultivation is high. Pepper cultivation involves high investment compared to other seasonal and annual crops. Price and price stability assumes more significance. Remunerative and steady price is required for increasing the production. Wide fluctuations in price level may discourage farmers from taking up large scale investment to improve productivity. In this context, as a part of this study, an attempt is to examine the economics of pepper cultivation by considering the cost of cultivation and the yield of the farmers.

Keywords: *Spices, Black Pepper, Establishment Cost, Maintenance Cost, Benefit Cost Ratio (BCR)*

Introduction

The history of Kerala is also closely linked with the trade of spices. This region is historically known for its spices plantations. The state has a rich and glorious past in the production and trade of many spices particularly black pepper. Several spices, which are cultivated like pepper, cardamom, ginger, turmeric, clove, nutmeg etc, give fragrance to the agricultural economy of the state.

Kerala spices acquired a wide fame across the world for its aroma and flavour. The spice production basket of the state includes 'major spices' such as pepper, cardamom, ginger and turmeric. In olden times foreigners came to this land to carry away the aromatic spices to their markets. The landing of Vasco da Gama opened a new episode in the history of Kerala. The arrival of Portuguese was followed by the Dutch, British and the French, which have also created new land marks in the history of the state. Kerala enjoys certain geographical advantages for the cultivation of black pepper. Pepper is rightly known as the 'King of Spices' and is one of the best known spices in the world. Kerala's pepper has a unique flavour and hence it has great demand in Middle East, Russia and Japan.

Relevance of the Study

In this globalised economic world, under the WTO agreements, spices pepper economy of Kerala requires a broad based development. Development of pepper industry can play a critical role in enhancing income, employment and export earnings of the state. In this context, there is a need to prepare our pepper industry for the global competition with cost–effective production and management. It is supposed to benefit Kerala, in terms of increasing the exports of our valuable black pepper. The opening up of agricultural trade should be looked at as a major opportunity for raising the export earnings by exploiting our competitiveness as well as comparative advantage in pepper cultivation. Kerala is the leading producer of black pepper in India. The present study has relevance in the globalised trade realm.

Cultivation of black pepper directly and indirectly stood as a major source of income to a large majority of rural farmers in the state. Trends in production, export and export unit price of black pepper can influence the well being of the cultivators. The extent of our export earnings is also significantly influenced by our pepper exports and its unit prices. Trade policies of the government can influence the trade of black pepper in many ways. It will have decisive effects on the destiny of the pepper growers who hopefully expect remunerative prices for their products always.

Remunerative and steady price is required for increasing the production. Pepper cultivation involves high investment compared to other seasonal and annual crops. Price and price stability assumes more significance. Wide fluctuations in price level may discourage farmers from taking up large scale investment to improve productivity. In this context, as a part of this study, an attempt is made to examine the economics of pepper cultivation after the globalisation and trade liberalisation under WTO regime. The study of price behaviour of black pepper is also relevant in this context. All the matter point out to the need for providing adequate agricultural finance to the pepper growers of the State. Easily accessible agricultural credit at a rational rate of interest can assure a pleasing life to the pepper growers.

Review of literature

Santha Kumar, V and Narayanan Nair, K (1999) have found that the agro climatic factors are conducive for growing a number of crops like pepper and cardamom in Kerala and such advantage is not there in several other states. The agro-climatic

features have determined the crop set in particular areas and the farmers have chosen particular cropping patterns.

Economic review (2002) has stated that international prices of agricultural commodities are characterized by high volatility which is a crucial factor for the trade policy and the strategy under WTO obligation. Quantitative Restrictions (QRs) cannot be used to check imports and price shocks in future. The world prices of almost all agricultural commodities have witnessed a steep decline after experiencing a boom in the end of 1990s. The need for a price stabilisation fund is significant in this context.

Srijit Mishra (2008) has assessed that in recent years the incidence of farmer's suicides in India has increased. According to him the farmers are price takers in the product as well as in the input markets. Such a situation could lead to increase in input costs and decrease in output prices, and hence, decline in profitability and returns from cultivation.

Lathika (2009) has stated that the agricultural sector of Kerala has undergone tremendous changes in terms of cropping pattern and ownership of land during the pre and post liberalisation periods. Traditionally crop choice of the farmers was ruled by comparative advantage considerations, which are chiefly governed by productivity of crop and domestic price of in puts and out put. But liberalisation process has made the competitive advantage as the dictating factor, along with other factors such as international variations in prices and change in subsidies.

Manjunath (2011) has observed that the number of farmers committing suicide in our country in the last fifteen years is more than the number of soldiers dying on the war front of our country. It is estimated that more than two lakh farmers committed suicide in India in the last fifteen years. It was strange that for a country that is mostly agrarian, policy makers were not worried about small farmers.

Swaminathan (2011) has assessed that the agricultural packages have not been successful in Wayanad district, unlike those in Alappuzha and Idukki. Wayanad, Kasargode and Palakkad were first identified as agrarian distress districts in Kerala and Alappuzha and Idukki were added later. Wayanad required a much more integrated planning, as the land use in the district was mainly for plantation crops. The problem with plantation crops is that their market primarily depends up on the international

markets and global prices that are highly volatile.

Cost and Profitability Aspects of Pepper Cultivation in the Era of Globalisation

Globalisation process and the establishment of World Trade Organisation (WTO) have influenced global trade in many ways. Various trade related agreements under WTO and removal of the Quantitative Restrictions (QRs) on trade in agricultural commodities and agro based industries have become a matter of debate and discussion in the economic and political groups. Kerala contributes a major share in the export of black pepper from India. But the volume of trade, receipts from trade and product prices are fluctuating. On the other hand the cost of pepper cultivation is mounting up and it makes a challenging situation to the pepper growers in the state. This has created some problems in the pepper economy of Kerala.

Both the media and the academic world have created lively discussions about the serious crisis that has emerged in the farm sector. It is a fact that many of the farmers cultivating pepper are in distress. Farmers are unable to depend fully on their cultivation for their livelihood. Due to various reasons farming has become unprofitable and many of the cultivators are leaving their farm fields. 'Non profitability of agriculture with soaring costs pulled the farmers to bankruptcy. Massive suicide of farmers marked a symbol of present agricultural crisis in Kerala' (Rajendran Nair, 2009). The increased number of farmer's suicides in the economy has generated a lively debate on the benefits and pitfalls of the process of globalisation and liberalisation. According to the State Farmers Debt Relief Commission there were 89 suicides by the farmers in the Idukki District, which is major pepper producing District in Kerala, during the period 2000-2006. Trade liberalisation has increased farmers' distress and the number of their suicides (K.N.Nair and Vineetha Menon, 2007).

Recently, the prices of various spices are fluctuating in a greater manner. During the post WTO regime the magnitude of price risk has increased. Recently, the fluctuations that occurred in the price of pepper were severe. On the other side, the cost of pepper cultivation is escalating year after year. The fog of distress is surrounding the pepper farmers mainly due to these reasons. Both the supply and demand side factors are responsible for the price variations. It is argued that the fall in price is due to the import export policies adopted by the central government as a part of globalisation process

or as a member country of WTO. In this context it is worthwhile to examine that to what extent the globalisation process and WTO regime have influenced our spices production and trade especially in the case of pepper. The prominent question is that whether the pepper economy of the state and the farmers are capable and prepared to face the challenges emerged in relation to globalisation process. It may be useful for the agro sector and farmers, if they are getting proper suggestions to reap the benefits of trade liberalisation and globalisation policies. This study is an attempt to examine the cost and profitability aspects of pepper cultivation and the need for agricultural credit for assuring a decent life to the farmer.

Objectives of the Study

The important objectives of the study are:

- To evaluate the cost and profitability of pepper cultivation in Kerala.
- To analyse the problems faced by pepper cultivators as a result of globalisation.

Methodology of the study

The study was conducted on the basis of both primary and secondary data. Trends in area, production and productivity of spices, trends in the quantity of spices exports and export earnings, direction of trade were studied by using secondary data. The main sources of secondary data were Spices Board, India, Cochin and the Data Base of International Pepper Community (IPC). The other sources were Department of Economics and Statistics, Trivandrum, Directorate of Areca nut and Spices Development, Calicut and the International Pepper Community, Jakarta. Various issues of the Economic Review, Economic Survey, Spices Export Review, Annual Reports of Spices Board India and the Annual Reports of the Cochin Chamber of Commerce and Industry (CCCI), Cochin were also used for the study.

Cost and profitability aspects of pepper cultivation, price spread of pepper, problems related to pepper cultivation and its marketing were studied with primary data. Primary data were collected through a sample survey method, by using a well structured interview schedule. The interview schedule has been prepared in accordance with the objectives of the study. The primary data regarding pepper growers and local pepper merchants were collected from five selected Grama Panchayaths of Idukki district, namely Vathikudi, Konnathadi, Nedumkandam, Kattappana, and Upputhara. Idukki district was selected purposely for the study because it

covers major part of the area under pepper cultivation in Kerala. These five Grama Panchayaths were also selected purposely on the basis of the largest area under pepper cultivation. These Grama Panchayaths have maximum production potential in pepper. A sample of 200 pepper growers was selected from these five Grama Panchayaths.

Tools of Analysis

1. **Compound Growth Rate-** The Compound Growth Rate (CGR) with regard to area, production and productivity has been estimated on the basis of the semi-log or exponential function

   Log Y = a + bT

   Where Y = Area /Production / Productivity

   T = Time

   'a' and 'b' are the parameters to be estimated Compound Growth Rate = {(anti log b-1) x 100}

2. **Instability Index-** In order to measure the degree of instability in the price of pepper, in various series during the pre and post globalisation periods, the following instability index method was employed.

   1/n E t=1 [(I Y (t) – p (t) I) / p (t)] ×100

   Where Y (t) is the observed magnitude of the variable

   p (t) is the magnitude estimated by fitting an exponential trend to the observed value and

   n = the number of observations.

3. **Benefit-Cost Ratio-** The Benefit-Cost Ratio (BCR) of pepper cultivation was calculated by estimating different types of costs of incurred and the return realised by the farmers per hectare. Benefit-cost ratio was calculated by using the following equation.

   B C Ratio = Benefit / Cost of Cultivation.

4. **Estimation of Cost Items-** The cost of cultivation was worked out in terms of the cost involved per one hectare of land. It is assumed that the standard number of plants per hectare is thousand.

The cost of cultivation of pepper was studied by using two approaches namely; 1) Establishment Cost and 2) Maintenance Cost.

5. **Cost Concepts Used for the Study** In order to calculate the cost of cultivation of pepper per hectare, the standard cost concepts Cost-A, Cost-B and Cost-C which are used in farm management studies are used.

Cost-A refers to all paid out expenditure. It include the cost of hired human labour, value of pepper vines and standards, value of fertilizers, manure and plant protection chemicals, depreciation of farm implements and machinery, interest on working capital and land revenue.

Cost-B refers to Cost-A + imputed rental value of land + interest on fixed capital and amortised establishment cost.

Cost-C refers to Cost-B + imputed value of family labour.

Leading Pepper Cultivating Countries of the world

Spices statistics show that pepper is cultivated in around 40 countries. Pepper (piper spp.) category as per FAO definition includes black pepper, white pepper and long pepper. World production of pepper during 2010 was 396.13 thousand tonnes. Details are given in table-1

Table: 1 Leading Producers of Pepper During 2014 (Area in hectares and production in tonnes)

Sl.no	Country	Area	Share in per cent	Production	Share in per cent
1	Vietnam	44430	9.35	111200	28.07
2	Indonesia	103900	21.88	56300	14.21
3	India	195920	41.25	51020	12.88
4	Brazil	22912	4.82	50086	12.64
5	Malaysia	13500	2.84	29700	7.50
6	Others	94286	19.85	97828	24.70
TOTAL		**474948**	**100.00**	**396134**	**100.00**

(Source: International Pepper Community)

Vietnam is the largest producer of pepper in the world. During 2010 their share in the world pepper production was 28.07 per cent, followed by Indonesia (14.21 per cent), India (12.88 per cent), Brazil (12.64 per cent) and Malaysia (7.50 per cent) respectively. The area under pepper was largest in India and it constituted 41.25 per cent of the total. Vietnam's share in respect of area was only 9.35 per cent. Recently their annual production of pepper is higher than one lakh tonnes.

Like in the production front, Vietnam has become the largest exporter of pepper in the international market. Their annual pepper production is almost double than that of India. During 2010 Vietnam exported 116.86 thousand tonnes of pepper valued at US $ 421.40 million. The export share of Vietnam was 34.05 per cent in terms of quantity and 32.15 per cent in terms of value. Indonesia was the second largest exporter of pepper. India's export share was around 7.53 per cent in terms of quantity and 6 per cent in terms of value. Compared to the previous year 2009, India's export share both in terms of volume and value has declined and that of Vietnam increased. In 2009 the export share of India in the international pepper market was 7.65 per cent and 6.71 per cent in terms of volume and value respectively. The export

share of principal pepper producing countries are illustrated in table-2

Table-2 Top Exporters of Black Pepper (Quantity in tonnes and value in US $ 1000)

Sl.no	Country	Export quantity	Share in per cent	Export Value	Share in per cent
1	Vietnam	116859	34.05	421403	32.15
2	Indonesia	62599	18.24	245924	18.76
3	Brazil	30761	8.96	108202	8.25
4	India	25847	7.53	78716	6.00
5	Malaysia	14107	4.11	62112	4.74
6	Others	92976	27.09	394573	30.10
TOTAL		343149	100.00	1310930	100

(Source: International Pepper Community)

Cost Aspects of Pepper Cultivation

Pepper crop is a major source of income and employment in Kerala which is the principal pepper growing state in the country. In Kerala more than 2.5 lakh farm families are involved in pepper cultivation. During the last three decades, which is from 1981 to 2010, Kerala's annual average production of pepper was more than 90 per cent of the total pepper production in the country. Idukki and Wayanad are the two major pepper producing districts in the state. The estimated area under pepper in the state during 2009-2010 was 171489 hectares and the estimated production was 42459 tonnes. In Idukki district the total area under pepper cultivation during the year 2009-2010 was 85739 hectares and production was 25472 tonnes. During this period, the share of Idukki district in the state's pepper economy was 50 per cent in area and 60 per cent in production.

Pepper is a major source of income of the majority of the farmers and it constitutes around 20 per cent of the agricultural income of the district. Pepper is grown virtually in every farm holding or homestead garden and therefore deeply associated with income and livelihood of majority of farmers. Pepper cultivation system in the district shows that it is being cultivated as a back yard crop in every compound, as a mixed or intercrop. It is cultivated as a mixed crop on shade trees in cardamom, coffee and tea plantations. But the area under pepper as a pure crop is very limited and it is only in small pockets. Neelamundi is the important type of cultivar cultivated in the district. Other major traditional varieties that are cultivated include Karimunda, Kuthiravalli, Narayakodi, Chenganooran etc.

In order to obtain a clear picture about the profitability of pepper cultivators, an attempt to assess the cost of cultivation of pepper is essential. Cost of cultivation implies that total amount of expenses incurred for cultivating pepper in one hectare of land. Pepper is a perennial crop. The usual life span of pepper plant is expected to be around twenty five years.The cost of cultivation was worked out in terms of the cost involved per one hectare of land. It is

assumed that the standard number of plants per hectare is thousand. The cost of cultivation of pepper was studied by using two approaches namely: A) Establishment cost and B) Maintenance cost.

A. Establishment Cost

Establishment cost is the cost incurred during the first three years of pepper plantation. The costs incurred under this category comprises land preparation, digging of pits, planting, plant protection measures, inter cultural operations, cost of vines, standards, plant protecting chemicals, and other miscellaneous expenses. The cost incurred during the establishment period is broadly classified into two such as variable cost and fixed cost.

1. **Variable cost-** Variable cost includes two items of costs such as labour cost and material cost.

   a. Labour cost: This item of cost includes expenses incurred for the preparation of land, opening of pits, planting of standards and pepper vines, plant protection measures, application of manure and fertilisers, inter cultural operations and other plant protection operations, including miscellaneous works. Labour used for these cultivation practices include both hired labour and family labour. Hired labour means labour hired from outside on payment of wages. Hired labour includes both male and female workers and their wages were also different. Labour cost was computed on the basis of the actual wage paid by the cultivators in the study area. During the survey period February 2009 to May 2009, the overall average wage of male workers was Rs.296.20 and that of female workers was Rs.170 per day. Wages were different in each of the three groups of small, medium and large farmers. These wage rates were considered for imputing the cost of family labour in each group.

   b. Material cost: It included the cost of standards, vines, manure, fertiliser, plant protecting chemicals etc. The cost of various planting materials such as pepper vines and standards were assessed on the basis of information provided by the farmers. Remaining material costs covered in this category were expenditure on fertilisers, plant protection chemicals and farm yard manure.

   c. Interest on working capital: Interest on working capital was calculated at the rate of 8.5 per cent per annum.

   d. Interest on fixed capital: Interest on fixed capital was computed at the rate of 9.5 per cent per annum.

2. **Fixed Costs**: It includes the rental value of owned land, land tax, depreciation cost and amortised establishment cost.

a. Land tax: Land tax paid by the cultivators during the survey period was considered for the study.

b. Rental value of owned land: In this study the rental value of owned land has been considered as 1/7 of the value of the average gross produce of the crop.

c. Depreciation cost: It was worked out to meet the wear and tear of farm assets like tools and equipments used for pepper cultivation. It was calculated at the rate of 20 per cent by using the straight line method.

d. Amortised establishment cost: The total establishment cost up to the bearing age was apportioned over a period of 25 years as it is the normal economic life span of pepper plants.

B. Maintenance Cost (Cost Incurred During the Bearing Period)

The cost of cultivation incurred annually during the bearing period is labeled as the maintenance cost. It includes all the costs incurred by the farmer annually for the maintenance of pepper plants and crop harvesting from the fourth year onwards. The maintenance cost was also broadly classified into variable cost and fixed cost. The variable cost incorporated the cost of fertiliser, manure, plant protection chemicals and cost of labour incurred for various farm activities including harvesting.

Establishment Cost of Pepper Plants at the Aggregate Level

The establishment cost of pepper plants in the case of aggregate level revealed that the total expenditure incurred for the initial three years period was Rs. 99287.58 per hectare. Out of this Rs. 35569.21 (35.82 per cent) was labour cost. Total material cost was Rs. 23647.08 (23.82 per cent). Thus the total variable cost was Rs. 64249.69 (64.71 per cent). Total fixed cost was Rs. 35037.90 (35.29 per cent). The annual expenditure incurred during the first year was Rs.45246.08, second year Rs. 26130.85 and in the third year Rs. 27910.66. The expenditure was highest during the first year which constituted 45.57 per cent of the total establishment cost. During the second and the third year the share of annual expenditure was more or less the same as 26.32 per cent and 28.11 per cent respectively.

The analysis of the cost incurred in the first year has shown that the maximum cost was incurred for labour input which was 42.30 per cent of the total expenditure. This higher percentage of labour cost was

attributed to the principal operations undertaken in the land in connection with the planting of pepper vines. The contribution of hired labour was much more than those of family labour. After the labour cost, the next important items of costs were the cost of planting materials such as standards and pepper vines. The cost of pepper standards and vines were 10.95 per cent and 6.35 respectively. The share of manure and fertilisers in the total establishment cost was only 12.26 per cent. The imputed rental value of land was 30.22 per cent of the establishment cost.

The item wise distribution of the establishment cost of the pepper plants per hectare at the aggregate level is illustrated in table 3

Table-3 Establishment Cost of Pepper Plants at the Aggregate Level **(Rs. /hectare)**

Sl.no	Item	I Year	II Year	III Year	Total
1	**Variable Cost**				
A	**Labour Cost**				
1	Land preparation	2864.24 (6.33)	0.00 (0)	0 (0)	2864.24 (2.88)
2	Opening of pits	3829.11 (8.46)	341.15 (1.31)	0 (0)	4170.26 (4.20)
3	Planting	3187.52 (7.04)	0.00 (0)	0 (0)	3187.52 (3.21)
4	Plant protection measures	1605.48 (3.55)	140.61 (0.54)	0 (0)	1746.09 (1.76)
5	Manure & Fertiliser application	2395.29 (5.29)	2082.92 (7.97)	2902.66 (10.40)	7380.87 (7.43)
6	Inter cultural operation	2694.41 (5.96)	2528.02 (9.67)	2951.15 (10.57)	8173.58 (8.23)
7	Plant protection operations	1996.06 (4.41)	2196.58 (8.41)	2293.47 (8.22)	6486.12 (6.53)
8	Miscellaneous	569.05 (1.26)	475.98 (1.82)	515.5 (1.85)	1560.53 (1.57)
Total Labour Cost (A)		**19141.16 (42.30)**	**7765.27 (29.72)**	**8662.78 (31.04)**	**35569.21 (35.82)**
B	**Material Cost**				
1	Standards	4954.19 (10.95)	430.07 (1.65)	0 (0)	5384.26 (5.42)
2	Vines	2871.83 (6.35)	249.43 (0.95)	0 (0)	3121.26 (3.14)
3	Manure	3514.58 (7.77)	3048.14 (11.66)	3757.36 (13.46)	10320.08 (10.39)
4	Fertiliser	0.00 (0)	738.67 (2.83)	1113.56 (3.99)	1852.23 (1.87)
5	Plant protection chemicals	0.00 (0)	852.00 (3.26)	1071.26 (3.84)	1923.26 (1.94)
6	Others	444.16 (0.98)	257.69 (0.99)	344.14 (1.23)	1045.99 (1.05)
Total Material Cost (B)		**11784.76 (26.05)**	**5576.01 (21.34)**	**6286.32 (22.52)**	**23647.08 (23.82)**
Interest on working capital@8.5%		2628.70 (5.81)	1134.01 (4.34)	1270.68 (4.55)	5033.39 (5.07)
Total Variable Cost(A+B)		**33554.62 (74.16)**	**14475.28 (55.40)**	**16219.78 (58.11)**	**64249.69 (64.71)**
II	**Fixed Cost**				
1	Rental value of land	10000.00 (22.10)	10000.00 (38.27)	10000 (35.83)	30000 (30.22)
2	Land tax	100.00 (0.22)	100.00 (0.38)	100 (0.36)	300 (0.30)
3	Depreciation	577.13 (1.28)	544.35 (2.08)	576.60 (2.07)	1698.08 (1.71)
4	Interest on fixed capital@ 9.5%	1014.33 (2.24)	1011.22 (3.87)	1014.27 (3.63)	3039.82 (3.06)
Total Fixed Cost		**11691.45 (25.84)**	**11655.57 (44.60)**	**11690.88 (41.89)**	**35037.9 (35.29)**
TOTAL (I+II)		**45246.08 (45.57)**	**26130.85 (26.32)**	**27910.66 (28.11)**	**99287.58 (100.00)**

(Source: Compiled from survey data)
(Figures in parenthesis represent the percentage values)

Table-4 Cost and Profit Analysis of Pepper Cultivation by Using the Concepts of Cost-A, Cost-B and Cost-C

(Rs. /hectare)

Particulars	Group-A	Group-B	Group-C	Average
Cost-A	20414.86	28465.90	29352.92	26077.89
Cost-B	35646.07	43999.72	44680.82	41442.20
Cost-C	46240.37	50382.77	48791.30	48471.48
Cost of production (Rs. / kg.)	110.29	105.77	106.88	107.55
Yield (kg./ hect)	419.25	476.35	456.50	450.70
Gross returns (Rs./ hect)	51462.94	58471.96	56035.38	55323.43
Farm business income (Profit at Cost-A)	31048.08	30006.06	26682.46	29245.54
Farm labour income (Profit at Cost-B)	15816.87	14472.24	11354.56	13881.23
Net income (Profit at Cost- C)	5222.57	8089.19	7244.08	6851.94

(Source: Compiled from survey data)

Benefit Cost Ratio of Pepper Cultivation

The Benefit Cost Ratio (BCR) of pepper cultivation was calculated by estimating different types of costs incurred and the return realised by the farmers per hectare. Benefit Cost Ratio was calculated by using the following formula.

B C Ratio = Benefit / Cost of Cultivation

On the basis of the concepts Cost-A, Cost-B and Cost-C the Benefit Cost Ratio of different groups of farmers were estimated. Benefit Cost Ratio at Cost-C was higher in Group- B and lower in Group-A. However,

BCR at Cost-A was highest among small farmers, which signified that small farmers were using more family labour for pepper cultivation. The summery of the findings are furnished in table 5.

Table 5 Benefit Cost Ratio of Pepper Cultivation

Particulars	Group-A	Group-B	Group-C	Average
BCR @ Cost-A	2.52	2.05	1.91	2.12
BCR @ Cost-B	1.44	1.33	1.25	1.33
BCR @ Cost-C	**1.11**	**1.16**	**1.15**	**1.14**

(Source: Compiled from survey data)

Need for Agricultural Credit to the Pepper Cultivators

Pepper is a perennial crop. It requires a huge initial investment for planting he pepper vines. After that proper care is needed annually. Pepper can be grown as a companion crop in the existing tree crops and as well as in homestead by using live or dead standards. The pepper plant is a climber and hence it needs support of some other plant (known as standard) to climb. Arecanut, jack, mango, 'murikku' and 'kalasu' trees are commonly used as standards for pepper cultivation.

The young pepper plants should be protected from hot sun during the summer. In order to protect the plant artificial shade should be given. Frequent watering is essential during the first three years of plant's growth. As the plant grows the shoots are tied to standard as and when required. The practice of lowering of the vines after one year's growth can promote the lateral branch production.

Pepper is a sensitive crop which requires special care of the soil. Careful maintenance is essential for getting reasonable yield. Weeding and light digging are practiced at the time of manure and fertiliser application. Timely weeding and cleaning at the base region of pepper plants are done depending upon the weed growth. After weeding and digging the base should be covered with mulch. As a part of the plant protection mulching is inevitable during the summer period. Disease affected vines should be removed from the farm fields for controlling the spread of pests and diseases. Manure and fertiliser application for pepper plants is to be done for its proper establishment and growth and the farmers are usually practicing it twice a year. The survey findings have revealed that more than 80 % of the farmers are in debt and the interest rate paid by them is more than 12 %. According to them the provision for getting agricultural loans is limited. Various co-operative socitei are providing only a maximum of Rs 10,000 as agricultural loans. The most important aspect noticed in this study is that more than 50 % of the pepper plants grown by the farmers is aged over 25 Years. The yield from these pepper plants will be very low. Therefore the urgent thing that is needed is the replanting of existing old pepper plants. It requires huge investment. In this context the pepper cultivating farmers are in need for adequate agricultural credit at a rational rate. Then only the farmers can obtain a reasonable

return from pepper cultivation. Such an effort from the concerned authorities such as department of Agriculture and Nationalised banks is urgently needed. No doubt that sufficient availability of agricultural credit can play a vital role in supporting agricultural production of black pepper production in the state. Availability and access to adequate, timely and low cost credit from institutional sources is of great importance especially to small and marginal pepper growers. According to the opinion of the pepper cultivators, the flow of credit to the agriculture sector failed to exhibit any appreciable improvement due mainly to the fact that commercial banks were not tuned to the needs and requirements of the small and marginal pepper cultivators, while the co-operatives, on the other hand, lacked resources to meet the expected demand.

Usually pepper is cultivated as a mixed crop in both areca and coconut plantations. The price of pepper in the market has gone up to Rs.600 from Rs.300 in 2015. A healthy lone pepper creeper gives about 3 to 4 kg of pepper and a normal pepper creeper will fetch about 1.5 kg to 2 kg of black pepper. There is not much agriculture labour involved in managing black pepper creepers. Water logging enables cultivators to get a higher yield. A disease that attacks black pepper creeper is wilt - a fungal disease. This wilt can be treated effectively with trychoderma - an organism that should be mixed with organic manure. This mixture should be given to the roots of the creeper before the commencement of the rainy season either in May or June or after the rainy season during September or October. This mixture has an antagonistic effect and sustains the creeper well. The processing of black pepper is neither expensive nor much labour intense. Right from harvesting to processing, the work takes only a day or two besides requiring just two labourers at the most. Since pepper is used worldwide, farmers can think of exporting better quality dried black pepper. They can store the pepper longer to reap profits.

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THE EXPORT PERFORMANCE OF SPECIAL ECONOMIC ZONE IN KERALA, A CASE STUDY OF COCHIN SPECIAL ECONOMIC ZONE

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Abstract

EPZs are special enclaves, separated from the Domestic Tariff Area (DTA) by fiscal barriers and are intended to provide an internationally competitive duty free environment for export production at low cost. India was one of the first in Asia to recognize the effectiveness of the Export Processing Zone (EPZ) model in promoting exports, with Asia's first EPZ set up in Kandla in 1965. With a view to overcome the shortcomings experienced on account of the multiplicity of controls and clearances; absence of world-class infrastructure, and an unstable fiscal regime and with a view to attract larger foreign investments in India, the Special Economic Zones (SEZs) Policy was announced in April 2000. The first Export Processing Zone in Kerala was set up in 1986 later it was converted as Special Economic Zone in 2000. This study gives brief overview and the need for SEZ concept. Later this paper gives an introduction about the CSEZ and also tries to analyze the export performance of Cochin Special Economic Zone (CSEZ) on an aggregate level and disaggregate level by making a sector wise analysis. Unit level study about the CSEZ also made in order to analyze the Unit-Output Ratios.

Keywords: *Special Economic Zone, Export Performance, Unit output Ratio, CSEZ*

In the globalized era, many developed countries have embraced the Special economic (SEZ) concept as a channel to switch their growth policy of import substitution to export promotion activities. The SEZs are considered as growth engines which can boost manufacturing, augment exports and generate employment. Existing studies have shown that EPZs have helped promote foreign direct investment and an export-oriented industrialisation strategy in many developing countries in Asia, Latin America and Africa (Agarwal 2007). Components of a Special Economic Zone include infrastructural facilities like roads, airports, ports, transport system, generation and distribution of power, telecom, hospitals, hotels, educational institutions, leisure and entertainment units, residential/ industrial/ commercial complexes, water supply sanitation and sewerage system and any other facility required for development of the Zone.

SEZs contribute to diversification through two pathways: First, by attracting manufacturing activities to predominantly resource-based developing countries, SEZs add to the diversity of economic activities just through their very existence. And

second, SEZs can stimulate the mainland economy through productive linkages.

SEZ are demarcated geographic areas contained within a country's national boundaries where the rules of business are different from those that prevail in the national territory. These differential rules principally deal with investment conditions, international trade and customs, taxation, and the regulatory environment; whereby the zone is given a business environment that is bintended to be more liberal from a policy perspective and more effective from an administrative perspective than that of the national territory. (Farole 2011)

According to the International Labour Organization (ILO), *Special economic zones are industrial zones with special incentives set up to attract foreign investors, in which imported materials undergo some degree of processing before being exported again(ILO 1998)*

A Special Economic Zone (SEZ) or Free Trade Zone (FTZ) is typically an enclave of units operating in a well-defined area within the geographical boundary of a country where certain economic activities are promoted by a set of policy measures that are not generally applicable to the rest of the country.

SEZ's create immense employment opportunities. The setting up of SEZ's creates lot of indirect employment in terms of labour required. Then after the completion it enables employment in the relevant industries operating in the SEZ. Then there are lots of indirect employments generated wherein people start investing around SEZ. For example SEZ's are townships of their own; thereby there are shopping malls, restaurants, amusement parks setup around to attract people, thus resulting in more economic development in that area.

Moreover SEZ's improve the country's foreign export. Because of the increased FDI and Private Equity presence, the local manufacturers get to tie up with these big names and export their products which now carry a better brand value, therefore helping in creating a greater demand for the goods of local manufacturers. Moreover the massive capital required for expansion is brought in form of FDI resulting in increased economic activity.

The increased exports from the country bring in more revenue for the country which improves the economic growth.

SEZ's help in creating a balanced economic growth in a country if they are properly located and implemented leading to

tapping of local talent and contributing to increased economic activity in the area.

The History of SEZ

The concept of SEZ's was largely pioneered by China, wherein the SEZ's contribute to 20 percent of the total FDI. Then the SEZ model was also successfully implemented in Poland and Philippines. In the former the SEZ's contribute to almost 35 percent of the FDI inflows. Shenzhen in China has been at the helm of rapid economic development, after growing by a staggering 28 percent for the last 25 years.

The modern era of Export Processing Zone began with the United States establishing its first Export Processing Zone in 1930. But the Shannon Free Zone of the Eire is considered as the model of modern export processing zone. The Gibraltar Export Processing Zone is the oldest among the operating EPZs of the world Gibraltar established its EPZ in 1705. In Asia, the Macao Free Zone is the oldest. It has been operational since 1829. The Macao Free Zone mainly produces garments, furniture, rubber goods, toys and novelty items. Taiwan took the process a step further with the establishment of a science part at Hsinche, which aims to shift the emphasis of investment away from labour-intensive assembly industries, towards advanced technology. (Hossian 2015)

The Need for SEZ

The SEZ's are important in today's context for the third world countries which have been in the race for rapid economic growth. There are many positives which emerge out of establishing an SEZ. Let us have a look on these factors.

For undertaking any kind of massive development program the government requires huge amount of funds. So it looks out for potential partners to help the government carry out the program. Now say for setting up an SEZ, the government may tie up with a private partner whose willing to invest in that area, thus a win-win situation for both. As in the government gets the capital needed to establish the required infrastructure and also the expertise. The private player on the other hand gets the right to market and use the SEZ's with relaxed tax laws, thereby increasing its revenue generating capacity and also carrying out the economic growth of the company in a more efficient way with the better tax policies. Actually SEZ's with relaxed import tariffs help the Import dependent and export driven industries to flourish by helping them develop manufactured goods at competitive prices.

SEZ in India.

The SEZ policy was first introduced in India in April 2000, as a part of the Export-Import ("EXIM") policy of India. Considering the need to enhance foreign investment and promote exports from the country and realizing the need that level playing field must be made available to the domestic enterprises and manufacturers to be competitive globally, the Government of India in April 2000 announced the introduction of Special Economic Zones policy in the country deemed to be foreign territory for the purposes of trade operations, duties and tariffs. To provide an internationally competitive and hassle free environment for exports, units were allowed be set up in SEZ for manufacture of goods and rendering of services. All the import/export operations of the SEZ units are on self-certification basis. The units in the Zone are required to be a net foreign exchange earner but they would not be subjected to any pre-determined value addition or minimum export performance requirements. Sales in the Domestic Tariff Area by SEZ units are subject to payment of full Custom Duty and as per import policy in force. Further Offshore banking units are being allowed to be set up in the SEZs.

India is one of the first countries in Asia to recognize the effectiveness of the Export Processing Zone (EPZ) model in promoting exports. Asia's first EPZ was set up in Kandla in 1965. With a view to create an environment for achieving rapid growth in exports, a Special Economic Zone policy was announced in the Export and Import (EXIM) Policy 2000. Under this policy, one of the main features is that the designated duty free enclave to be treated as foreign territory only for trade operations and duties and tariffs. No license required for import. The manufacturing, trading or service activities are allowed. While EPZs are industrial estates, SEZs are virtually industrial townships that provide supportive infrastructure such as housing, roads, ports and telecommunication. The scope of activities that can be undertaken in the SEZs is much wider and their linkages with the domestic economy are stronger. Resultantly they have a diversified industrial base. Their role is not transient like the EPZs, as they are intended to be instruments of regional development as well as export promotion. As such, SEZs can have tremendous impact on exports, inflow of foreign investment and employment generation.

SEZ Act 2005: To provide a stable economic environment for the promotion of Export-import of goods in a quick, efficient and hassle-free manner, Government of India enacted the SEZ Act, which received the assent of the President of India on June 23, 2005. The SEZ Act and the SEZ Rules, 2006 ("SEZ Rules") were notified on February 10, 2006. The SEZ Act is expected to give a big thrust to exports and consequently to the foreign direct investment ("FDI") inflows into India, and is considered to be one of the finest pieces of legislation that may well represent the future of the industrial development strategy in India. The new law is aimed at encouraging public-private partnership to develop world-class infrastructure and attract private investment (domestic and foreign), boosting economic growth, exports and employment. The SEZ Act 2005 envisages key role for the State Governments in Export Promotion and creation of related infrastructure. A Single Window SEZ approval mechanism has been provided through a 19 member inter-ministerial SEZ Board of Approval (BoA). The applications duly recommended by the respective State Governments/UT Administration are considered by this BoA periodically. All decisions of the Board of approvals are with consensus.

SEZ Rules, came into effect on 10th February, 2006, providing for drastic simplification of procedures and for single window clearance on matters relating to central as well as state governments. The main objectives of the SEZ Act are:

(a) Generation of additional economic activity

(b) Promotion of exports of goods and services;

(c) Promotion of investment from domestic and foreign sources;

(d) Creation of employment opportunities;

(e) Development of infrastructure facilities;

It is expected that this will trigger a large flow of foreign and domestic investment in SEZs, in infrastructure and productive capacity, leading to generation of additional economic activity and creation of employment opportunities.

The SEZ Rules provide for different minimum land requirement for different class of SEZs. Every SEZ is divided into a processing area where alone the SEZ units would come up and the non-processing area where the supporting infrastructure is to be created.

The SEZ Rules provide for:

- Simplified procedures for development, operation, and maintenance of the Special Economic Zones and for setting up units and conducting business in SEZs;
- Single window clearance for setting up of an SEZ;
- Single window clearance for setting up a unit in a Special Economic Zone;
- Single Window clearance on matters relating to Central as well as State Governments;
- Simplified compliance procedures and documentation with an emphasis on self certification

As per SEZ Rule, A Special Economic Zone may be established under this Act, either jointly or severally by the Central Government, State Government, or any person for manufacture of goods or rendering services or for both or as a Free Trade and Warehousing Zone.

A Special Economic Zone shall be deemed to be a territory outside the customs territory of India for the purposes of undertaking the authorized operations.

A Special Economic Zone can be deemed to be a port, inland container depot, land station and land customs stations, as the case may be, under section 7 of the Customs Act, 1962: Provided that for the purposes of this section, the Central Government may notify different dates for different Special Economic Zones.

Cochin Special Economic Zone

Cochin SEZ is a Special Economic Zone in Cochin, in the State of Kerala in southwest India, set up for export- oriented ventures. Cochin is being developed by the Dubai Ports International as a container transhipment terminal with direct sailings to important markets of the world. CSEZ is a multi-product Special Economic Zone, established in an area of 41.7 hectares (103.0 acres) in the Kakkanad area under the Thrikkakara Municipality. The Zone is run directly by the Government of India.

It is a multi-product zone, with industrial units operating in Electronics Hardware, Engineering, Gem & Jewellery, IT & ITES, Agro & Food Processing, Textile & garments, Plastic & Rubber etc. Currently it has around 121 units operating employing more than 11,000 people.

CSEZ was originally started as one of the first Export Processing Zone in India, and was later converted into a Special Economic

Zone in 2000. It is operated by the Government of India, Ministry of Commerce, under the CSEZ Authority, and headed by a Development Commissioner. It is the first integrated industrial park in Kerala.

CSEZ offers standard design factory floors, and plots of land for building custom buildings. There is a dedicated building for IT/ITES units, built with private participation. Power distribution, Telephone connectivity, Water supply and sewage processing are managed by the zone authority. There is on site customs facilities for easy processing of import and export.

Most of the procedures for starting a unit is handled by the zone authority, except a few regulatory approvals from the government. The Central Board of Excise and Customs have an office dedicated for the units in the CSEZ on the premises, and all the customs procedures for import and export can be done in the unit itself. Consignments are inspected and sealed on premises, and doesn't require customs processing at the port entry/exit points.

The zone operates a 25MVA/110KV electrical substation exclusively for the use within the zone. This is fed from the main grid of the Kerala State Electricity Board. The zone is a licensee of power distribution, and supplies power to the units via the network of underground cables. The zone is exempt from the power-cuts normally applied to the consumers at the time of shortages.

BSNL have established a 1000 line 5ESS telephone exchange exclusively for the zone. It supports all the facilities available to PSTN, ISDN and DSL customers. The cellular operators have base stations on site, and the private telecom operators also provide telephone and high speed internet services. The international gateway of VSNL is located very close to the zone, and has established an access center on the premises of the zone. The CSEZ authority has established an optical fiber network that serves all the buildings, where the units can avail the connectivity for data and internet access. The zone has also set up a video conferencing facility that could be availed by the units.

The Zone has its own integrated water supply system. Water is drawn from the Kadamprayar River and treated at a facility within the Zone. The system capacity is 1.5 million liters per day. A Common Effluent Treatment facility of one million liters per day capacity is established to process all the sewage and effluents let out from units. Zone units are required to send all their sewage and effluent to this treatment

plant. Units are encouraged to undergo ISO 14000 certification.

There is a warehouse admeasuring an area of 24000 sq.ft. for the temporary storage requirements of CSEZ units. The Zone has an efficient drainage network and an incinerator for disposal of solid waste within the zone. The Zone also has a 35m3 capacity bio-gas plant to treat vegetable/seafood waste.

Cochin Special Economic Zone is a spectacle that has grown on us as a microcosm of the manufacturing and processing worlds, squeezed into 105 acres, straddling industrial Kerala like a colossus.

Products from the Zone range from optical fiber couplers and splitters to rubber gloves. In between the two ends of the spectrum are violin bows, linen, ceramics, gems and jewellery, frozen foods, computer hardware and tissue-cultured exotic plants, which find their way to most parts of the world.

The Export Performance of CSEZ

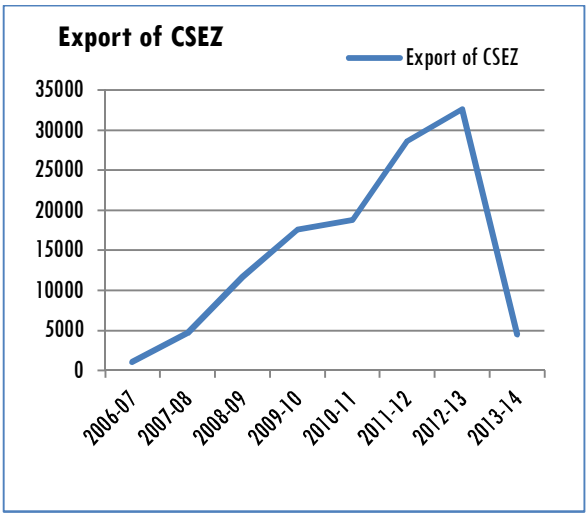
The exports are considered as a vital performance indicator of a special economic zone since the major objective behind the zone concept is to generate more exports. The export performance of CSEZ is analyzed to have a clear understanding about the trend and pattern of the exports generated by the CSEZ. The total export values (In Crore) of the CSEZ is given in Table-1

Table-1

Year	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Export (In Crore)	1037.52	4651.31	11683.54	17588.24	18746	28637.32	32579.47	4461.07
Growth Rate	-	348.31	151.19	50.54	6.59	52.77	13.77	-86.30

Data Source: APR - CSEZ
Values in crores

It is clear from the above table that the export from CSEZ has grown at a considerable rate from 2006-07. There was a major increase in the growth rates in 2007-08 and 2008-09. It is should be noted that the zone maintained considerable level of export growth even though the world was facing global recession in the same period of time.



Sector wise Export Performance

In order to have a clear understanding of the export performance of CSEZ a disaggregate study is necessary. Sector-wise

study of the CSEZ is conducted for the same. The major sectors functioning with in the CSEZ are Food and Agro, Electronics Hardware, Engineering, Gem and Jewellery, IT/ ITES Miscellaneous and Textiles and Garments. The total export performance of CSEZ from 2006-07 is given in Table-2 Sector -Miscellaneous includes exports from Rubber, Plastics, Jute and Ceramic industries.

Table-1

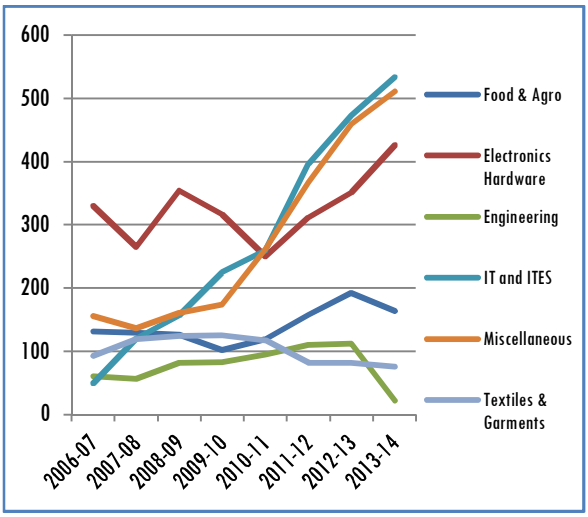
Sector	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	CAGR	Mean
Food & Agro	130.89	129.27	126.61	102.42	118.66	157.2	192.29	163.35	2.81	141
Electronics Hardware	330	264.79	354.08	316.66	249.65	311.61	351.57	426	3.24	325.5
Engineering	60.78	56.46	81.38	83.11	95.27	110.05	111.99	22	-12	77.7
Gem & Jewellery	218.94	3824.43	10680.27	16562.28	17644.5	27213.57	30908.96	2729	37.08	13723
IT and ITES	49.02	120.62	156.33	224.01	259.07	396.15	473.1	533.57	34.77	276.5
Miscellaneous	155.21	136.09	160.75	174.09	261.97	366.99	459.92	511.15	16.07	279
Textiles & Garments	92.68	119.65	124.12	125.67	116.88	81.75	81.64	76	-2.45	102
Total	**1037.52**	**4651.31**	**11683.54**	**17588.24**	**18746**	**28637.32**	**32579.47**	**4461.07**	**20**	**14783**

Data Source: APR - CSEZ
Values in crores

In the initial stage it was food and agro, Gem and Jewellery and Miscellaneous sectors were the major contributors to the zone's export with 130.89, 218.94 and 155.21 respectively. But by 2008-09 the contribution of Food and Agro sector has diminished Electronic Hardware sector had made a drastic improvement in its export to 354.08 crores. It is also notable that the export of Gem and Jewellery had made a tremendous growth in their export from 2007-08 onwards. Gem and Jewellery sector became the major contributor to the zone's export from then onwards. Sectors like, IT/ITES and Miscellaneous have maintained a study growth rate in their export performance throughout the period.

The compound annual growth rate (CAGR) represents the annual growth rate over a specified period of time longer than one year. In Table-2 the highest CAGR is represented by Gem and Jewellery and IT/ITES Sectors. These sectors also exceed the zone's total CAGR which is 20. The sectors such as Engineering showed a negative growth rate over a period of time. The mean value for Gem and Jewellery and Electronic Hardware produced the highest mean values of export over the years which are 13723 and 325.5 respectively. The Engineering sector produced the lowest mean value of exports over the years of 77.7.

Figure-2



The above graph represents the export performance of the various sectors over the period. The performance of the Gem and Jewellery sector is not included in this graph since Gem and Jewellery became the major export contributor of the zone from 2007-08 and its performance remarkably outweighed the other Sectors.

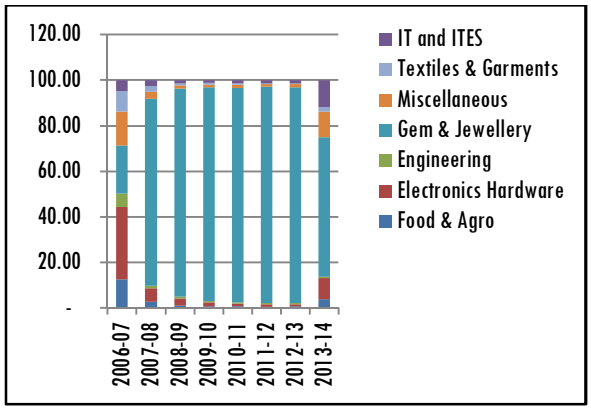
Table-3 displays the share (%) of contribution made by each sectors towards the total export of the zone over the years. Table gives unambiguous impression regarding the contribution and performance of different sectors too.

Table -3

Sector	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Food & Agro	12.62	2.78	1.08	0.58	0.63	0.55	0.59	3.66
Electronics Hardware	31.81	5.69	3.03	1.80	1.33	1.09	1.08	9.55
Engineering	5.86	1.21	0.70	0.47	0.51	0.38	0.34	0.49
Gem & Jewellery	21.10	82.22	91.41	94.17	94.12	95.03	94.87	61.17
IT and ITES	4.72	2.59	1.34	1.27	1.38	1.38	1.45	11.96
Miscellaneous	14.96	2.93	1.38	0.99	1.40	1.28	1.41	11.46
Textiles & Garments	8.93	2.57	1.06	0.71	0.62	0.29	0.25	1.70
Total	100	100	100	100	100	100	100	100

Data Source: APR - CSEZ

It is evident from table- 3 that Gem and Jewellery sector had been performing a tremendously comparing to the other sectors, the share of the same sector has risen from 21.10 % in 2006-07 to 82.22% in the next year and from there on it maintained over 90% contribution level till 2012-13. Even though the performance of the Gem and Jewellery fell in 2013-14, it maintained the role of major contributor of the zone with the contribution of 61.17% of the zone's export. IT/ITES and Miscellaneous sector displayed a consistent performance over the period. In the initial phase of the study Engineering and Food and Agro were the contributing considerably to the zone's export but by 2008-09 both these sector's contribution has decreased to3.03 and 1.08 respectively.



The Figure proves the fact that form 2007-08, Gem and Jewellery sector outweighed the sector in terms of share in total export of CSEZ.

Unit- Export Performance

To understand the performance of the CSEZ units, the unit output ratio is calculated, which helps to analyze the per unit productivity of the zones.

Table-4

Sector	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Food & Agro	14.54	12.93	14.07	11.38	11.87	15.72	17.48	14.85
Electronics Hardware	41.25	29.42	70.82	79.17	124.83	155.81	175.79	213.00
Engineering	6.75	5.65	5.81	5.94	7.94	7.86	7.47	1.38
Gem & Jewellery	31.28	546.35	1,335.03	2,760.38	1,960.50	1,814.24	1,626.79	143.63
IT and ITES	2.33	5.48	5.39	8.30	10.36	13.21	15.26	16.17
Miscellaneous	4.85	3.68	4.59	5.44	8.19	10.79	13.14	14.20
Textiles & Garments	18.54	23.93	31.03	31.42	58.44	40.88	40.82	38.00
Total	9.96	45.22	111.12	182.14	202.47	266.17	281.63	36.12

Data Source: APR - CSEZ
Values in Crores

Sector Food and Agro's Unit export value is 14.54 in 2006-07 it is 14.85 in 2013-14 which shows there is not much increase in the productivity of the units over the period of time. The Electronics and Hardware has been maintaining its highest rank on Unit- export value 2006-07 and in 2013-14. But from 2007-08 to 2012-13 it was Gem and Jewellery which created the highest value for Unit- Export value. The same sector made the highest contribution in the year 2009-10 with Rs. 2760 per unit. Gem and Jewellery and Electronics and Hardware Sector's Unit- Export contribution is way ahead that the zone's total unit-export contribution in almost all years.

Conclusion

The Cochin Special Economic Zone is one of the earliest endeavors in the state for export oriented production. It was one the major export generating entity and employment hug in the past. Started in a humble way the zone has generated the export earnings of Rs. 32579.47 in 2012-13. The Major sectors in operation are Food & Agro, Electronics Hardware, Engineering, Gem & Jewellery, IT and ITES, Miscellaneous and Textiles & Garments. The sectors like Food and Agro, Miscellaneous and Textile and Garments are traditional sectors, the export contribution of these sectors are smaller compared to the other modern sectors. The sector Gem and jewellery is the highest contributing sector to the zone's total export. It is maintaining its

position since 2006-07 onwards. The Major reason for the highest export value by this sector is mainly because of the high product value of Gold. Gem and Jewellery and Electronics Hardware recorded the highest CAGR over the years by 37.08 and 34.77 respectively meanwhile Engineering and Textile and Garments made a negative CAGR over the years. . Sector, IT and Electronics Hardware maintains the highest employment generation in the zone. The modern sectors are creating more employment opportunities and generating export value to the zone.

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A STUDY ON ZOOPLANKTON BIOMASS AND HYDROGRAPHY IN THE COCHIN ESTUARY DURING DIFFERENT SEASONS OF THE YEAR

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Abstract

The present study embodies quantitative aspects of zooplankton, its faunal composition and fluctuations, in relation to the environmental characteristics of the Ernakulam channel in the Cochin backwater system extending between Thevara bridge to barmouth during different seasons of the year. The Cochin backwater system is largest of its kind in the south west coast of India and one of the most affected ecosystem by human interferences in recent years. Due to the diurnal and seasonal changes in the estuarine environment, good part of the zooplankton communities have an ephemeral existence contributing to the detritus deposits of the backwater ecosystem. A part of the detritus thus accumulated, in turn, forms the food of some pelagic and benthic communities, while a portion is transported to the neighbouring ecosystem by the influence of tides and fresh water flow. The tide also plays a vital role in the mode of distribution of zooplankton in this backwater environment. Environmental factors like temperature, salinity, pH, dissolved oxygen and turbidity have prominent roles in the production and ecology of planktonic organisms in this estuarine ecosystem and also on the spatial and temporal variations of the planktonic communities. It is also observed that the plankton population in the Cochin backwater is rich and varied during the pre monsoon period, when salinity is high in this area. During the peak of the monsoon the water in the estuary become practically fresh and the total biomass of the zooplankton is greatly reduced. The gradual recovery during the post monsoonal period attained its maximum by the late pre monsoon period. The study of zooplankton could provide a basis not for understanding of variability, but also for the investigation of the relative importance of physical and biological factors in the control of pelagic ecosystem.

Keywords: *Cochin Estuary, Hydrographical parameters, Zooplankton, Seasons*

Introduction

Cochin backwaters situated at the mouth of Northern Vembanadu lake is a tropical positive estuarine system extending between 9^0 40' and 10^0 12'N and 76^0 10' and 76^0 30'E with its northern boundary at Azheekodu and southern boundary at Thannirmukkam bund. The major hydrological variable in Cochin backwaters is salinity. Backwaters also act as nursery grounds of commercially important prawns and fishes. Cochin backwaters, widely regarded as one of the polluted estuaries in India, receive contaminated fresh water inputs and discharges of effluents and partially treated sewage from many points throughout its tidally mixed zones. Zooplankton animals are small heterotrophic animals, inhabiting the waters at all depth and occupy almost every type of ecological environment. The study of zooplankton

could provide a basis not for understanding variability, but also for the investigation of the relative importance of physical and biological factors in the control of pelagic ecosystem.

Study Area

Station 1

Opposite to Thevara bridge which is the" lesser saline zone"; the depth varied between 5m and this area was influenced by fresh water influx than tidal current during the monsoon season.

Station 2

The major tanker berth, opposite to Candle island and depth at the station was 10 m. This area had relatively less fresh water influence and more marine influence during the monsoon season.

Station 3

The bar mouth area opposite to Aspin wall and the depth at the station was found to be 12 m and the area was influenced relatively more at the surface by the flood current during low tide in the monsoon season and tidal current at the bottom during high and low tides.

Materials and Methods

Environmental data on water temperature, salinity, P^H, dissolved oxygen and turbidity were collected from surface and bottom to study their relationship with zooplankton fluctuation and abundance. Surface water temperature was measured at each site soon after collection of water samples with an accuracy of + or_ 0.1^0 C using a precision mercury thermometer (0-50^0 C). Salinity, P^H, dissolved oxygen, turbidity were recorded by using salinometer as described by Strickland and Parsons (1968), P^H meter, and Winkler's titration method as described by Strickland and Parsons (1968) and sechi's disc respectively.

Samples were collected using HT net of 50 cm diameter and 1m long with mesh size of 300µ m. The first part of the net that is the part attached to the loop is made up of thin canvas thus making the net stronger. At the cod -end of the plankton net a sampling bucket is attached. The cod end bucket receives most of the plankton as the net is towed along, but some always remain on the wall of the net and is removed by washing it with water and collected into preserving bottles. For the vertical tows, the net attached to the wire rope released to the respective depth along with sufficient weights tied with the wire rope (hanging below the net ring), was retrieved at constant speed. Plankton samples thus collected from vertical and oblique tows at each station were preserved in separate wide mouthed plastic bottles with 4% diluted formalin,

labeled properly and transported to the laboratory for analysis. In the laboratory the samples were halved with a Folsom plankton splitter for biomass determination and faunistic studies. Counts of various taxa were made on a fraction of each sample varying from 1ml to 20 ml. The sub sample was examined under a dissection microscope using the zooplankton counting chamber and the percentage composition of the different zooplankton groups was assessed.

Volume of water filtered was determined by using the following formula

Volume of water filtered (m^3)= Mouth area of the net used (m^2) × distance towed(m)

Distance towed in meter = Duration of haul× Speed of the boat=3.14 × r^2× distance towed (m)

Calculation used for finding out the biomass (ml/m^3) and population (No./m^3) of plankton.

Biomass (ml/m^3) = Displacement volume (ml) / Volume of water filtered (m^3)

Population (No./m^3) = Total number of plankton / Volume of water filtered (m^3)

% of organisms in total catch =Number of organisms in 100% x100 / Total number of all organisms.

Results and Discussion

Salinity was found to be high during the first half of the year and the downward trend was found during the monsoon period which was noticed by the previous workers (George 1958; Ramamirtham and Jayaraman, 1963). Investigations clearly show that the important factor influencing salinity variation is the monsoon rain and the inflow of fresh water.

Temperature values decrease by the onset of monsoon and maximum temperature was recorded during pre monsoon season. Sankaranarayanan and Qasim (1969) stated that the influx of fresh water into the estuarine system is not the sole factor in bringing down the water temperature in the estuary, but the influx of cold water from the sea may also be a significant factor.

In the present study both in the monsoon and post monsoon season increased pH was found at the surface than at the bottom. But in the pre monsoon season pH remained the same both in the surface and bottom. Turbidity varied from.75-1.15m during post monsoon and 5.1-12m during pre monsoon and 2-8m during monsoon.

Important groups of Zooplankton found in surface and bottom layers of the Cochin Estuary

Hydromedusae

Hydromedusae were present in the surface layer during the pre monsoon season, with the onset of monsoon they disappeared from the estuary. They disappeared when the salinity became low. Our knowledge of the taxonomy and distribution of hydromedusae of the Cochin backwaters is mainly based on the *studies* by Vannuci *et al.,* 1970.

Chaetognatha

They were found to be higher in the post monsoon period in the bottom layer but absent in the low salinity condition.

Copepoda

Though abundant during the pre monsoon periods, they were present throughout the backwaters in all seasons. Consistent high numbers were recorded during the high saline period. Their numbers which fell with the monsoon began to increase again at the mouth regions during the post monsoon period. Our present knowledge on the taxonomy and distribution of the group in this estuarine area around Cochin are due to the works by Sewall, 1913; George, 1958, Wellershaus,1969, 1970; Abraham, 1970; Pillai, 1970; Pillai et al.,1973, Nair & Tranter 1972, Menon et al 1972, presented a general picture of the distribution of the copepod component of the zooplankton in the Cochin backwater and the connected estuarine water.

Nauplius

Through the present investigation it has been found that nauplius was found abundant during pre monsoon but was absent during post monsoon and monsoon season.

Zoea

In the present study pre monsoon showed highest number of zoea and in the monsoon season zoea was found to be absent but moderate amount of zoea was found during post monsoon season.

Mysid larvae

In the present study mysids were present maximum in number during pre monsoon and scarce during monsoon season.

Mysis

Mysis showed maximum number during pre monsoon and absent during post monsoon and monsoon season.

Lucifer

Occurrence of lucifer was found to be abundant during post monsoon and pre monsoon period and absent during monsoon period.

Fish eggs and larvae

Fish eggs and larvae was found to be abundant during post monsoon season and pre monsoon.

Temperature and dissolved oxygen also did not show any direct relationship with the fluctuation and abundance of copepods in the present investigation. It may be concluded that the biological factors such as food availability, species composition of copepods, their life span and reproductive potential of the different species in space and time might have vital role in limiting the population. This is in view with the findings of Silas and Pillai (1975) who stated that salinity is the main factor that limits copepod population. The copepod population has also been reported to be limited by the occurance of other zooplankton groups like cladocerans (Menon et al.,1971) ctenophores and hydromedusae (Madhupratap, 1987). The distribution of chaetognath was very much restricted in number during monsoon season in the back water zone of the study area and their occurrence seems to have relationship with salinity. This is in accordance with the findings of Srinivasan (1971). The distribution and percentage abundance of medusae among the three stations revealed their affinity to saline condition in the estuarine water of the study area by their abundance in number during the pre monsoon when the salinity was relatively high. This is in conformity with the observation of George (1958), Santhakumari and Vannucci (1971) and Madhupratap and Haridas (1975). The distribution and percentage abundance of fish eggs and larvae showed wider fluctuations among the stations. The results revealed that their abundance is more related to the habitat of the breeder. This is in accordance with the findings of George (1958).

Conclusion

Investigations show that among the different zooplankton groups copepods contributed the maximum followed by zoea, fish larvae, chaetognaths, and mysis respectively during the onset of monsoon. During the pre monsoon period copepod contributed the maximum followed by zoea, nauplius, mysis, fish larvae, fish egg, medusae, mysid, lucifer. During the closure of monsoon, copepod contributed the maximum followed by zoea, fish larvae, chaetognaths and mysis. Zooplankton was relatively high during the pre monsoon period and low during the monsoon months with relatively minor secondary peak during the post monsoon season. Southwest monsoon had more influence on zooplankton production in the backwater environment.

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PERMEABILITY STUDY OF GRAPHENE FILLED NATURAL RUBBER COMPOSITES

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Abstract

Fillers such as carbon black, carbon nanotubes, metals etc. are long been used as fillers for synthesizing composites for various applications. While these fillers help in developing desired properties in the composite, question on the permeability properties of the composite and compatibility were always raised. In this study the use of graphene powder to natural rubber matrix is reported. Permeability property of the composite also verified

Keywords: *Elastomer, Nano composite, permeability*

1. Introduction

Conducting polymer composite systems constituted by conducting filler particles dispersed inside an insulating polymer matrix have been extensively studied in the last decades as a way to produce proficient materials that combine the good mechanical properties, thermal stabilities and processablity of the matrix with the electrical properties of the conducting component. Introduction of fillers into polymers leads to a wide range of interactions arising at the polymer-filler interface. Particle filled elastomeric composites have become attractive owing to their low cost and widespread industrial applications [1]. The dispersed fillers considerably influence the properties of the polymer composites, including their degradation and stability. The major factors that control these properties are the surface chemistry, nature, shape and size of particles, size distribution and specific surface area etc of the filler [2].

The type of the reinforcing filler strongly influences the performance of the composite. Small particle size is a necessary requirement and very likely the predominant requirement for the reinforcing effect in rubber. The application of nanometer fillers to polymer materials is a promising channel for property modification. Some nano-fillers have improved polymer performance remarkably because of their high specific surface area compared to conventional particles [3–5]. Nano composites have played a major role in material science over the last decade [6-9]. Polymer nano composites are generally lightweight, require low filler loading, are often easy to process, and provide property

enhancements extending orders of magnitude beyond those realized with traditional composites. Rapid advancements in nano composite technologies have been realized as new classes of nano scale fillers continue to emerge. The nano particle chosen for dispersion in a resin is dependent on the intended application. Incorporating nano-fillers into rubber materials to obtain beneficial mechanical and physical properties has been an important task and one with great value to many industries due to their high surface-to-volume ratio. In Polymer-based nano composites the physical, mechanical, and electrical properties of nano composites can be tailored by their preparation routes (incorporation of ‘‘preformed’’ particles or in situ production of the latter) and formulations (e.g.,types and content of nano inclusions).

For many industrial applications, like tire industry, natural rubber is reinforced by carbon black. This reinforcement effect comes from the filler–filler and filler–rubber interactions, both chemical and physical, which take place at different length scales due to the specific structure of carbon black. However, new materials have been implemented as reinforcers, whether for economical reasons or rather to impart some desirable characteristics. This work focused on the effect of fillers on permiability of the composite material.

2. Experimental

The natural rubber /graphene composites is prepared by dry mill mixing technique using a two roll mixing mill so that composite with significant properties can be prepared by adjusting the ratio of the conducting component in the insulating matrix. The temperature of the rolls of the mill is kept at room temperature by the circulation of cold water. The various rubber chemicals and the cross linking agent are mixed with NR matrix and graphene particles using the roll mill. The amount of the filler is varied from 10phr to 50phr. The formulation of rubber chemical is shown in table 1.

Table.1 Formulation of NR/Graphene powder composites

Formulation	Composition (phr)
Natural rubber	100
ZnO	5
Steric acid	2
MBTS*	1
CBS**	1.1
TMT***	0.2
Sulfur	2.5
Graphene powder	10phr-50phr

*Mercaptobenzothiazyl disulphide
**N-cyclohexy-2-benzothiazolesulfenamide (CBS)
***Tetramethyl thiurium disulfide

In the case of elastomer composites the effects of fillers are quite erratic, since several factors such as distribution, dispersion and

interface of the filler with the components of the composite may vary widely. However, the processing problems and cost efficiency for obtaining distinct homogeneous polymers are still demanding concern for many potential applications. Because of this, there is a rising demand for dry mill mixing method compared to the solution processable composite in which the use of organic solvents come to pass problems. The unvulcanised composite samples are compression molded at 433 K using a hot press and then cut into standard specimen. The tests of all characterization studies of vulcanized pristine NR and its composites are carried out according to the ASTM standards. Five specimens are measured for every case and the average values are taken.

Optical absorption spectra of the samples are taken using Avantes UV/Vis photometer in the range 200-900 nm. The absorption spectrum will show a number of absorption bands corresponding to structural groups within the molecule. Permeability study of the sample is also carried out.

3. Result and Discussion

3.1. Permeability study of NR/ graphene composites

The excellent gas barrier property of NR/grapheme composites is one of the most important advantages among properties. The graphene powder with high aspect ratio are believed to greatly reduce the gas permeability by creating a tortuous path that retards the progress of the gas molecules through the matrix.

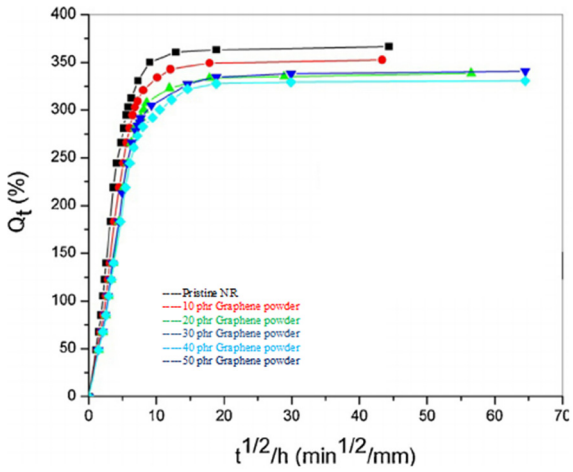

Fig.1. Permeability of pure NR and its composites with different graphene contents

The nitrogen (N_2) fluxes of pure NR and the composites with different graphene powder contents as a function of time are plotted in Fig.1. Clearly, the graphene content in NR exerts a strong effect on both non-steady state and steady state fluxes of N_2 through the nanocomposites. With the

increase of graphene content, the nonsteady state region of flux curve broadens (slower diffusion) and steady-state flux decreases (lower permeability). As summarized in Fig. 1, the permeability of the composites rapidly decreases with the increase of graphene content. When the volume fraction of graphene decreases the permeability of NR decreases by about 50%. The remarkable improvement in barrier properties is attributed to the reduction of permeable amorphous rubber content in the composites and the increase of tortuosity of the diffusion path for penetrant molecules [10-17]. The promising barrier property of graphene/rubber composites is pretty precious for its application in inner tube of tire, rubber balloon and so on.

3.2. UV/Vis Spectroscopy

Figure 4 shows the UV/Vis spectra of the pristine natural rubber and its composites. It has been seen that the pristine natural rubber does not show any absorption in the UV/Vis region. It is also observed that in the pristine state the polymer is colorless due to the absence of conjugated sequences of double bonds. The introduction of Graphene powder increases the absorption of the matrix strongly on the visible region, accompanied by the appearance of broad absorption bands. This absorption can be introduced by the presence of Graphene powder which possess the conjugated sequences of unsaturated double bonds in the polymer backbone. It is seen that as the amount of Graphene powder is increased the intensity of absorption of composite is also found to be increasing. The 50 phr composite shows the highest absorption.

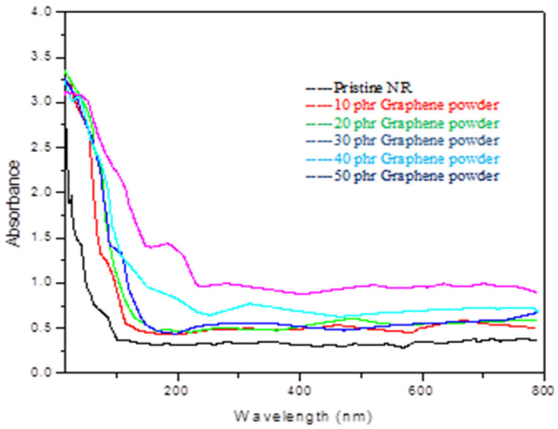

Fig.2. The UV/Vis spectra of NR /Graphene powder composites

From the wavelength positions of the absorption maxima [18-19] it can be suggested that short conjugated sequences of five to six C=C bonds have been introduced in to the cis 1,4 polyisoprene chains. The presence of electron releasing substituent is proposed to be the key factor in the generation of conducting complexes [20]. The colour of the $SbCl_5$ doped natural rubber must be originate from the absorption of oxidized polymer [21].

4. Conclusion

In the present scenario we are in need of light weight, eco- friendly and cost effective rubber composites for tyre industry. The present study points out that the Graphene powder are an effective alternate for the presently used conventional materials since it is extremely compatible with rubber matrix. The NR/Graphene powder composites are prepared by two roll mill mixing method. It is seen that the permeability of NR is greatly decreased by introduction of amount of graphene powder.

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DEVELOPMENT OF LOW FREE-FORMALDEHYDE RESOL RESIN WITH IMPROVED PHYSICAL AND MECHANICAL PROPERTIES

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Abstract

PF resin containing low free- formaldehyde was synthesized without compromising physico-mechanical properties of the resin thereby making it more human – friendly and less damaging to environment. Tannin (TA) was used in the resin to reduce the free formaldehyde content(FFC). With the incorporation of tannin the FFC of resol resin was reduced by 89 %. The gel time of the resol resin was decreased with increase in the tannin content. The tensile strength was improved by 24% and elongation at break by 54% for 1% tannin modified samples.

Keywords: *PF resin, free formaldehyde content (FFC), Tannin (TA), tensile properties.*

1. Introduction

PF resins have been getting much attention over more than hundred years due to their excellent thermal stability, water resistance, binding strength, chemical resistance, flame retardance, electrical insulation, and dimensional stability(1-5). Resol resins are produced by reacting an excess of formaldehyde with phenol under basic conditions. Resols are quite stable at room temperatures, but react rapidly at elevated temperatures forming methylene bridges by eliminating water and formaldehyde.

The major drawback of PF Resol is the high amount of formaldehyde emission. The unreacted formaldehyde is emitted from the products continuously after the manufacturing process. Free formaldehyde in the resin gets liberated leading to micro voids in the cured resin. The liberated formaldehyde pollutes air. It has an unpleasant odour and irritates eyes and nasal passages. It can also give rise to various health problems(6-7). It has been reported that direct contact with skin can cause cancer (8-11).

Many attempts have been made to reduce the free formaldehyde content of PF resin.

One such methods is the use of scavengers. There are different scavengers available for lowering the formaldehyde emission from formaldehyde resin. But some of these scavengers adversely affect the properties of the resole resin(12-14). Apart from the chemical scavangers, several bio based materials have also been suggested to control the liberation of formaldehyde.

Recently, there have been increasing interests on tannins (15-18) Tannins are naturally occurring poly phenolic compounds with distinct molecular weights**.** It has high affinity towards formaldehyde due to the presence of several adjacent polyhydroxyl phenyl groups in their structure(19). It has high reactivity with formaldehyde than phenol(20). A. Pizzi et al. carried out some experiments on tannin based resins(21). He found that tannin is an appropriate substitute for phenol in PF resin. The results indicated that free formaldehyde emission decreased (5mg/100g of board) in presence of tannin due to its high reactivity towards formaldehyde than phenol. Y. B. Hoong et.al(22) reported that formaldehyde emission level from resin bonded products decreased from 37mg/100 g to 0.6 mg/100 g on the addition of tannin scavenger. Hence Tannin can be used as a formaldehyde scavenger in resol resin.

However, the potential of tannin as formaldehyde scavenger in resol resin has not been explored systematically. In this work resol resin containing different amounts of tannin was synthesized and the free formaldehyde content was evaluated. The effect of tannin on the thermal, mechanical and dynamic mechanical properties is also presented.

2. Materials and Methods

2.1 Materials

Phenol(MW=94. 11, M.P=39-41^{0}C), formaldehyde (37 % solution in water), sodium hydroxide, hydrochloric acid and glacial acetic acid were of laboratory reagent (LR) grade supplied by Alpha Chemicals and Diagnostics, Kochi, India. Tannin powder(mesh size= 300) was supplied by S.D.Fine-Chem Ltd., Mumbai, India.

2.2 Methods

PF resol resin was synthesized with F/P molar ratio1:1. 8 in presence of NaOH catalyst at 90°C. Reaction vessels were heated to the same reaction temperature. The resulting reaction mixture was stirred and heated to 90–95 °C until the mixture became cloudy. Then tannin at different weight percentages were added and stirred for 1 hour at room temperature**.**

Total solid content was determined by evaporating an accurately weighed sample (about 2 g) to dryness at 135 ^{0}C for 3 hours.

pH of the resin was checked by using digital pH meter. Gel time of the resin was measured by the method outlined in DIN16945.

The percentages of the free formaldehyde in the resin were determined using a modified version of Walker's

hydroxylamine hydrochloride method using methanol, HCl, hydroxylamine hydrochloride and NaOH.

The tensile properties were determined using dumb-bell shaped specimens on a Schimadzu Autograph Universal Testing Machine (ASTM D 638) with a load cell capacity of 10 kN at a cross head speed of 50 mm/min.

3. Results and Discussion

3.1 Free Formaldehyde Content Analysis (FFC)

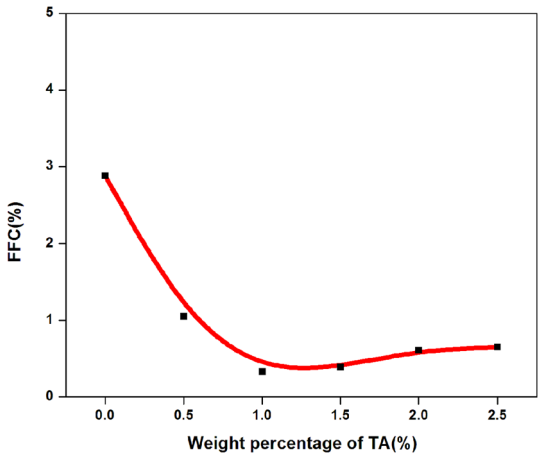
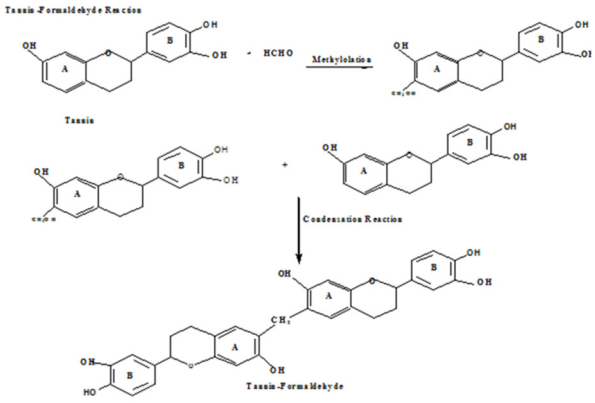


Figure1. Variation of free formaldehyde content with tannin content

Figure.1 shows the variation of FFC with varying tannin content. It is observed that tannin is effective in reducing the free formaldehyde content of the resol resin. The neat resin has a FFC of 2.9%. On addition of bio based tannin (1 wt%) the formaldehyde is rapidly reduced to 0.33 %. This decrease in FFC is due to the reaction of free formaldehyde with tannin. Since tannin contains several hydroxyl groups it easily reacts with formaldehyde than phenol (23). It has been reported that some of the methylol groups present in PF resin will be released as formaldehyde and the reactive tannin can bond with this free formaldehyde as well as the methylol groups present in the resin, thereby reducing FFC(24). The proposed mechanisms for tannin- formaldehyde reaction and tannin-resol reaction is given in schemes 1&2 respectively.

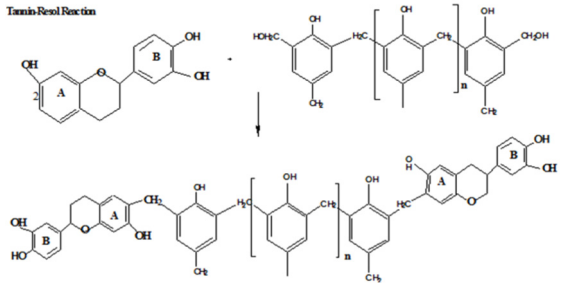


Scheme 1: The reaction of tannin with formaldehyde

The reaction between tannin and formaldehyde involves two steps- methylolation and condensation. Methylolation is an electrophilic aromatic substitution reaction in which the formaldehyde attacks the reactive nucleophilic position of tannin. Thus methylol group is attached to the reactive position of the tannin. The second step is the condensation reaction

between methylol tannin and another tannin molecule. In this step methylol group of methylol tannin reacts with another tannin forms tannin –formaldehyde through methylene linkage (25).

Scheme 2. represents the reaction between tannin and resol resin. Resol resins contain large number of methylol groups. These methylol groups can easily react with tannin molecule results in the formation of a tannin-resol condensed product. Thus tannin molecules react with the free methylol groups of resol resin through methylene linkages.



Scheme 2: The reaction of tannin with resol

3.2. Physical properties

Table 1. Variation of physical properties of the resin with tannin content

TA(Wt %)	pH	TSC(%)	Gel time(secs)
0	9.60	48.30	2311
0.5	9.65	48.53	2250
1	9.67	48.57	2223
1.5	9.69	48.64	2135
2	9.70	48.70	2100
2.5	9.65	48.65	2093

Table 1. shows the pH, total solid content(TSC) and gel time of neat and tannin modified resol samples. As expected, the pH remains almost same for all samples. There is considerable increase in total solid content on tannin addition**.** The gelation time of the phenolic resol resin decreases with increase in the tannin content. This shows that tannin is more reactive towards formaldehyde, making the formation of cross links easier.

3.3 Tensile properties

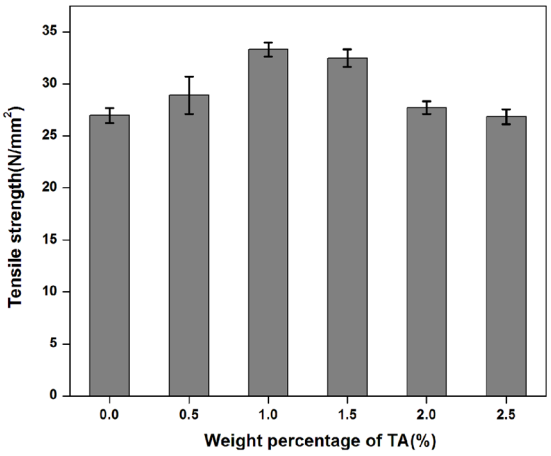


Figure 2a. The variation of the tensile strength with weight percentages of tannin

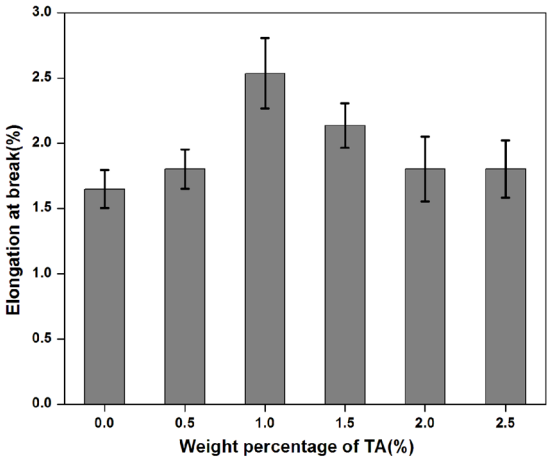


Figure 2b. The variation of percentage of elongation with weight percentages of tannin

The variations of the tensile strength and elongation at break with different weight percentages of tannin/PF composites are shown in figures 2a and 2b. The tensile strength is found to be maximum at an optimum tannin content of 1 wt%. It is improved by 24% in the case of 1% tannin modified samples. At higher loading of tannin, the tensile strength gradually decreases. This may be attributed to the possible self- condensation of tannin under the reaction conditions leading to incomplete cure with the resultant weakness and brittleness of the resin(26).

There is relatively more free formaldehyde in the unmodified resin and it escapes during the cure reaction, leaving voids in the matrix. This results in inferior tensile strength (27), as observed in the case of the neat resin. In the case of the samples modified with tannin, the free formaldehyde content is reduced and hence the possibility of void formation is reduced. The resulting tannin modified compounds are stiff and tough.

The variation of elongation at break follows the similar trend as observed for tensile strength. An increase of 54% is obtained at 1 % tannin loading. The increase in both the tensile strength and % of elongation implies improved toughness for the modified resins.

4. Conclusions

The present study shows that tannin is an effective formaldehyde scavenger for resol resins. The free formaldehyde content is reduced to 0.33%. The optimum loading of the tannin is 1%.The tensile strength is improved by 24% and elongation at break by 54% for 1% tannin modified samples.

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SOME PROPERTIES OF ROUGH IDEALS

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Abstract

In this paper, we shall introduce the concept of different rough ideals and give some properties of them. Also we study the rough ring homomorphism and anti-homomorphism of rough ideals.

Keywords: *Rough ideal, rough prime ideal, rough primary ideal, rough semi-prime ideal*

1. Introduction

The theory of Rough set was proposed by Z Pawlak in 1982 [8]. Rough set theory, a new mathematical approach to deal with inexact, uncertain or vague knowledge, has recently received wide attention on the research areas in both of the real life applications and the theory itself. It is an extension of set theory in which a subset of universe is approximated by a pair of ordinary sets, called upper and lower approximations. A key concept in Pawlak rough set model is an equivalence relation, which are the building blocks for the upper and lower approximations. Combining the theory of rough set with abstract algebra is one of the trends in the theory of rough set. Some authors substituted an algebraic structure for the universal set and studied the roughness in algebraic structure. On the other hand, some authors studied the concept of rough algebraic structures. The concepts of rough group, rough semigroup and rough quotient group are studied in [7], [2] and [4]. B. Davvaz studied roughness in rings [3]. Su-Qing Han [10] proposed the concept of rough ring in an approximation space. He also proposed the concept of rough cosets and rough normal groups. In this paper, we shall review the concept of rough ring, introduce the concept of different rough ideals. Also, we prove some properties about rough ring homomorphism and anti-homomorphism on rough ideals.

In section 2 we give the basic concepts of rough ring. Section 3 deals with

the concept of different rough ideals. In section 4 we define homomorphisms of rough ideals and prove some related results. Section 5 discuss the properties of the anti-homomorphism on rough ideals.

2. Basic concepts

In this section we give the basic concepts of rough set and rough ring.

2.1 Definition. [7] A pair (U, θ) where U≠ Ø and θ is an equivalence relation on U , is called an approximation space.

2.2 Definition. [7] For an approximation space (U, θ) and a subset X of U , the sets

1. $\theta^{-}(X) = \{x \in U / [x]_\theta \cap X \neq \varphi\}$
2. $\theta_{-}(X) = \{x \in U / [x]_\theta \subseteq X\}$
3. $BN(X) = \theta^{-}(X) - \theta_{-}(X)$

are called upper approximation, lower approximation and boundary region of X in (U, θ), respectively.

2.3 Definition. [9] Let (U, θ) be an approximation space and let +, ∗ be two binary operations on U . A subset R of U is called a rough ring if it satisfies the following properties. Let (U, θ) be an approximation space and let +, ∗ be two binary operations on U . A subset R of U is called a rough ring if it satisfies the following properties.

I (1) $\forall x, y \in R, x + y \in \theta^{-}(R)$.

(2) Associativity holds in $\theta^{-}(R)$ with respect to +.

(3) $\forall x \in R, \exists e \in \theta^{-}(R)$ such that $x + e = x = e + x$, e is called additive rough identity.

(4) $\forall x \in R, \exists y \in R$ such that $x + y = e = y + x$, y is called additive rough inverse.

(5) $\forall x, y \in R, x + y = y + x$.

(These first five conditions show that < R, + > is a commutative additive rough group.)

II (1) $\forall x, y \in R, x * y \in \theta^{-}(R)$.

(2) Associativity holds in $\theta^{-}(R)$ with respect to ∗. (These two conditions show that < R, ∗ > is a multiplicative rough semigroup.)

III (1) $(x + y) * z = (x * z) + (y * z)$

(2) $x * (y + z) = (x * y) + (x * z)$ $\forall x, y, z \in R$.

(These conditions are the distributive property of multiplication over addition.)

3 Rough Ideal

In this section, we define rough prime ideal, rough primary ideal, rough semi-prime ideal and prove some related theorems.

3.1 Definition. [9] A non-empty subset I of a rough ring R is said to be a rough right (left) ideal if

1. I is a rough subgroup under addition.
2. For every $a \in I$ and $r \in R$, $a * r \in \theta^{-}(I)$

If I is both rough right ideal and rough left ideal of R, then it is called a rough ideal of R. It is sometimes called a two-sided rough ideal.

Remark: A rough ideal is a rough subring.

3.2 Definition. A non-empty subset P of a rough ring R is said to be a rough prime ideal if

1. P is a rough ideal of R.
2. For every $a * b \in \theta^{-}(P)$ implies $a \in P$ or $b \in P$.

Example: Let U = {[0], [1], [2], ..., [8]} be the set of equivalence classes with respect to modulo 9. Let $+_9$ be the addition of equivalence classes and $*_9$ be the multiplication of equivalence classes modulo

9. A classification of U is U |R = $\{E_1, E_2, E_3\}$, where E_1 = {[0], [3], [6]}, E_2 = {[1], [4], [7]}, E_3 = {[2], [5], [8]}. Let R = {[0], [2], [3], [6], [7]} and let I = {[0], [3], [6]}. Then $\theta^{-}(R) = E_1 \cup E_2 \cup E_3 = U$ and $\theta^{-}(I)$ = {[0], [3], [6]}. Then $< R, +_9, *_9 >$ is a rough ring. Now

1. $\forall x, y \in I$, $x +_9 y \in \theta^{-}(I)$.
2. $-[0] = [0] \in I$, $-[3] = [6] \in I$, $-[6] = [3] \in I$
3. $\forall x, y \in I$, $x *_9 y \in \theta^{-}(I)$.
4. $\forall x \in I$ and $r \in R$, $x *_9 r \in \theta^{-}(I)$ and $r *_9 x \in \theta^{-}(I)$ ($r * a \in \theta^{-}(I)$). Therefore I is a rough ideal of rough ring R. Now for $a *_9 b \in \theta^{-}(I)$ implies $a \in I$ or $b \in I$. Therefore I is a rough prime ideal of R.

3.3 Definition. A non-empty subset P of a rough ring R is said to be a rough semi-prime ideal if

1. P is a rough ideal of R.
2. For every $a^2 \in \theta^{-}(P)$ implies $a \in P$.

Example: Let U = {[0], [1], [2], ..., [8]} be the set of equivalence classes with respect to modulo 9. Let $+_9$ be the addition of equivalence classes and $*_9$ be the multiplication of equivalence classes modulo

9. A classification of U is U |R = $\{E_1, E_2, E_3\}$, where E_1 = {[0], [3], [6]}, E_2 = {[1], [4], [7]}, E_3 = {[2], [5], [8]}. Let R = {[0], [2], [3], [6], [7]} and let I = {[0]}. Then $\theta^{-}(R) = E_1 \cup E_2 \cup E_3 = U$ and $\theta^{-}(I) = \{[0], [3], [6]\} = E_1$. Then $< R, +_9, *_9 >$ is a rough ring. Clearly, I is a rough ideal of rough ring R.

Now for $a *_9 a \in \theta^{-}(I)$ implies $a \in I$.

Therefore I is a rough semi-prime ideal of R.

Remark: By definition it is obvious that every rough prime ideal is a rough semi-prime ideal. But the converse need not be

true. For example the above I is a rough semi-prime ideal but not a rough prime ideal of R.

3.4 Definition. A non-empty subset P of a rough ring R is said to be a rough primary ideal if

1. P is a rough ideal of R.
2. For every $a * b \in \bar{\theta}(P)$ implies $a \in P$ or $b^n \in P$ for some positive integer n.

Example. Let U = {[0], [1], [2], ..., [8]} be the set of equivalence classes with respect to modulo 9. Let $+_9$ be the addition of equivalence classes and $*_9$ be the multiplication of equivalence classes modulo 9. A classification of U is U |R = $\{E_1, E_2, E_3\}$, where E_1 = {[0], [3], [6]}, E_2 = {[1], [4], [7]}, E_3 = {[2], [5], [8]}. Let R = {[0], [2], [3], [6], [7]} and let I = {[0], [3], [6]}. Then $\bar{\theta}(R) = E_1 \cup E_2 \cup E_3 = U$ and $\bar{\theta}(I)$ = {[0], [3], [6]}. Then $< R, +_9, *_9 >$ is a rough ring. Now

1. $\forall x, y \in I$, $x +_9 y \in \bar{\theta}(I)$.
2. $-[0] = [0] \in I$, $-[3] = [6] \in I$, $-[6] = [3] \in I$
3. $\forall x, y \in I$, $x *_9 y \in \bar{\theta}(I)$.
4. $\forall x \in I$ and $r \in R$, $x *_9 r \in \bar{\theta}(I)$ and $r *_9 x \in \bar{\theta}(I)$

Therefore I is a rough ideal of rough ring R.

Now for $a *_9 b \in \bar{\theta}(I)$ implies $a \in I$ or $b^n \in I$. Therefore I is a rough primary ideal of R.

Remark. By definition it is obvious that every rough prime ideal is a rough primary ideal. But the converse need not be true.

4 Homomorphism on Rough Rings

In this section we define and study about homomorphism of rough rings. Let (U_1, θ_1) and (U_2, θ_2) be two approximation spaces and $+, *; +', *'$ be binary operations on U_1 and U_2 respectively. Let $R_1 \subseteq U_1$ and $R_2 \subseteq U_2$ be two rough rings.

4.1 Definition. A mapping $\varphi : \theta_1(R_1) \rightarrow \theta_2(R_2)$ satisfying

1. $\varphi(x + y) = \varphi(x) +' \varphi(y)$
2. $\varphi(x * y) = \varphi(x) *' \varphi(y)$

$\forall x, y \in \theta_1(R_1)$, is called a rough ring homomorphism from R_1 to R_2.

Remark. In this case we simply say that $\varphi : R_1 \rightarrow R_2$ is a rough ring homomorphism, which means that the mapping φ is in fact from $\theta_1(R_1)$ to $\theta_2(R_2)$ and satisfies the above two conditions.

4.2 Theorem. [9] Let I be a rough ideal of a rough ring R_1. Then $\varphi(I)$ is a rough ideal of rough ring R_2 if $\varphi(\theta_1(I)) = \theta_2(\varphi(I))$.

4.3 Theorem. Let $\varphi : \theta_1(R_1) \rightarrow \theta_2(R_2)$ be a rough ring monomorphism and let P be a rough prime ideal of the rough ring R_1. Then $\varphi(P)$ is a rough prime ideal

of the rough ring R_2 if $\varphi(\theta_1(P)) = \theta_2(\varphi(P))$ and $\varphi(R_1) = R_2$.

Proof. By definition of rough prime ideal, P is a rough ideal of rough ring R_1. Then by theorem (4.2), $\varphi(P)$ is a rough ideal of rough ring R_2.

For $x', y' \in R_2$, $\exists\ x, y \in R_1$ such that $\varphi(x) = x'$ and $\varphi(y) = y'$. Now

$x' *' y' \in {}_1(\varphi(P)) \Rightarrow x' *' y' \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(x * y) \in \varphi(\theta_1(P))$

$\Rightarrow x * y \in \theta_1(P)$

$\Rightarrow$ $x \in P$ or $y \in P$ ($\because$ P is a rough prime ideal)

$\Rightarrow \varphi(x) \in \varphi(P)$ or $\varphi(y) \in \varphi(P)$

$\Rightarrow x' \in \varphi(P)$ or $y' \in \varphi(P)$

Therefore, $\varphi(P)$ is a rough prime ideal of rough ring R_2.

4.4 Theorem. Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring monomorphism and let P be a rough semiprime ideal of the rough ring R_1. Then $\varphi(P)$ is a rough semi-prime ideal of the rough ring R_2 if $\varphi(\theta_1(P)) = \theta_2(\varphi(P))$ and $\varphi(R_1) = R_2$.

Proof. As before, $\varphi(P)$ is a rough ideal of rough ring R_2. For $x' \in R_2$, $\exists\ x \in R_1$ such that $\varphi(x) = x'$. Now

$(x')^2 \in \theta_2(\varphi(P)) \Rightarrow (x')^2 \in \varphi(\theta_1(P))$

$\Rightarrow [\varphi(x)]^2 \in \varphi(\theta^1(P))$

$\Rightarrow \varphi(x^2) \in \varphi(\theta_1(P))$

$\Rightarrow x^2 \in \theta_1(P)$

$\Rightarrow x \in P$ ($\because$ P is a rough semi-prime ideal)

$\Rightarrow \varphi(x) \in \varphi(P)$

$\Rightarrow x' \in \varphi(P)$

Therefore, $\varphi(P)$ is a rough semi-prime ideal of rough ring R_2.

4.5 Theorem. Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring monomorphism and let P be a rough primary ideal of the rough ring R_1. Then $\varphi(P)$ is a rough primary ideal of the rough ring R_2 if $\varphi(\theta_1(P)) = \theta_2(\varphi(P))$ and $\varphi(R_1) = R_2$.

Proof. Again, $\varphi(P)$ is a rough ideal of rough ring R_2.

For $x', y' \in R_2$, $\exists\ x, y \in R_1$ such that $\varphi(x) = x'$ and $\varphi(y) = y'$. Now

$x' *' y' \in \theta_2(\varphi(P))$

$\Rightarrow x' *' y' \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(x * y) \in \varphi(\theta_1(P))$

$\Rightarrow x * y \in \theta_1(P)$

$\Rightarrow$ $x \in P$ or $y^n \in P$ for some positive integer n

($\because$ P is a rough primary ideal)

$\Rightarrow \varphi(x) \in \varphi(P)$ or $\varphi(y^n) \in \varphi(P)$

$\Rightarrow \varphi(x) \in \varphi(P)$ or $[\varphi(y)]^n \in \varphi(P)$

$\Rightarrow x' \in \varphi(P)$ or $(y')^n \in \varphi(P)$

Therefore, $\varphi(P)$ is a rough primary ideal of rough ring R_2.

4.6 Theorem. [9] Let I_2 be rough ideal of R_2.

Then $I_1 = \varphi^{-1}(I_2)$ is a rough ideal of R_1 if $\varphi(\theta_1(I_1)) = \theta_2(\varphi(I_1))$.

4.7 Theorem. Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring monomorphism and let P_2 be a rough prime ideal of R_2. Then $P_1 = \varphi^{-1}(P_2)$ is a rough prime ideal of R_1 if $\varphi(\theta_1(P_1)) = \theta_2(\varphi(P_1))$ and $\varphi(R_1) = R_2$.

Proof. Since $P_1 = \varphi^{-1}(P_2)$, we have $\varphi(P_1) = P_2$, and so $\theta_1(P_2) = \theta_2(\varphi(P_1)) = \varphi(\theta_1(P_1))$. By definition of rough prime ideal, P_2 is a rough ideal of rough ring R_2. Then by theorem (4.6), P_1 is a rough ideal of R_1. For $x, y \in R_1$

$x * y \in \theta_1(P_1) \Rightarrow \varphi(x * y) \in \varphi((P_1))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \varphi(\theta_1(P_1))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \theta_2(P_2)$

$\Rightarrow \varphi(x) \in P_2$ or $\varphi(y) \in P_2$

$\Rightarrow x \in \varphi^{-1}(P_2)$ or $y \in \varphi^{-1}(P_2)$

$\Rightarrow x \in P_1$ or $y \in P_1$

Therefore, $P_1 = \varphi^{-1}(P_2)$ is a rough prime ideal of R_1.

4.8 Theorem. Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring monomorphism and let P_2 be a rough semiprime ideal of R_2. Then $P_1 = \varphi^{-1}(P_2)$ is a rough semi-prime ideal of R_1 if $\varphi(\theta_1(P_1)) = \theta_2(\varphi(P_1))$ and $\varphi(R_1) = R_2$.

Proof. Since $P_1 = \varphi^{-1}(P_2)$, we have $\varphi(P_1) = P_2$, and so $\theta_2(P_2) = \theta_2(\varphi(P_1)) = \varphi(\theta_1(P_1))$. By definition of rough semi-prime ideal, P_2 is a rough ideal of R_2. Then by theorem (4.6), P_1 is a rough ideal of R_1. For $x \in R_1$

$x^2 \in \theta^1(P_1)$

$\Rightarrow \varphi(x^2) \in \varphi(\theta_1(P_1))$

$\Rightarrow [\varphi(x)]^2 \in \varphi(\theta_1(P_1))$

$\Rightarrow [\varphi(x)]^2 \in \theta_2(P_2)$

$\Rightarrow \varphi(x) \in P_2$ ($\because P_2$ is a rough semi-prime ideal)

$\Rightarrow x \in \varphi^{-1}(P_2) \Rightarrow x \in P_1$

Therefore, $P_1 = \varphi^{-1}(P_2)$ is a rough semi-prime ideal of R_1.

4.9 Theorem. Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring monomorphism and let P_2 be a rough primary ideal of R_2. Then $P_1 = \varphi^{-1}(P_2)$ is a rough primary ideal of R_1 if $\varphi(\theta_1(P_1)) = \theta_2(\varphi(P_1))$ and $\varphi(R_1) = R_2$. ($\because P_2$ is a rough prime ideal)

Proof. Since $P_1 = \varphi^{-1}(P_2)$, we have $\varphi(P_1) = P_2$, and so $\theta_2(P_2) = \theta_2(\varphi(P_1)) = \varphi(\theta_1(P_1))$. As before, P_1 is a rough ideal of R_1. For $x, y \in R_1$

$x * y \in \theta_1(P_1) \Rightarrow \varphi(x * y) \in \varphi(\theta_1(P_1))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \varphi(\theta_1(P_1))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \theta_2(P_2)$

$\Rightarrow \varphi(x) \in P_2$ or $[\varphi(y)]^n \in P_2$ for some positive integer n

($\because P_2$ is a rough primary ideal)

$\Rightarrow x \in \varphi^{-1}(P_2)$ or $y^n \in \varphi^{-1}(P_2) \Rightarrow x \in P_1$ or $y^n \in P_1$

Therefore, $P_1 = \varphi^{-1}(P_2)$ is a rough primary

ideal of R_1.

5 Anti-homomorphism of Rough Rings

In this section we define and study about anti-homomorphism of rough rings. Let (U_1, θ_1) and (U_2, θ_2) be two approximation spaces and $+, *; +', *'$ be binary operations on U_1 and U_2 respectively. Let $R_1 \subseteq U_1$ and $R_2 \subseteq U_2$ be two rough rings.

5.1 Definition. A mapping $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ satisfying

1. $\varphi(x + y) = \varphi(x) +' \varphi(y)$
2. $\varphi(x * y) = \varphi(y) *' \varphi(x)$

$\forall x, y \in \theta_1(R_1)$, is called a rough ring anti-homomorphism from R_1 to R_2.

Remark. In this case we simply say that $\varphi : R_1 \to R_2$ is a rough ring anti-homomorphism, which means that the mapping φ is in fact from $\theta_1(R_1)$ to $\theta_2(R_2)$ and satisfies the above two conditions.

5.2 Theorem. [9] Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring anti-monomorphism and let I be a rough ideal of a rough ring R_1. Then $\varphi(I)$ is a rough ideal of rough ring R_2 if $\varphi(\theta_1(I)) = \theta_2(\varphi(I))$.

5.3 Theorem. Let $\varphi : \theta^1(R_1) \to \theta^2(R_2)$ be a rough ring anti-monomorphism and let P be a rough prime ideal of the rough ring R_1. Then $\varphi(P)$ is a rough prime ideal of the rough ring R_2 if $\varphi(\theta_1(P)) = \theta_2(\varphi(P))$ and $\varphi(R_1) = R_2$.

Proof. By definition of rough prime ideal, P is a rough ideal of rough ring R_1. Then by theorem (5.2), $\varphi(P)$ is a rough ideal of rough ring R_2. For $x', y' \in R_2$, $\exists\ x, y \in R_1$ such that $\varphi(x) = x'$ and $\varphi(y) = y'$.

Now

$x' *' y' \in \theta_2(\varphi(P))$

$\Rightarrow x' *' y' \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(y * x) \in \varphi(\theta_1(P))$

$\Rightarrow y * x \in \theta_1(P)$

$\Rightarrow y \in P$ or $x \in P$

$\Rightarrow \varphi(y) \in \varphi(P)$ or $\varphi(x) \in \varphi(P)$

$\Rightarrow y' \in \varphi(P)$ or $x' \in \varphi(P)$

Therefore, $\varphi(P)$ is a rough prime ideal of rough ring R_2.

5.4 Theorem. Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring anti-monomorphism and let P be a rough semi-prime ideal of the rough ring R_1. Then $\varphi(P)$ is a rough semi-prime ideal of the rough ring R_2 if $\varphi(\theta_1(P)) = \theta_2(\varphi(P))$ and $\varphi(R_1) = R_2$.

Proof. As before, $\varphi(P)$ is a rough ideal of rough ring R_2. For $x' \in R_2$, $\exists\ x \in R_1$ such that $\varphi(x) = x'$.

Now $(x')^2 \in \theta_2(\varphi(P))$

$\Rightarrow (x')^2 \in \varphi(\theta_1(P))$

$\Rightarrow [\varphi(x)]^2 \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(x^2) \in \varphi(\theta_1(P))$

$\Rightarrow x^2 \in \theta^1(P)$

$\Rightarrow x \in P$ ($\because$ P is a rough semi-prime ideal)

$\Rightarrow \varphi(x) \in \varphi(P)$

$\Rightarrow x' \in \varphi(P)$

Therefore, $\varphi(P)$ is a rough semi-prime ideal of rough ring R_2.

5.5 Theorem. Let $\varphi : \theta_1(R_1) \rightarrow \theta_2(R_2)$ be a rough ring anti-monomorphism and let P be a rough primary ideal of the rough ring R_1. Then $\varphi(P)$ is a rough primary ideal of the rough ring R_2 if $\varphi(\theta_1(P)) = \theta_2(\varphi(P))$ and $\varphi(R_1) = R_2$.

Proof. Again, $\varphi(P)$ is a rough ideal of rough ring R_2. For $x', y' \in R_2$, $\exists$ $x, y \in R_1$ such that $\varphi(x) = x'$ and $\varphi(y) = y'$. Now

$x' *' y' \in \theta^2(\varphi(P)) \Rightarrow x' *' y' \in \varphi(\theta_1(P))$

$\Rightarrow \varphi(x) *' \varphi(y) \in \varphi(\theta_1(P)) \Rightarrow \varphi(y * x) \in \varphi(\theta_1(P)) \Rightarrow y * x \in \theta_1(P)$

$\Rightarrow y \in P$ or $x^n \in P$ for some positive integern

($\because$ P is a rough primary ideal)

$\Rightarrow \varphi(y) \in \varphi(P)$ or $\varphi(x^n) \in \varphi(P)$

$\Rightarrow \varphi(y) \in \varphi(P)$ or $[\varphi(x)]^n \in \varphi(P)$

$\Rightarrow y' \in \varphi(P)$ or $(x')^n \in \varphi(P)$

Therefore, $\varphi(P)$ is a rough primary ideal of rough ring R_2.

5.6 Theorem. [9] Let $\varphi : \theta_1(R_1) \rightarrow \theta_2(R_2)$ be a rough ring anti-monomorphism and let I_2 be rough ideal of R_2. Then $I_1 = \varphi^{-1}(I_2)$ is a rough ideal of R_1 if $\varphi(I_1) = \varphi(I_1)$.

5.7 Theorem. Let $\varphi : \theta_1(R_1) \rightarrow \theta_2(R_2)$ be a rough ring anti-monomorphism and let P_2 be a rough

prime ideal of R_2. Then $P_1 = \varphi^{-1}(P_2)$ is a rough prime ideal of R_1 if $\varphi(\theta_1(P_1)) = \theta_2(\varphi(P_1))$ and $\varphi(R_1) = R_2$.

Proof. Since $P_1 = \varphi^{-1}(P_2)$, we have $\varphi(P_1) = P_2$, and so $\theta_2(P_2) = \theta_2(\varphi(P_1)) = \varphi(\theta_1(P_1))$. By definition of rough prime ideal, P_2 is a rough ideal of rough ring R_2. Then by theorem (5.6), P_1 is a rough ideal of R_1. For $x, y \in R_1$

$x * y \in \theta_1(P_1)$

$\varphi(x * y) \in \varphi(\theta_1(P_1))$

$\Rightarrow \varphi(y) *' \varphi(x) \in \varphi(\theta_1(P_1))$

$\Rightarrow \varphi(y) *' \varphi(x) \in \theta_2(P_2)$

$\Rightarrow \varphi(y) \in P_2$ or $\varphi(x) \in P_2$

$\Rightarrow y \in \varphi^{-1}(P_2)$ or $x \in \varphi^{-1}(P_2)$

$\Rightarrow y \in P_1$ or $x \in P_1$

Therefore, $P_1 = \varphi^{-1}(P_2)$ is a rough prime ideal of R_1.

5.8 Theorem. Let $\varphi : \theta_1(R_1) \rightarrow \theta_2(R_2)$ be a rough ring anti-monomorphism and let P_2 be a rough semi-prime ideal of R_2. Then $P_1 = \varphi^{-1}(P_2)$ is a rough semi-prime ideal of R_1 if $\varphi(\theta_1(P_1)) = \theta_2(\varphi(P_1))$ and $\varphi(R_1) = R_2$.

Proof. Since $P_1 = \varphi^{-1}(P_2)$, we have $\varphi(P_1) = P_2$, and so $\theta_2(P_2) = \theta_2(\varphi(P_1)) = \varphi(\theta_1(P_1))$.

As before, P_1 is a rough ideal of R_1. For $x \in R_1$

$x^2 \in \theta_1(P_1)$

$\Rightarrow \varphi(x^2) \in \varphi(\theta_1(P_1))$

$\Rightarrow [\varphi(x)]^2 \in \varphi(\theta_1(P_1))$

$\Rightarrow [\varphi(x)]^2 \in \theta(P_2)$ ($\because$ P_2 is a rough semi-prime ideal)

$\Rightarrow \varphi(x) \in P_2$

$\Rightarrow x \in \varphi^{-1}(P_2) \Rightarrow x \in P_1$

Therefore, $P_1 = \varphi^{-1}(P_2)$ is a rough semi-prime ideal of R_1.

5.9 Theorem. Let $\varphi : \theta_1(R_1) \to \theta_2(R_2)$ be a rough ring anti-monomorphism and let P_2 be a rough primary ideal of R_2. Then $P_1 = \varphi^{-1}(P_2)$ is a rough primary ideal of R_1 if $\varphi(\theta_1(P_1)) = \theta_2(\varphi(P_1))$ and $\varphi(R_1) = R_2$.

Proof. Since $P_1 = \varphi^{-1}(P_2)$, we have $\varphi(P_1) = P_2$, and so $\theta_2(P_2) = \theta_2(\varphi(P_1)) = \varphi(\theta_1(P_1))$. Again, P_1 is a rough ideal of R_1. For $x, y \in R_1$

$x * y \in \theta_1(P_1) \Rightarrow \varphi(x * y) \in \varphi(\theta_1(P_1))$

$\Rightarrow \varphi(y) *' \varphi(x) \in \varphi(\theta_1(P_1))$

$\Rightarrow \varphi(y) *' \varphi(x) \in \theta_2(P_2)$

$\Rightarrow \varphi(y) \in P_2$ or $[\varphi(x)]^n \in P_2$ for some positive integer n

($\because$ P_2 is a rough primary ideal)

$\Rightarrow y \in \varphi^{-1}(P_2)$ or $x^n \in \varphi^{-1}(P_2) \Rightarrow y \in P_1$ or $x^n \in P_1$

Therefore, $P_1 = \varphi^{-1}(P_2)$ is a rough primary ideal of R_1.

6 Conclusion

The theory of rough sets is regarded as a generalisation of the classical set theory. It is developed as a mathematical tool to deal with vagueness. In this paper, we discussed the concept of different rough ideals and introduced the homomorphic and anti-homomorphic properties of rough ideals.

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EXTRACTION OF pH INDICATORS FROM GRAPE AS A SUBSTUTUTE TO SYNTHETIC INDICATORS

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Abstract

A pH indicator is a halochromic chemical compound added in small amounts to a solution so that the solution can be determined visually. Commonly used indicators for titrations are synthetic in nature. They are found to posses hazardous effects in human body. The highly coloured pigments obtained from plants and fruits are found to exhibit colour changes with variation of pH. A study has been done to investigate the indicator activity of aqueous extract of grape juice and with that of already existing synthetic indicators.

Keywords: *pH indicator, pigments, grape juice, synthetic indicator*

Introduction

A pH indicator is a chemical detector for hydronium ions (H_3O^+) or hydrogen ions (H^+) in the Arrhenius model. Normally, the indicator causes colour change of a solution depending on the pH. Indicators can also show change in other physical properties. The pH value of a neutral solution is 7.0. Solutions with a pH value below 7.0 are considered acidic and solutions with pH value above 7.0 are basic. pH indicators find many applications in biology and analytical chemistry. Moreover, pH indicators form one of the three main types of indicator compounds used in chemical analysis. For the quantitative analysis of metal cations, the use of complexometric indicators is preferred whereas the redox indicators, are used in titrations involving a redox reaction as the basis of the analysis.

pH indicators are frequently weak acids or weak bases. The general reaction scheme of a pH indicator can be formulated as:

$$\mathrm{HInd} + \mathrm{H_2O} \rightleftharpoons \mathrm{H_3O^+} + \mathrm{Ind^-}$$

Here, HInd stands for the acid form and Ind^- for the conjugate base of the indicator. The ratio of these determines the color of the solution and connects the color to the pH value. pH indicators that are weak protolytes, the Henderson-Hasselbalch equation for them can be written as:

$$\mathrm{pH} = \mathrm{pK}_a + \log \frac{[\mathrm{Ind^-}]}{[\mathrm{HInd}]}$$

The equation, derived from the acidity constant, states that when pH equals the pK_a value of the indicator, both species are present in a 1:1 ratio. If pH is above the pK_a value, the concentration of the conjugate base is greater than the concentration of the acid, and the color associated with the conjugate base dominates. If pH is below the pK_a value, the converse is true.

Materials and Methods

In the present study all the chemicals of analytical grade were procured from M/s Sigma chemical company. The cleaned grapes are blended in a juicer by adding boiling water. It is filtered and kept in a large beaker. The filtrate is deep violet, in colour. The pH of the solution is measured.

Experimental Procedure

10 ml of the titrant with two drops of the natural indicator was titrated against titrates and the color changes for the indicators are noted. The results for strong acid-strong base (HCl - NaOH), strong acid- weak base and weak acid-strong base (CH_3COOH - NaOH) are noted. Each titration is carried out three times by using 1N strength of acid and alkali and results were recorded.

For all type of titrations equivalence point is observed when natural pH indicator is exactly coincided or very closed with equivalence point obtained by standard indicator phenolphthalein. This represents the usefulness of water extract of grape indicator as an indicator in acid base titrations. The titration results are given in the Table 1.

Table.1

Titrant	Indicator	Colour	Titrate	Colour at the end point
HCl	G.I	Deep Red	NaOH	Orange
CH_3COOH	G.I	Purple	NaOH	Orange
HCl	G.I	Deep Red	Na_2CO_3	Green
CH_3COOH	G.I	Purple	Na_2CO_3	Purple

G.I-Grape Indicator

Volume of titrant with standard indicater is given in the Table 2.

Table.2

Titrant	Titrate	Volume taken (ml)	Std.Indicator	G.Indicator
HCl	NaOH	10	10.1	10.1
CH_3COOH	NaOH	10	9.5	9.8
HCl	Na_2CO_3	10	9.8	10
CH_3COOH	Na_2CO_3	10	-	-

Its use in strong acid-strong base titration was found to be more significant over standard indicator as it gives sharp color change at equivalence point. It is observed that indicators acts reversibly and gives sharp color change in both directions. The results obtained showed that the routinely used indicators could be replaced successfully by grape extract as they are simple, accurate, and precise and can be prepared just before experiment. The proposed grape indicator can be used as a substitute to synthetic indicators.

Conclusions

An attempt has been made to investigate the indicator activity of extract of grape juice and to replace synthetic indicators as they have certain disadvantages like chemical pollution, availability problems and high cost. Grape juice extract gives sharp and intense colour change as compared to phenolphthalein and methyl orange. Indicators from grape Juice are evaluated by using strong acid - strong base, strong acid - weak base and weak acid - strong base. In all these titrations the extract was found to be very useful and accurate for indicating the neutralization point. The proposed grape indicator can be used as a substitute to synthetic indicators.

From the Literature review it was found that Grape juice contains anthocyanins; which are the pigmented flavonoids; which may be the reason for its activity as an indicator. Apart from the above advantages the isolation of pure compounds possessing indicator's properties help to know the mechanism by which they shows indicator's properties and new theories of indicators could established.

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PHYTOCHEMICAL AND PHARMACOLOGICAL ANALYSIS OF CENTELLA ASIATICA

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Abstract

Centella has a large amount of triterpenoids including asiaticoside, brahmoside, Asiatic acid, and brahmic acid. Other products include centellose, centelloside and madecassoside. The herb contains the alkaloids brahmine, herpestine and a mixture of three bases. The herb also contains the saponins, hersaponin and bacosides A and B. In this work we extract the chemicals present in it using different solvents and phytochemicaland

Keywords: *Centella, triterpenoids, brahmine, herpestine*

Introduction

Centella asiatica, commonly known as centella and gotu kola, is a small herbaceous, frost-tender perennial plant of the family Apiaceae. It is used as a medicinal herb in Ayurvedic medicines, traditional African medicines, and traditional Chinese medicines. Centella grows in tropical swampy areas. The stems are slender, creeping stolons, green to reddish green in colour.

Centella is used to treat varicose veins and chronic venous insufficiency and in ointments to treat psoriasis and help heal minor wounds. Asiaticoside was revealed as protective against cecal ligation and puncture induced lung injury in mice. This plant also increases vigority.

According to the European pharmacopoeia the herbal substance consists of the dried, fragmented aerial parts, containing minimum 6% of total triterpenoid derivatives, expressed as asiaticoside ($C_{48}H_{78}O_{19}$)

IUPAC name: 6-[[3,4-dihydroxy-6-(hydroxymethyl)-5-(3,4,5-trihydroxy-6-methyl-oxan-2-yl)oxy-oxan-2-yl]oxymethyl]-3,4,5-trihydroxy-oxan-2-yl]10,11-dihydroxy-9-(hydroxymethyl)-1,2,6a,6b,9,12a-hexamethyl-2, 3, 4, 5, 6, 6a, 7, 8, 8a,10,11,12,13,14b-tetradecahydro-1H-picene-4a-carboxylate)

The substances of therapeutic interest are the saponin-containing triterpene acids and their sugar esters, the most important being: Asiatic acid, madecassic acid and the three asiaticoside, asiaticoside A, asiaticoside B. The structure of the three triterpenoid trisaccharides asiaticoside, asiaticoside-A, asiaticoside-B,, have been elucidated by spectroscopic analysis as the [O-β-L-rhamnopyranosyl-(I→4)-O-β-D-glucopyranosyl(I→6)-O-β-D-glucopyranose esters of 2β,3β,23β-trihydroxy-

urs-12-ene-28-oic acid, of 2β,3β,6β,23v-tetrahydroxy-urs-12-ene-28-oic acid and of 2β,3β,6β,23β-tetrahydroxyolean-12-ene-28-oic acid

The main active principles of *Centella asiatica*, are the triterpenoids glycosides asiaticosides and madecassoside (asiaticoside A), used for the quantification of this species as described in the European Pharmacopoeia, and their respective glycols (Asiatic acid and madecassic acid). Significant differences in active constituent contents have been observed between samples of *Centella asiatica* originating from different countries.

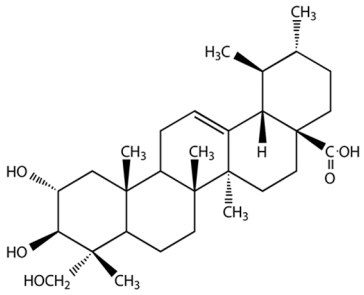
Centella asiatica plants are reported to contain also the following glycosides: indocentelloside, brahmoside, brahminoside, theankuniside and isothankuniside.

The major component of Centella asiatica essential oil is an unidentified terpenic acetate. Other compounds: β-caryophyllene, trans-p-farnesene and germacrene D have been detected in Centella asiatica in respectable amount

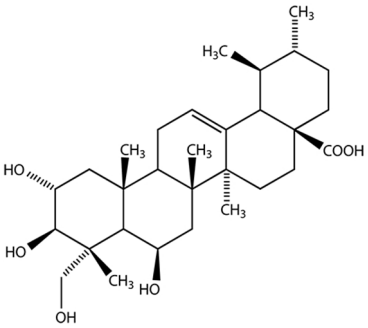
Other chemical constituents found in Centella asiatica are: vallarine, hydrocotylin, pectic acids, steroids, hersaponin, bacogenin, monnierin, tannins.

Centella asiatica leaves are rich in carotenoids, vitamin B and C. Recently to new Flavanoids named castilliferol 1 and castillicetin 2(both exhibiting antioxidant activity), as well as a known compound, isochlorogenic acid 3, were isolated from the whole plant of Centella asiatica. The falavanoids apigenin, rutin and quercetin have been detected in methanolic extract of Centalla asiatica

A polysaccharide, isolated from methanolic extract of Centella asiatica, is a complicated arabinogalactan (AG), which contains a little α-(1→4)-linked GalpA and α-(1→2)-linked Rha*p* residues.



ASIATIC ACID



MADECASSIC ACID

Materials and Methods

Fresh plant parts of *Centella asiatica* were collected from nearby areas. Leaves stem and roots were used for the study. The parts were washed, cleaned and dried under

shade for about 4 days. The dried plant were powdered and used for the extraction process.

Dreid sample is placed inside a thimble made from thick filter paper and loaded into the main chamber of Soxhlet extractor.Four solvents are used for the extraction: acetone, diethyl ether, ethanol and water. The extract obtained is be stored under refrigeration and used for further analysis.

From the extract presence of Phyto chemical analysis like the presence of Carbohydrate, Proteins, Alkaloids, Flavanoids, Tannins, Saponins, Terpenoids were done using standard tests.

For the Antimicrobial study, Stock cultures of *Staphylococcus aureus* and *Bacillus subtilis* were sub cultured and maintained in nutrient broth at 4^{o} C. *Staphylococcus bacillus* is a gram positive bacteria and *Bacillus subtilis* is a gram negative bacteria.

The disc diffusion method was used for the antimicrobial assay. Using a sterile cotton swab lawn cultures of the test organisms were made on nutrient agar plates under aseptic organisms. Filter paper discs of 5mm diameter (whatman filter paper No. 1) were prepared using paper punch and sterilized. Test solutions of crude extract at concentrations were impregnated on the sterile disc. The discs were placed on the surface on the nutrient agar with flamed forceps and gently pressed down to ensure complete contact of the disc with the agar plates.

Weigh out different concentration of the extract and made different discs using Whatman No.1 filter paper. The obtained discs were put in tubes containing different concentration of plant extracts and kept it for 1-2 days at 40° C. The discs will absorb the drug which can be used as disc of different concentration. For the present study the concentrations used are 100µg, 200µg and 300µg.

Discs impregnated with Tetracycline are used as standard.

TREATMENT	ACETONE EXTRACT	DIETHYL ETHER EXTRACT	ETHANOL EXTRACT	WATER EXTRACT
T1	Disc impregnated with Tetracyclin (standard)	Disc impregnated with Tetracyclin (standard)	Disc impregnated with Tetracyclin (standard)	Disc impregnated with Tetracyclin (standard)
T2	Disc impregnated with 100µg Acetone extract	Disc impregnated with 100µg Diethyl ether extract	Disc impregnated with 100µg Ethanol extract	Disc impregnated with 100µg Water extract
T3	Disc impregnated with 200µg Acetone extract	Disc impregnated with 200µg Diethyl ether extract	Disc impregnated with 200µg Ethanol extract	Disc impregnated with 200µg Water extract
T4	Disc impregnated with 300µg Acetone extract	Disc impregnated with 300µg Diethyl ether extract	Disc impregnated with 300µg Ethanol extract	Disc impregnated with 300µg Water extract

After incubation, the plates are examined for the presence of zones of inhibition of bacterial growth around the antimicrobial discs. Anti-bacterial activity of each extract was expressed in terms of the mean diameter of zone of inhibition (in mm)

produced by respective extract at the end of incubation period. If there is no inhibition, growth extends up to the rim of the discs on all sides and the organism is reported as resistant (R) to the antimicrobial agent in that disc. If the zone of inhibition surrounds the disc, the organism is not automatically considered susceptible (S) to the drug being tested. The diameter of the zone must measure and compared for the size with values listed in a standard chart.

The size of the zone of inhibition depends on a number of factors including the rate of diffusion of a given drug in the medium, the degree of susceptibility of the organism to the drug, the number of organisms inoculated on the plate and their rate of growth.

Results and Discussions

The presence of anti-microbial substances in the higher plant is well established. Present study reveals the presence of phytochemical constituents like carbohydrates, alkaloids, triterpenoids and flavanoids in the water extract of *centella asiatica.*

The presence anti-bacterial substances in the higher plants are well established. The study reveals the profound anti-microbial activity of different extract of *centella asiatica* on bacteria's *staphylococcus aureus* and *Bacillus subtilis.* The study also reveals the presence of different phytochemical constituents in centella *Centella asiatica.*

Figure. 1, Figure. 2 and Figure. 3 shows the comparison of antibacterial activity of *centella asiatica* against *staphylococcus aureus* and *bacillus subtilis.* All the tested extract except acetone extract showed varying degrees of strain inhibitory action. Among these water extract showed greater inhibitory action against *Staphylococcus aureus* and *Bacillus subtilis*. Diethyl ether extract showed lesser inhibitory action. Comparing the different extract, the inhibitory action was higher against gram positive *Staphylococcus aureus* than *Bacillus subtilis*. The plant conatins different phytochemical compounds which seems to be responsible for anti-bacterial activity.

The study has shown the scientific basis of the therapeutic uses of traditional medicinal plants. The obtained results provide a support for the use of this plant in traditional medicine and its further investigation. Further studies are required to identify the responsible bioactive molecules and to isolate the compounds responsible for the activity. Our findings confirm the presence of some phytochemical compounds and the anti-microbial activity of centella asiatica. The present results thus offers a scientific basis for traditional use of plants.

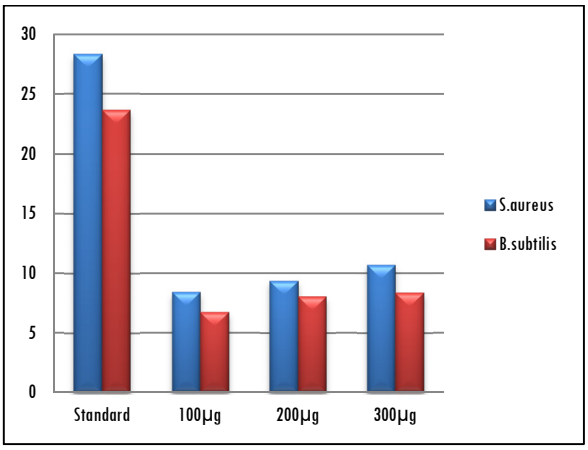


Figure.1 Comparison of diethyl ether extract of Centella asiatica against Staphylococcus aureus and Bacillus subtilis

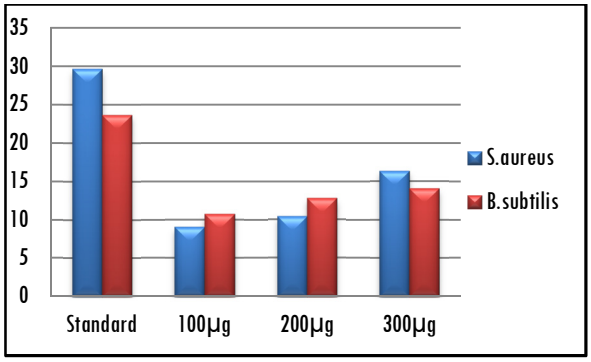


Figure 2 Comparison of water extract of Centella asiatica against Staphylococcus aureus and Bacillus subtilis

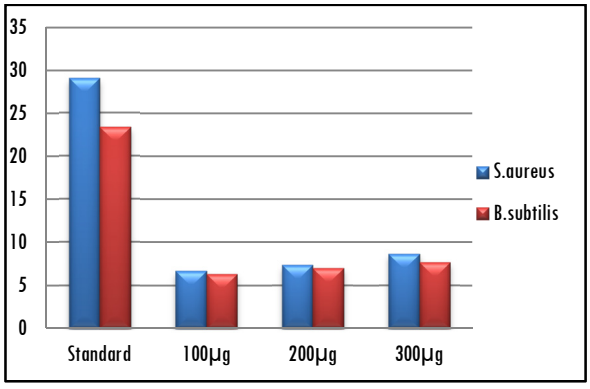


Figure 3 Comparison of ethanol extract of Centella asitica against Staphylococcus aureus and Bacillus subtilis

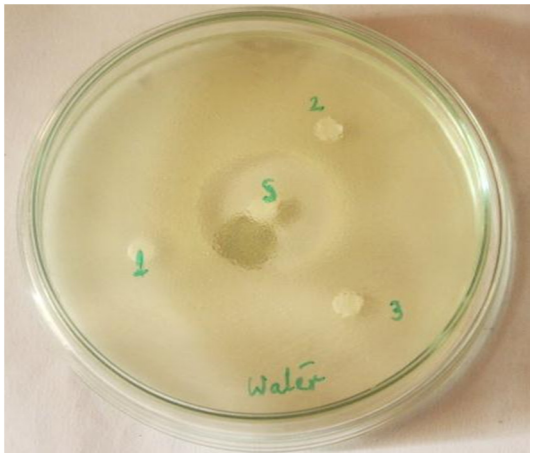


Fig1: Water Extract

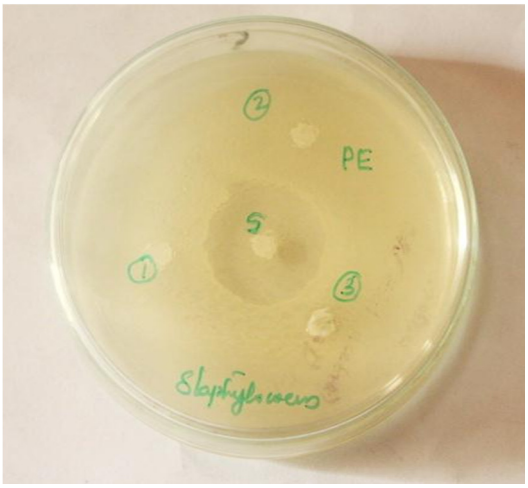


Fig 2: Diethyl Ether Extract

Fig1: Ethanol Extract

Conclusions

From the study it was concluded that soxhlet apparatus can be used for the successful extraction of plant sample. The yield of the extracted sample was calculated and found that acetone extract has more yield and diethyl ether extract has comparatively less yield. The phytochemical analysis showed the presence of various classes of compounds in water extract of *Centella asiatica.* Carbhohydrate, Alkaloids, Triterpenoids, Flavanoids were present in the water extract of *Centella asiatica* were as Proteins, Saponins and Tannins were absent in the sample.

Pharmacological study showed that *Centella asiatica* has the anti-bacterial activity against Gram positive and Gram negative bacteria. The crude extract obtained from *Centella asiatica* plant using solvents of various polarity such as acetone, ethanol, diethyl ether and water extract were subjected for the study. Of this water extract exhibited high activity against *Staphylococcus aureus* and *Bacillus subtilis* were as acetone extract showed no activity against these bacteria's.

From the study it was concluded that different extract of centella asiatica be a very good source for extraction of anti-microbial components. The extract could be used as drug after proper pharmacological evaluation and clinical trials. The future prospects of the current study include further purification of extract and its evaluation and identification of phytochemical components.

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