INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN SCIENCE & TECHNOLOGY

IJSRST

International Journal of Scientific Research in Science and Technology

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CONTENTS

The Drug, The Company, The Life: A Review

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ABSTRACT

Drug becomes an essential 'tool' to reduce pain in daily life. However, religious perspectives are less 'positively agreed' in drugs usage especially towards company production for medicine purposes. However, medicine had successfully save thousands of life in reducing pain suffering. Therefore, drug is important for patients to continuing survivor.

Keywords: Drug, Medicine, Religious, Patients, Survivor.

I. INTRODUCTION

Drug is very important in our daily life to treat the disease. Drug can kill the germ or virus in the body that may cause sick, or pain with the drug digest by the antibody. However, some drug may bring bad impact towards the human, especially children. Paroxetine is 1 of 6 drugs in the class of selective serotonin reuptake inhibitors or SSRIs; may cause the risk of suicide. This can be prove in the year of 1998, where the antidepressant paroxetine had no beneficial effect in treating adolescent. However, the company and the medical center will plays a big role in facing the problem; but they try to withhold the data about the SSRI use in the children. So, this actually are against the rule in the research field, especially involve the medical research. Actually, the drug should undergo the test to confirm that the benefits of the drug still out-weigh its potential risk before its can be use by public.

When we are looking forward to the problem, Paroxetine was no more effective than placebo in treating pediatric depression, a study in 1993-1996 conducted in US. So, the Paroxetine are believed to have no effect in treating the depression. Paroxetine (also known by the trade names Aropax, Paxil, Pexeva, Seroxat, Sereupin) is an antidepressant drug of the SSRI type. Paroxetine is used to treat major depression, obsessive-compulsive disorder, panic disorder, social anxiety, posttraumatic stress disorder, and generalized anxiety disorder in adult outpatients. From the information, taking Paroxetine may cause adverse effect like contraindications, suicide, discontinuation syndrome, interaction, and also overdosage. Britain's Medicines and Healthcare products Regulatory Authority (MHRA) advised doctors in June 2003 that the paroxetine should not be prescribed to patients under the ages of 18 because evidence from various clinical trials showed that episodes of suicidal behavior were between 1.5 and 3.2 times higher in children taking drug than in those receiving placebo. From the prove show that, when the drug test are undergoes among the children during 1993-1996, the clinical trial result were, according to the document, "insufficiently robust" to support an application to regulatory authorities for a label change approving Seroxat for use in pediatric depression. The drug test is actually fail for use in the children, however, the company are trying to withhold the data from public so that they can find another way for treating the paroxetine for children.

II. METHODS AND MATERIAL

The purpose of drug is to help human in curing and surviving the life. So, if the drug are never give any response to the victim, then it may bring the harm to the user of the drug. "In medical research on human subjects, consideration related to the wellbeing of the human subject should take precedence over the interests of science and society (WMA, para5)." From the paragraph

above, show that we must very concern on the human life when taking human as a subject for any research. So, the medical center or the researcher should know the situation of human subject before undergo for the drug test or drug study. The researcher must know "Is the trial on the children will give any effect?" or "This test will save the depression children?". However, when the result on drug test are announce, either a positive impact or negative impact; the company and the researcher must need to be transparent and honestly with the result to the parents. The company plays an important role in treating the data to the public. Moreover, if the result is bad news or negative impact, this will lead to the depression on life to be continuing more worst and even may bring death. The company and the medical center will bring harm to the public especially to the patients.

Secondly, if the patients agreed to undergo for the drug test; and in the process, the test seem to be fail, the patient parent or native have the right to cancel the drug test. If the test continues, then the human will become a victim as the company and the medical center doing the research is just for the sake science breakthrough. As Fernandez et al (2003) argue, the principle of respect for persons 'requires that individual who capable of making decisions for themselves be accorded high regard, and this is embodied in the concept and practice of free and informed consent'. So, human have the right to stop any kind of treatment if there will bring more harm to the patient. It also follows from principles of justice and fairness that those who are not competent to consent should not be exploited as prime candidates for research. So, both parents for children that having the illness on the depression, they need to know the rule before they send their children for drug test.

III. DISCUSSION

When the drug test on mice succeed, but the drug test are need to go for the human as a subject. In religious perspective, especially in Islamic view, Al-Quran; state that "Then, eat of all fruits, and follow the ways of your Lord made easy (for you)." *There comes forth from their bellies, a drink of varying colour wherein is healing for men.* (AN NAHL, ayat 68-69), means Allah wants people to seek for cure even if it come in the mysterious way (as long as the method is not harm). In Hadith, from Jabir bin Abdullah, Muhammad (phuh) said : There is a

remedy for every sickness, and when the remedy is applied to the disease it is cured with the permission of Allah, the Exalted and Glorious. (Narrated by Muslim and Ahmad). In this paragraph, it means that everybody have obligation to find cure. In the Quran, Holy book of Islam, God has said; "God does not forbid you from showing kindness and dealing justly with those who not fought you about and have not driven you out of your homes. God loves just dealers." (Quran, chapter 60/ verse 8). From the paragraph above, we know that God is the creator of anything, and God wants human to love and respect each other, and not trying to take advance on each other just because of the luxury property. So the company should not be selfish just because of the money and never concern on the children life.

In Buddhism view, Buddhism provide guidelines for the village justice, namely in the form of the five basic moral prohibitions (the Pancha Sila, or the five precepts for the laity), which is refrain for taking life, don't steal, avoid illicit sexual activity, don't speak falsely, and refrain from consuming inebriating substances. These guidelines are supposed to be followed by the lay people and monks.(from the Buddhism And Views On Morality, Desire, And Violance). The religious historian I.B. Hunter wrote: "The criteria of Buddhist morality is to ask yourself, when there is one of three kinds of deeds you want to do, whether it will lead to the hurt of self, of others, or of both. If you come to the conclusion that it will be harmful, then you must not do it. But if you form the opinion that it will be harmless, then you can do it and repeat. A person that torments neither himself or another is already transcending the active life." So, in such a way, the company should follow the teach, which they should not trying to cheat in any sense just because to get more benefits on other people. Moreover, the cheat towards the data will bring bad impact especially death to the children when the company withhold the data. The company should not practice bad habit in treating bad to other and harm to other people. Moreover, the Great Buddhist said; "So come what may, I'll never harm; My cherry happiness of mind. Depression never brings me what I wants, My virtue will be warped and marred by it", means that there are happiness in every person live, for a freedom person. When there is someone or something that depress on the situation, than this will never bring the freedom and may cause sadness in the person. So, this situation can be view in children

itself. When they are forces to get the drug test and, may cause pain to them, thus the children will never have a happy life in their own.

In Hinduism perspective, they teach that cheating is very bad attitude. In a universal sense, cheating and other forms of immoral behavior are accepted as necessary for the Divine Play to unfold. Futhermore, everything that is done anywhere at any time is accomplished by Shakti-Prakriti –"He sees [truly] who sees that all actions entirely are being performed by Prakriti, and that the Self is not the Doer." (Gita 13: 29). Therefore, who is there to blame? And who is to blame whom? "Deluded by ego, a person thinks," I am the Doer." (3: 27). In a personal sense, however, cheating or lying creates obstacles to spiritual unfoldment. Therefore, it is not condoned, but rather it is recommended that individuals interested in attaining enlightenment and liberation, the ultimate Goal of all Hindus, should conform to ethical behavior as much as possible. So the company or the researcher should not practice in cheating when involve with the life. If there are happened, this may cause harm to the children. Moreover, Ghandi also concern in the human right in human live, by saying that "I learnt from my illiterate but wise mother that all rights to be deserved and preserved came from duty well done. Thus, the very right to live accrues to us only when we do the duty of citizenship of the world. From this one fundamental statement, perhaps it is easy enough to define the duties of Man and of Woman and correlate every right to some corresponding duty to be first performed." So when the statement is applied in this situation, where the children are actually have the right to argue with their parents when they are scare to undergo for the drug study. The children have the right to live in a freedom, happy and the normal life. The holy prayer of Hinduism from time immemorial has been state that "Let all be happy, Let all be free from disease, Let all see auspicious things, Let nobody suffer from grief." From the statement, can show that how important in life with living happily with free of disease and no people suffer when the pain can be treat. So, if the company is no effort to cure the depression, then it is better not cheating the public and the children by changing on the data.

From the previous view above, if the company is selfish, this will lead to the failure in the research. The company should practice the value of disinterestedness, which is the company supposed to act the benefit for the public good rather than for personal gain. Taking as an example, in the journal of Industry-Sponsored Clinical Research, if there are involve a large of funding in the drug test, the bias will on the result will be the problem. The investigator designed the studies, analyzed and interpreted the data, wrote the papers, and decided where and how to report the results. Generally, the investigator nor their institutions had other financial connections to sponsoring companies. So, in addition to grant support by the company, faculty investigators often have other financial ties to the sponsors of their research. Clinical research that is published is often biased, usually by designing the studies in ways that will almost inevitably yield favorable results for the sponsor. From the point, means the data may be bias towards to the company, and the result may change from negative to positive. So, this will give the harm to the children and make more advantages to the company and the medical center. Since the drug may cause death or bad impact, the company should practice the value of organized skepticism. The company should transparent about the data and expose on the result, so that they get criticize on the drug test before it can be sell or use by public. Changing the result of data is not scientific method to practice. However, the journal on "scientists behaving badly" may cause the data to change in short-time. Taking for an example, in 2000, the US Office of Science and Technology Policy (OSTP) defined research misconduct as "fabrication, falsification, or plagiarism (FFP) in proposing, performing, or reviewing research, or in reporting research results". The modern scientist faces intense competition, and is further burdened by difficult, sometimes unreasonable, regulatory, social, and managerial demands. This mix of pressures creates many possibilities for the compromise of scientific integrity that extend well beyond FFP. When the situation exists, together with the problem that faces in this paper, the scientist or researcher may tend to change the result just because of pressure from the company and also the public. So, that's important for the company to expose the result to the other researcher to make a criticism on the result that may cause harm to the children. Moreover, the company and the researcher should know that the scientific results are the common property of the entire scientific community, which involve with the value of communalism. The success of

the drug test will be benefits for sharing among the community. The duty to participate in research is not a duty to enable industry to profit from moral commitment or basic decency, and that fairness and benefit sharing as well as the widest and fairest possible availability of the product of research is an essential part of the moral force of the argument for the obligation to pursue research. Benefit sharing must be part of any mechanism for implementing the arguments on the research of science.

The drug study is actually trying to save the people from being pain. The researcher is demonstrating in a term "mandatory contribution to public good". (Harris,J. 2012). From the sentence, lifesaving is a major product of science research. So, once the drug test is success, the children are believed to have a happy and good life, but before they did, the company should not involve or disturbing into the research when the result are announce. And the researcher also must realize that their role that changing the result will never change the good things except bad things. The Declaration of Helsinki states: "Medical research is only justified if there is a reasonable likelihood that the population in which the research is carried out stand to benefits from the results of the research". (WMA, para 19). The research is not directly beneficial to the patients but also to the public good when the drug test is success, where the disease can be cure from being depression on the children. The company and the researcher need to be responsible and honest when preferring with the drug test. Both parties should undergo the consequentialism and deontology. They cannot lie by changing the data; because when they lie, this will kill the children that suffering in the depression illness.

IV. CONCLUSION

As a conclusion, Depression is "a mental state or chronic mental disorder characterized by feelings of sadness, loneliness, despair, low self-esteem, and self-reproach." There are some treatment like exercise, taking right nutrition, having more sleep, and social support that can help in reduce depression. However, there will involve a long term to overcome the depression. So, the only way to overcome it fast is by medical treatment; but the company or researcher, or even the medical center must concern on the important of the life. When researcher are being ask whether there is a moral obligation to

support and even to participate in serious scientific research, that's need first to be clear that the scientist are talking of research directed towards preventing serious harm or providing significant benefits to humankind. In all cases, the degree of harm or benefits must justify the degree of burden on research subject, individual, or society. The research must surely be serious in the sense that the project is well designed and with reasonable prospect of leading to important knowledge that will benefit persons in the future.

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Antimicrobial, Antioxidant and Anti-Inflammatory Activities of the extract of a Moroccan endemic Narcissus: *Narcissus broussonetii*

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ABSTRACT

The antioxidant, antibacterial and anti-inflammatory activities, of the extract of the *Narcissus broussonetii* bulbs were studied. The report concerning those properties of this Moroccan endemic species is described for the first time. Nine main alkaloids compounds were identified by GC and GC-MS such as tazettine, pretazettine, homolycorine, lycorine, ismine, 3-epimacronine and papiramine. The extracts of *N. broussonetii* up to 40 mg/100g b.wt, revealed a significant anti-inflammatory effect in mice and showed also a significant scavenging activity at 10 mg mL^{-1}. However, the extract showed a moderate antibacterial activity against all the microorganisms tested.
Keywords: *Amaryllidaceae*, *Narcissus broussonetii*, Alkaloids, Pharmaceutical Activities.

I. INTRODUCTION

The Narcissus which belongs to the family of Amaryllidaceous is long-lived herbaceous plants. However the classifications of Angiosperm Phylogeny Group (APG) place them rather among Alliaceae, in the probable subfamily of Amaryllidoideae [1]. The main environments of Narcissus, are Morocco, Iberian Peninsula and nearby countries [2]. They are also occurring in the East to the Ukrainian Carpathian Mountains, in Asia Minor and in China and Japan [3].

The Narcissus are bulbous plants, with basal sheets and hollow stems, contracted in plate, but sometimes forming a rhizome, carrying of one in several yellow or white flowers [4].These flowers are remarkable by the presence of a crown stemming from the perigone, presented in section or in trumpet, and which contain six petalloids tetals, and six stamens [5,6]. The fruits are out of trefoil capsule containing generally numerous egg-shaped dry seeds, and often black. The roots are fleshy and contractile, usually persistent during the rest period, and an underground bulb, which sink profoundly into the ground [7, 8].

Narcissus plants are mostly toxic, contain numerous sorts with big variability of forms and colours; their strong smell can give the migraine, and also loosens a

slightly sweetened and peppered flavor. It is since known century for a medicinal custom, and used in perfume shop [3, 7].

The Narcissus broussonetii is an endemic species of Morocco which quite localised in the coastal region; It is a hardy perennial plant which passes by a period of biological dormancy; it flowered after the first rains (after October); his environment extends of Mohammedia (30 Km north of Casablanca) until the Oualidia and Eljadida (90 Km south of Casablanca); it lives in the small rocky hills with in fresh ground, and the rocky beds of the old rivers which thrown themselves into the Atlantic. It is the flat with white flowers and appears in little dense population from 10 to 60 cm in height, strong, rustic, but threatened in its territory; it multiplies by sowing or by division bulbs; the inhabitants know the plant by the strong toxicity for the cattle [9].

The alkaloids are the main secondary metabolite of Narcissus plants. They have an interesting therapeutic effect, a great diversity of pharmacological activities and are also toxic [10].

More than hundreds of alkaloids are known in the Narcissus species. They have apparently diverse chemical structures, but derive all of a single precursor, norbelladine. These poisons are studied with interest view they are biologically active and they are candidates to make drugs [11].

Recently, de Andrade et al (2012) studied the Moroccan Narcissus broussonetii and mentioned that twenty three alkaloids were identified, including the very rare dinitrogenous alkaloids obliquine, plicamine, and secoplicamine. Pretazettine, a potent cytotoxic alkaloid, was also isolated from N. broussonetii. The EtOAc extract of N. broussonetii showed notable antiprotozoal in vitro assay against Trypanosoma cruzi, with an IC50 value of 1.77 g/ml. [12]

The aim of this study is to evaluate the antioxidant, antibacterial and anti-inflammatory activities, of the ethanolic extract of the Narcissus broussonetii. The result of this investigation will allow us to examine the possibility to exploit those extracts as new pharmacologically acceptable drugs in the future.

II. METHODS AND MATERIAL

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2.1. Sampling

The bulbs of the Moroccan endemic *Narcissus broussonetii* were collected during November and December 2011 from the Atlantic region of Casablanca. The plant material was identified according to the flora of Morocco [13] and also by Pr. M. Rejdali, Agronomic Institute and Veterinary Hassan II, Rabat (Morocco) and confirmed by Pr Carles Codina, and Pr Jaume Bastida, Department of Natural Products, Plant Biology and Soil Science, Faculty of Pharmacy, Barcelona, Spain. A voucher specimen is deposited in the Herbarium of the Department of Botany and Ecology at the Agronomic Institute and Veterinary Hassan II, Rabat (Morocco), in our laboratory at the Chemistry Department at the Faculty of Science Ain-chock, Casablanca (Morocco) (herbarium n° Nb2912008) and also at the University of Barcelona Herbarium (BCN 58745). [21]- Jahandiz, E. and Maire R. 1934. Catalogue des plantes du Maroc. Tome III, imprimerie Minerva, Alger, Algérie

2.2. Preparation of the extracts

The extraction was performed following the protocol described by Labrana et al (12 bis). Bulbs of *Narcissus broussonetii* (3 kg) were crushed and macerated with EtOH for 48 h. The extract was evaporated under reduced pressure. The bulb crude extract (extract A) was (115 g). The residue dissolved in H_2O and acidified with 5% H_2SO_4 to pH 2-3. The acidic fraction was extracted with petroleum ether. After removing neutral material, the aqueous solution was extracted with ethyl acetate to provide ethyl acetate fraction (extract B). Basifying the aqueous solution up to pH 10-11 with 10% NH_4OH and extracting it with n-Hexane gave hexane fraction (extract C). (12 bis) J. Labra˜na, A.K. Machocho, V. Kricsfalusy, R. Brun, C. Codina, F. Viladomat, J. Bastida, Alkaloids from Narcissus angustifolius subsp. transcarpathicus (Amaryllidaceae), Phytochemistry 60 (2002) 847–852.
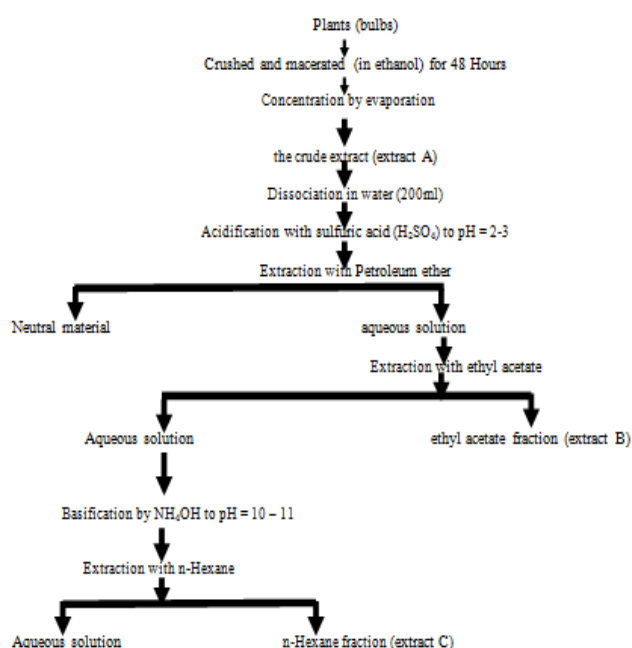
Figure 1 : General diagram of the method used for obtaining the fractions rich in alkaloids

GC–MS Analysis

The EI-MS spectra were obtained on an Agilent 6890NGC 5975 inert MSD operating in EI mode at 70 eV (AgilentTechnologies, Santa Clara, CA, USA). A DB-5 MS column (30 m×0.25 mm×0.25 _m, Agilent Technologies) was used. The temperature program was: 100–180 ◦C at 15 ◦C min−1, 1 min hold at 180 ◦C and 180–300 ◦C at 5 ◦C min−1 and 40 min hold at 300 ◦C.The injector temperature was 280 ◦C. The flow rate of carrier gas (helium) was 0.8 ml min−1. The split ratio was 1:20 for the analysis of the *N. broussonetii* extracts.

Identification of alkaloids by GC–MS

The alkaloids were identified by comparing their GC MS spectra and Kovats retention indices (RI) with our own library database. This library has been continually updated and reviewed with alkaloids repeatedly isolated by our group and identified using other spectroscopic techniques such as NMR, UV, CD and MS [13,14–15].

2.3. Evaluation of antioxidant activity (in vitro)

The antioxidant activity of the *N. broussonetii* extract was studied *in vitro* using the DPPH method. The activity of DPPH (1, 1-Diphenyl-2-picrylhydrazyl)

(Sigma-Aldrich, Steinheim, Germany) radical scavenging was investigated according to the method of Peiwu *et al*. [16]. In this method, a methanolic solution of DPPH (2.95 ml) was added to 50 μl sample of different concentrations of the extracts (10 to100 mg ml^{-1}) in disposable vial. UV spectra were recorded on a UV-vis spectrophotometer HP 8453. The absorbance was measured at 517 nm at regular intervals of 15 sec for 5 min. Ascorbic acid was used as a standard with concentration (0.1 M) [17].

$$Inhibition(\%)(Reactive\ reaction\ rate) = \frac{Abs.(DPPH\ solution) - Abs.(sample)}{Abs.(DPPH\ solution)} \times 100$$

2.4. Anti-Inflammatory activity Animals

Adult's mice of both sexes, weighing 25-28 g, were used in the experiments. The animals were allowed access to standard mouse chow and tap water. They were maintained in a controlled environment at 22-25 °C and 60±5 % relative humidity with a 12 h dark/light cycle and acclimatized for at least one week prior to use. The animals were randomly assigned to different experimental groups. each group kept in separate cage. All animal procedures were performed after approval from the Ethics Committee of the National Research Centre and in accordance with the recommendations for the proper care and use of laboratory animals.

Carrageenan-Induced Rat Paw Edema

The carrageenan was used to evaluate the anti-inflammatory properties of our ethanolic crude extract [18]; the mice were randomly assigned to treatment groups. The sterile carrageenan lambda (100 μL of a 1% solution in saline) was injected sub-planter into the right hind paw of the mice. The contralateral hind paw received the same volume of pure saline solution (0.9% NaCl) and served as a normal control (non-inflamed paw). Carrageenan caused visible redness and pronounced swelling that was well developed during 5 h and persisted for more than 48 h [19]. The hind footpad thickness was measured with a micrometer caliber [20, 21] before and after carrageenan injection at 1, 2, 3, 4 and 5 h. Three groups of six mice were used. The first group was administered saline solution (1ml) and served as control. The second group was tested by crude extract (20 and 40 mg/100 g b. wt. orally); the third group was

tested by indomethacin (2 mg/100 g body. wt.). The oral administration of the crude extract or indomethacin was given 1 h after carrageenan injection.

The mean paw volume was measured immediately before carrageenan injection (Vo) and then every hour (Vt) for five hours post administration of the crude extract and control [20]. The anti-inflammatory activity is expressed as percentage of reduction of the edema in the treated mice compared to control mice. The percentage edema and the percentage inhibition were calculated as follows:

$$\% \text{ edema (E)} = \frac{Vt - V0}{V0} \times 100$$

2.6. Antimicrobial Activity

Ethanolic crude extract and fractions were tested against *Candida albicans* ATCC 28367, *Fusarium solani* ATCC 36031, *Staphylococcus aureus* ATCC 25923, *Pseudomonas aeruginosa* ATCC 27853, *Escherichia coli* ATCC 25922 *Klebsiella pneumoniae* ATCC 23467 *Salmonella enteritidis* ATCC 13312 and *Streptococcus pneumoniae* ATCC 49619. Identity of the bacteria (Origin ATCC Gene Bank) used in this study was confirmed by Microbial Identification System in Biotechnology Application and Research Center at the National Institute of Hygiene, Rabat, Morocco.

The bacterial strains were cultured overnight at 37 ℃ in Mueller-Hinton Agar (MHA), and the tow fungi *Candida albicans and Fusarium solani* were cultured overnight at 30 ℃ in Sabouraud dextrose agar [22].

The antimicrobial activity was studied using the well diffusion method [23]. The degree of growth inhibition was evaluated after 48hr for bacteria and 12hr for fungi and compared with the growth inhibition results obtained from the controls (Tetracycline for bacteria and Nystatin for fungi).

2.7. Statistical Analysis

Data were expressed as Mean±SE of at least three independent experiments. The differences between control and treated groups were determined by one-way ANOVA followed by the least significant difference (LSD) [24].

III. RESULT AND DISCUSSION

3.1. Chemical composition of the extracts

The isolated compounds led to the identification of seven alkaloids (Table 1) which the most important alkaloids are: Tazettine with an abundance of approximately 20.46% and 34.10% of the total mixture respectively in the crude extract and ethyl acetate fraction. In addition we observed the presence of other alkaloids with abundance significantly, as Homolycorine, Lycorine, Ismine, Prettazetine, and 3- Epimacronine.

Table.1: Main alkaloids identified from *Narcissus broussonetii*

Alkaloids	Crude extract	n-Hexane	Ethyl acetate
Tazettine	20.46		34.10
Ismine	14.84		13.85
Homolycorine	18.6	29.21	
Lycorine			29.21
8-O Demetilhomolicorine	16.84		
3-Epimacronine	2.06		2.06
Trisferidine			
Papiramine		0.61	
Pretazettine		11.34	
Total	*72.8*	*41.16*	*79.22*

3.2. Pharmacological Results

3.2. 1. Antioxidant Activity (in vitro)

The antioxidant activity of ethanol extract of *N.broussonetii* was studied in vitro using DPPH method. The result of the kinetics of DPPH scavenging reaction of ascorbic acid and *N. broussonetii* ethanol extract at different concentrations is given in figure 1. It showed a strong scavenging activity just after 5 second and the % of inhibition obtained were 82.5, 79.3, 77.9, 73.6, 72.4, 65.2, 61.7, 62.5, 66.1 and 66.9, respectively for the concentrations 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 mg mL^{-1}. The values found for these samples were lower than those of the positive control ascorbic acid (89.8). The lower concentration (10 mg mL^{-1}) seems to be more active than the higher one as shown in Figure 1.

Figure 2 : The in vitro antioxidant activity of the ethanol extracts of *N. broussonetii*

groups	After 1h		2h		3h		4h		5h	
	Oedema %	Oedema inhibition %	Oedema %	Oedema inhibition %	Oedema %	Oedema inhibition %	Oedema %	Oedema inhibition %	Oedema %	Oedema inhibition %
Control	67.1 ±5.6*	-	82.1 ±2.8*	-	85.6 ±3.6*	-	87.03 ±3.3*	-	92.4 ± 2.1*	-
N. broussonetii ethanolic extract (20 mg/100g b.wt)	42.1 ±3.4*	36.7	51.4 ±2.3*	32.6	58.8 ±3.7*	30.0	62.01 ±2.4*	29.4	61.5 ±2.3*	27.3
N. broussonetii ethanolic extract (40 mg/100g b.wt)	41.4 ±1.6*	34.8	45.5 ±5.3*	38.0,	58.5 ±4.0*	31.5	59.7 ±6.4*	32.9	58.5 ±4.5*	30,4
Indomethacin (2mg/100g b.wt)	44.2 ±3.1*	34.1	45.5 ±1.7*	44.6	52.5 ±2.5*	38.7	44.30 ±1.0*	48.1	43.6 ±3.4*	49.2

Data are presented as Mean±SEM; Significant change from control values at respective time; Points are denoted by *p<0.05 (one way ANOVA and Duncan test)

3.2.3. Antibacterial and antifungal activities

The result of antibacterial activity was summarized in table 3.

Table 3: Antimicrobial activity of ethanolic extract and fractions of *N. broussonetii*

Microorganisms	Zone of inhibition in mm²+			Standards
	Extract and fraction			
	Crude extract	Ethyl acetate fraction	n-Hexane fraction	
Fungi				Nystatin(50 IU)
Candida albicans	17	32	26	34
Fusarium solani	15	30	20	38
Bacterial				Tetracycline (30 IU)
Escherichia coli	16	28	20	24
Klebsiella. Pneumoniae	15	25	21	20
Salmonella enteritidis	10	24	19	25
Staphylococcus aurous	24	24	25	30
Streptococcus pneumoniae	18	22	22	26
Pseudomonas aeruginosa	17	23	21	<4

* Including the diameter of the well (4 mm);   + Mean value of three independent experiments

The crude extracts showed significant activity against all Gram-positive bacteria except *Salmonella enteritidis*. The ethyl acetate fraction also showed moderate antibacterial activity against all bacteria whose zone of inhibition was ranging from (22-28 mm). The n-hexane fraction showed mild antibacterial activity against all Gram positive bacteria whose zone of inhibition was ranging from (19-21 mm).

The ethanolic crude extracts of *N. broussonetii* showed an activity in comparison to standard. Highest Zone of inhibition with ethanol extract of bulbs of *N. broussonetii* was found to be 24 mm against *Staphylococcus aurous* and lowest zone of inhibition was found to be 10 mm against Gram negative

Chart Title

3.2. 2. Anti-Inflammatory activity

Sub-planter injection of carrageenan into the mouse hind paw elicited an inflammation (swelling and erythma) and a time dependant increase in paw thickness compared with the pre carrageenan control value.

The anti-inflammatory activity is expressed as percentage of reduction of the edema in the treated mice compared to control mice.

The acute paw oedema response induced by sub-planter carrageenan was significantly reduced at 1, 2, 3, 4 and 5 h by 36.7, 32.6, 30.0 29.4 and 27.3% for 20 mg of *N. broussonetii* ethanolic extract and by 34.8, 38.0, 31.5, 32.9 and 30.4% for 40 mg of the same extract. For indomethacin, the % of oedema inhibition was 34.1, 44.6, 38.7, 48.1 and 49.2% respectively at 1, 2, 3, 4 and 5 h (table 2).

Table 2: Anti-inflammatory effect of *N.broussonetii* ethanolic extract at doses of 20 and 40 mg/100 g b. wt. on carrageenan-induced mice paw oedema

Salmonella enteritidis. The n-hexane fraction showed highest activity against Gram negative *Staphylococcus aurous* 25 mm and lowest zone of inhibition was found to be 19 mm against Gram positive *Salmonella enteritidis*. The ethyl acetate fraction showed highest activity against Gram positive *Escherichia coli* 28 mm and lowest zone of inhibition was found to be 22 mm against Gram negative *Streptococcus pneumoniae.*

The antifungal screening was carried out against tow fungi *Candida albicans and Fusarium solani.* Ethyl acetate fraction was found to have a better antifungal activity (30-32 mm) than n-hexane (20-26 mm) and the crude extract (17-15mm).

IV. CONCLUSION

In this study, nine alkaloids from *Narcissus broussonetii* bulbs were reported. This investigation reports that the plant possesses antioxidant, anti-inflammatory and antimicrobial activities. Further studies are underway to reveal any additional potential of this plant as a biocide, and thus to determine the mechanisms of action.

V. ACKNOWLEDGEMENTS

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Review on Foundry Waste Treatment

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ABSTRACT

India's rapid economic growth and soaring demand by sectors like infrastructure, real estate and automobiles, at home and abroad, has put Indian steel industry on the global map. According to the latest report by International Iron and Steel Institute (I ISI), India is the seventh largest steel producer in the world. A foundry is a casting manufacturing system. Casting is the process of forming objects by pouring liquid metal into prepared mould and allowing the melt to solidify. Foundry is a factory which produces metal castings from either ferrous or non- non-ferrous alloys. Metals are turned into parts by melting the metal into a liquid, pouring the metal in a mould, and then removing the mould material or casting. The most common metal alloys processed are aluminium and cast iron. However, other metals, such as steel, magnesium, copper, tin, and zinc, can be processed. The foundry operations generate different kinds of air pollution, depending upon the kinds of furnace in use and the kinds of energy inputs that they use. Foundry is one of the most energy intensive metallurgical industries. Various sections of Foundry namely Pattern making, moulding, melting, core making, compressed air etc. consume energy in the form of electricity or through burning of fuel. Among these largest amount of energy to the tune of 65 – 70 % of the total Foundry energy is consumed in melting operation. As the Foundries are growing with mechanization and automation, the requirement of energy is also increasing day by day. On the other hand today the whole world is frightened of climate change and global warming due to CO_2 generation from burning of fuel as source of energy or for producing electricity.

Keywords: Infrastructure, Casting, Foundry, moulding, CO_2

I. INTRODUCTION

In foundries, molten metals are cast into objects of desired shapes. Castings of iron, steel, light metals (such as aluminium), and heavy metals (such as copper and zinc) are made in units that may be independent or part of a production line. Auto manufacturing facilities usually have foundries within their production facilities or as ancillaries. The main production steps include:

- Preparation of raw materials
- Metal melting
- Preparation of moulds
- Casting

Finishing (which includes fettling and tumbling).
Electric induction furnaces are used to melt iron and other metals. However, large car component foundries and some small foundries melt iron in gas or coke-fired cupola furnaces and use induction furnaces for aluminium components of engine blocks. Melting capacities of cupola furnaces generally range from 3 to 25 metric tons per hour (t/hr.). Induction furnaces are also used in zinc, copper, and brass foundries. Electric arc furnaces are usually used in stainless steel and sometimes in copper foundries. Flame oven, which burns fossil fuels, are often used for melting nonferrous metals. The casting process usually employs non-reusable moulds of green sand, which consists of sand, soot, and clay (or water glass). The sand in each half of the mould is packed around a model, which is then removed. The two halves of the mould are joined, and the complete mould is filled with molten metal, using ladles or other pouring devices. Large foundries often have pouring furnaces with automatically controlled pouring. The mould contains channels for introducing and distributing the metal a "gating system." For hollow casting, the mould is fitted with a core. Cores must be extremely durable, and so strong bonding agents are used for the core, as well as for the moulds themselves. These bonding agents are usually organic resins, but inorganic ones are also used. Plastic binders are being

used for the manufacture of high-quality products. Sand cores and chemically bonded sand moulds are often treated with water-based or spirit-based blacking to improve surface characteristics. Aluminium and magnesium, as well as copper and zinc alloys, are frequently die-castor gravity-cast in reusable steel moulds. Finishing processes such as fettling involves the removal from the casting of the gating system, fins (burrs), and sometimes feeders.

II. METHODS AND MATERIAL

A. Foundry

2.1 Manufacturing process

A generalized block flow diagram of the sand casting process is shown in Figure 2.1. The sand casting process begins with patternmaking. A pattern is a specially made model of a component to be produced. Sand is placed around the pattern in a split container, called a flask, to make a mild. Melds are usually produced in two halves so that the pattern can be easily removed. When the two halves are reassembled, a cavity remains inside the mild in the shape of the pattern. Cores are made of sand and a binder and must be strong enough to be inserted into a mold.Cores shape the interior surfaces of a casting that cannot be shaped by the mild cavity surface. The patternmaker supplies core boxes which are filled with specially bonded sand for producing precisely dimensioned cores. Cores are placed in the mild, and the mild disclosed. Molten metal is then poured into the mild cavity, where it is allowed to solidify within the space defined by the sand mild and core. The melds used in sand casting consist of a particulate refractory material (sand) that is bonded together to hold its shape during pouring. The most common type of melding process is green sand melding. Green sand is typically composed of sand, clay, carbonaceous material and water. Sand constitutes 85 to 95 present of the green sand mixture. Often the sand is silica, but olivine and zircon are also used. Approximately 4 to10 present of the mixture is clay. The clay acts as a binder, providing strength and plasticity.

The foundry or metal casting process begins with melting of the metal to be poured into foundry melds. During melting, the metal may be alloyed by the addition of other metals, refined when undesirable impurities are present or inoculated to improve their

final solidification structure. Cupola, electric arc, induction, hearth (reverberator), and crucible furnaces are all used to melt metals. Once the molten metal has been treated to achieve the desired properties, it is tapped from the furnace and transferred to the pouring area in refractory-lined ladles. Sometimes the molten metal is poured directly from the furnace into a mild or melds without subsequent transfer by ladles. After cooling, risers and runners are removed from the casting using band saws, abrasive cut-off wheels, or arc cut-off devices. Parting line flash is removed with chipping hammers. Contouring of the cut-off areas and parting line is done with grinders. Castings may be repaired to eliminate defects by welding, brazing or soldering.
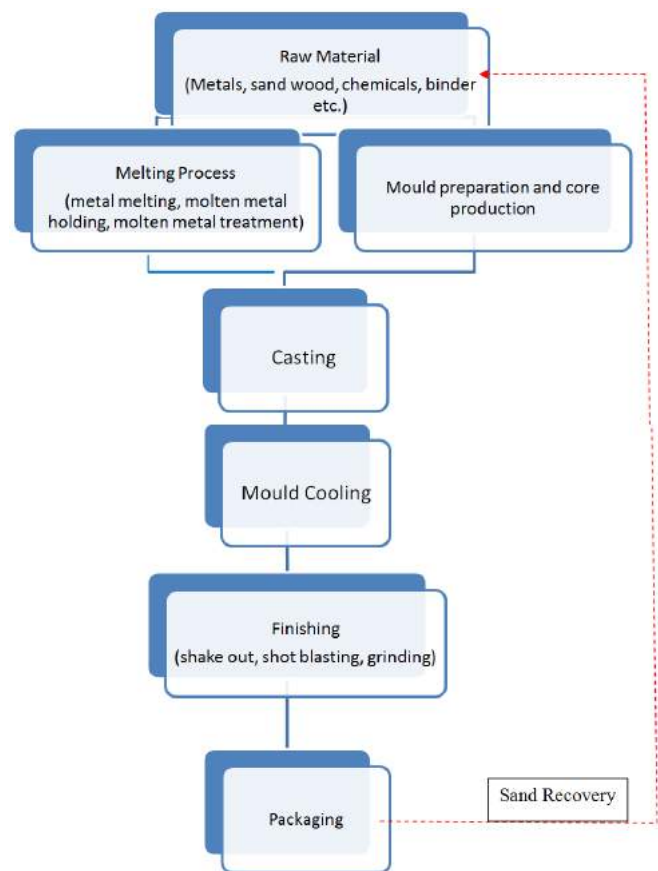
Figure 1 : Flow Diagram for Casting Manufacturing Process.

2.2 Sources of Waste

Product castings manufactured by foundries generate the following wastes:

- Spent system sand from melding and core making operations and used core sand Not returned to the system sand (sweepings, core butts)

- Investment casting shells and waxes
- Cleaning room waste (spent shot, grinding wheels, dust)
- Dust collector and scrubber waste
- Slag
- Miscellaneous waste.

2.2.1 Spent Foundry Sand

Most foundries reuse some portion of their core making and melding sand; in many cases most of the sand is reused. Green sand is reused repeatedly. Fines build up as sands are reused, and a certain amount of system sand must be removed regularly to maintain the desired sand properties. The removed sand, combined with the sand lost to spills and shakeout, becomes the waste sand. Dust and sludge produced from melding sand are often collected as part of an air pollution control system located over the melding and shakeout operations. Waste canals are in the form of large clumps that are screened out of the melding sand recycle system or in the form of sand that has been cleaned from the castings.

2.2.2 Investment Casting Waste

Investment casting shells can be used only once and are disposed of in landfills as a non-hazardous waste unless condensates from heavy metal alloy constituents are present in the shells. Waxes that are removed from the casting shells can be recycled back into wax sprees and runners for further reuse or can be sent to a wax recycling operation for recovery.

2.2.3 Cleaning Room Waste

Cleaning room waste that is ultimately disposed of in a landfill includes used grinding wheels, spent shot, floor sweepings and dust from the cleaning room dust collectors. This waste may be hazardous if it contains excessive levels of toxic heavy metals.

2.2.4 Dust Collector and Scrubber Waste

During the melting process, a small percentage of each charge is converted to dust or fumes collected by bag houses or wet scrubbers. In steel foundries, this dust may contain varying amounts of zinc, lead, nickel, cadmium and chromium. Carbon-steel dust tends to be high in zinc and lead as a result of the use of galvanized scrap, while stainless steel dust is high in nickel and chromium. Dust associated with non-ferrous metal production may contain copper, aluminium, lead, tin and zinc. Steel dust may be encapsulated and disposed of in a permitted landfill, while non-ferrous dust is often sent to a recycler for recovery of metal.

2.2.5 Slag Waste

Slag is a relatively inert, glassy mass with a complex chemical structure. It is composed of metal oxides from the melting process, melted refractory's, sand, coke ash (if coke issued), and other materials. Slag may also be conditioned by fluxes to facilitate removal from the furnace. Hazardous slag may be produced in melting operations if the charge materials contain significant amounts of toxic metal such as lead, cadmium and chromium. To reduce the sulphur content of iron, some foundries use calcium carbide desulphurization in the production of ductile iron. The calcium carbide desulphurization slag generated by this process may be classified as a reactive waste.

2.2.6 Wastewaters

Cooling water, such as that from cooling of induction furnaces, is usually discharged to a storm sewer system without treatment. Most foundries generate little or no process wastewater. Water quenching baths, if employed, when purged or discarded, may require treatment depending on the nature of contaminants and regulations governing discharges. Storm water, if uncontaminated by contact with waste materials, such as spent foundry sand, usually can be discharged directly to municipal storm sewers.

2.2.7 Miscellaneous Waste

Most foundries generate miscellaneous waste that varies greatly in composition, but makes up only a small percentage of the total waste. This waste includes welding materials, waste oil from forklifts and hydraulics, empty drums of binder and scrubber lime.

3. Process

3.1.1 Raw Material Receipt

Raw metal is primarily in the form of metal and alloy ingots with any further treating or alloying occurring in the melting furnace. The use of ingots, as opposed to scrap, as feed, keeps emissions from the melting furnace at a low level.

3.1.2 Pattern Tooling

The patterns of different moulds to be casted are prepared with help of different machines such as lathe, grinders etc. These patterns are thoroughly checked as the quality of product depends on these patterns.

3.1.3 Moulding & Core Shop

In this part, different moulds of sand are prepared according to the requirements of the part. The sand used for making moulds is recycled thus minimising the solid waste generated.

3.1.4 Liquid Metal Pouring

Different raw materials such as Pig Iron, Mild steel, Etc. are melted in an electric arc furnace. This molten metal is then poured into different moulds to give them the desired shape.

3.1.5 Cooling

The metal casting and the sand mould is separated in a separator and the sand is then carried to the sand depot where it is cooled and reused to make the mould. The ready casting is then passed on to the cooling tower where small water droplets are sprayed so as to bring down the temperature of the casting.

3.1.6 Dispatch and Delivery

The casting is the carried to the dispatch shop where final finishing such as shot blasting; grinding is done in order to make the finishing of the product very smooth. This finished product is then dispatched through the trucks.

III. RESULT AND DISCUSSION

Effluent Treatment Plant

Foundry effluent contains soluble organics, suspended solids, trace organics. All these components contribute largely towards their high biological oxygen demand (BODS) and chemical oxygen demand (COD). Foundry wastes are dark black in colour and usually slightly alkaline in nature and become acidic quite rapidly due to the addition of different oils. The characteristics of a dairy effluent contain Temperature, Colour, PH (6.5-8.0), DO, BOD, COD, Dissolved solids, suspended solids, chlorides, sulphate, oil & grease. Uncontaminated cooling water is usually discharged to municipal storm

sewers or ditches. Some foundries employ static water quench tanks. The frequency of static quench tank dumps, quench water characteristics when dumped and receiving facility or medium are unknown. One foundry has a permit for the discharge of process wastewater to a ditch after clarification and oil separation. The operation of the ETP is such that it will give an effluent of such standard, prescribed by the Maharashtra Pollution Control Board (MPCB). The following prescribed standard by the board or under EP Act, 1986.

Table 1: Norms for Foundry.

Sr. No.	Parameters	Standards Prescribed by Board
		Limiting concentration in mg/l, except for pH
1.	pH	6-9
2.	Oil & Grease	<10
3.	BOD (3 days 27^0C)	25
4.	Suspended Solids	100
5.	COD	<250

Padmavati Castings Pvt. Ltd. has provided an ETP in order to treat the waste water coming out of the foundry. This water is recycled and reused for different purposes such as cooling tower, gardening, etc. The units of the ETP are:

1. Equilization Tank
2. Settling Tank
3. Sludge Drying Beds

The flow diagram of the ETP is shown in the diagram below (fig 2).
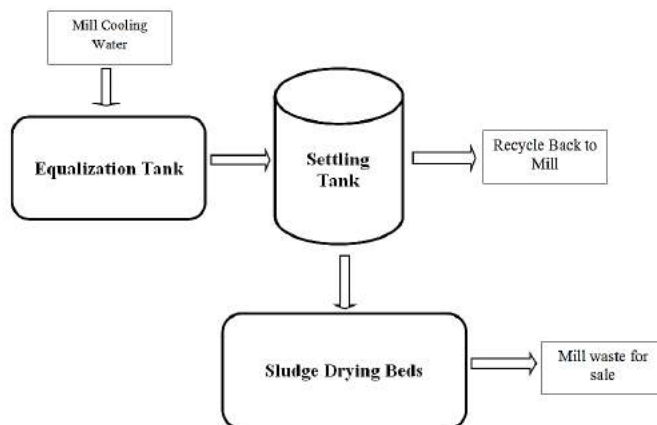
Figure 2 : Process Flow Diagram of ETP of Industry

A. Equalisation Tank

ETPs are usually designed to treat wastewater that has a more or less constant flow and a quality that only fluctuates within a narrow range. The equalization tank overcomes this by collecting and storing the waste, allowing it to mix and ensuring that it becomes less variable in composition before it is pumped to the treatment units at a constant rate. The purpose of equalization for industrial treatment facilities are therefore:

- To minimize flow surges to physical-chemical treatment systems and permit chemical feed rates that are compatible with feeding equipment.
- To help adequate pH control or to minimize the chemical requirements necessary for neutralization.
- To provide continuous feed to biological systems over periods when the manufacturing plant is not operating.
- To prevent high concentrations of toxic materials from entering the biological treatment plant.The purpose of providing equalization tank is that self-neutralization & dilution will take place due to discharge of regeneration cycles& cooling water blow down. Oil and grease if any, will be skimmed off from top. After collection in equalization tanks the waste water will be pumped to neutralization tanks. Depending upon pH, addition of acid (H2SO4) or alkali (lime solution) will be done. The contents of neutralization will be stirred for at least one hour.

B. Settling Tank

After neutralization tank, the waste water will be allowed to settle in a setting tank of about 6 hours retention period. There claimed water is used for slag cooling / or land irrigation.

C. Sludge Drying Beds

The sludge drying beds are used for dewater the settled sludge. The excess sludge from the clarifier is discharged to sludge drying beds at intervals so that the concentration of MLSS is maintained in aeration tank. These are the sand beds of 250 mm of sand over about equally thick well-graded gravel layer, underlain by perforated drainage lines spaced 2.5 to 6 m apart. The bed should slope towards the discharge end at rate of 1 in 200.

D. Economic Consideration

The costs of wastewater treatment are a factor of the major importance for the selection the appropriate treatment system. Estimates should be made the investment costs and the expected annual costs. The investment costs are largely determined by construction costs will depends on the price of the energy and chemicals required for the operation of the plant, the discharge fees and the capital costs on investment. A problem for the estimation of the costs of treatment plants is that prices are rapidly changing. Cost estimates should therefore be referenced to an index.

IV. CONCLUSION

The study concerned with the ETP for Foundry Industry. It can be concluded that, the overall performance of the effluent treatment plant was satisfactory. The individual units are also performing well and their removal efficiencies are satisfactory. The treated effluent meets the MPCB standard for discharge in inland surface water hence it can be said that the plant is working efficiently. This treatment plant is high potential for, reduction for pH, Temperature, TDS, and COD.

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Parking Study of CBD Area of Indore – A Case Study

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ABSTRACT

Indore is the commercial capital of Madhya Pradesh. It had a registered vehicle population of about 0.48 million in 2000 which is increasing at an average annual rate of 8.8 percent. Indore has a population of 3,276,697 with an area of only 3,898 square kilometers (as per the Census-estimated 2011). It is the most densely populated city in the central province. Thus being the most densely populated city it has major parking problems everywhere, especially at CBD areas. In the present study parking behavior and present parking scheme has been studied at Novelty Market Jail Road. The average of the total vehicles parked has been determined by cordon count, patrolling and questionnaire method. An average of seven days of vehicle count has been considered.
Keywords: CBD, Parking Turnover, Parking Index, Cordon Count, Patrolling.

I. INTRODUCTION

Growing population of India has created many problems among which parking has been one of the most common problems which we encounter every day. There is not only problem of space for the traffic moving on the road but also for the parking of the vehicles. The problem of parking is quiet high in Indore district. The CBD areas of the city are mostly affected with insufficient or no parking spaces at all during the entire daytime. This encourages people to opt for illegal parking which further leads to traffic congestions and sometimes many a times causes jamming condition.

Novelty market of Indore is one of the most congested areas of Indore. It has about an average of 1300 shops with no suitable parking scheme. The only parking facility is on street right angled parking. The lack of suitable parking scheme makes it inconvenient for the costumers to park their vehicles. Also, this makes the area most susceptible to jamming about any time of the days.

II. METHODS AND MATERIAL

The following are the objectives of the present study :

- To determine the total number of vehicles parked per day
- To determine the actual number of parking spaces available
- To determine the number of legal and illegal parking
- To suggest a suitable parking scheme, if required
- To suggest suitable parking charges for the same
- To suggest the amount of revenue generated from the parking scheme

A. Methodology

The following methodology has been adopted:

- **Determination of total number of parked vehicles**

Three methods were used for the determination of number of vehicles parked in Novelty area:

- Cordon count method
- Patrolling method
- Questionnaire method

Cordon Count:

The two ends of the novelty market i.e. intersection at Jail road and intersection at Devi Ahilya Marg were marked with cordon lines. The difference between the

total number of incoming traffic and total outgoing traffic provided the total number of parked vehicles. This was computed for every 15 minutes.

Patrolling Method

The total length of Road is about 425 meters. Patrolling was done for every hour. The total number of parked vehicles was counted.

Questionnaire method: The questionnaire was carried for a week excluding Sunday. In this 150 people were questioned regarding:

- Trip purpose
- Time of arrival
- Time of departure
- Regularity of visit

Questionnaire Method

Questionnaire was conducted separately for the shopkeepers.

- **Determination of actual number of parking space available**

Since, the entire parking scheme of the Novelty Market is On Street parking the total length available for parking was measured and the total parking space was computed for the same. The difference between the total parked vehicles and the number of parking space available gave the total number of illegal parking.

- **Determination of suitable parking scheme**

On the basis of available land space for construction of a parking system a suitable parking scheme has been suggested.

- **Cost Analysis**

The following features were taken into account for cost analysis:

- Tentative cost of construction for parking scheme
- Revenue generated from the parking scheme
- Miscellaneous (maintenance, electricity, guards etc.)

B. Calculations

- **For Parking Determination of total number of parked vehicles**

Total Length of road available for parking = 1300 meters (approximately)
*This includes all the congested lanes connecting the main road where parking is allowed.

Average space required to park a bike = 0.8 X 350 m2
*As per the field dimensions

Total parking spaces (for bikes) = 1000/0.8 = 1250

Total number of shops in novelty market = 1300 (approximately)

As per the questionnaire conducted each shop has atleast two shopkeepers at an average and each shopkeeper has his separate vehicle.

Therefore, total number of parking spaces required for shopkeepers = 1300 X 2 = 2600

TABLE I
NUMBER OF VEHICLES PARKED PER DAY AT DIFFERENT TIME INTERVALS

Time	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
12 p.m. to 01 p.m.	567	557	397	379	509	519
01 p.m. to 02 p.m.	447	846	409	310	478	403
02 p.m. to 03 p.m.	678	417	405	410	468	368
03 p.m. to 04 p.m.	577	490	410	400	532	300
04 p.m. to 05 p.m.	511	400	504	491	667	588
05 p.m. to 06 p.m.	670	426	599	477	709	707
06 p.m. to 07 p.m.	800	740	770	791	997	1007
07 p.m. to 08 p.m.	712	790	680	887	961	1471
08 p.m. to 09 p.m.	665	861	657	800	867	709
Total	5627	5527	4831	4945	6188	6472
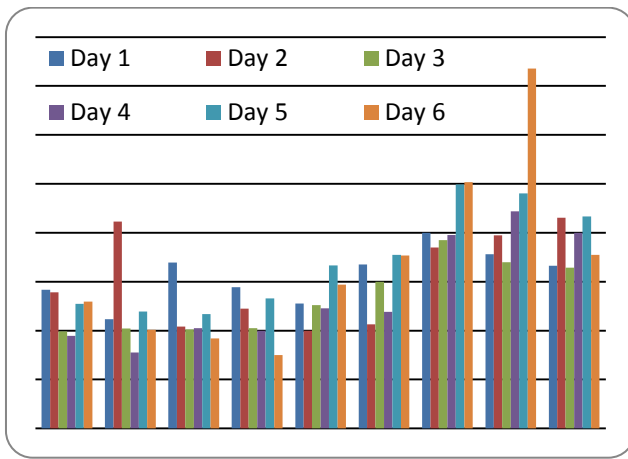
Figure 1: Bar chart showing comparison between number of vehicles parked per day at different time intervals

As per the cordon count at an average of about 5500 Vehicles Park in Novelty every day from morning 12 p.m. to 10 p.m. i.e. 555 vehicles per hour.

From questionnaire the total time taken by a costumer is about 15 minutes.

Thus, total parking space required = 2728 (for fifteen minutes)

Thus average total illegal parking= 2728 – 1250 = 1478

Parking Volume = 2600 + 5000 = 7600 vehicles per day

Average parking duration of customers = 15 minutes

Average parking duration of shopkeepers = 11 hours

Average parking index = 2728/1250 = 2.18

For Revenue Generated

Total number of parking space reserved for shopkeepers = 2600

Total revenue generated from shopkeepers (@ 250 Rs. per month) = 2600 X 250 = 6, 50,000/-

Total number of parking space for customers = 300
*Assuming average growth rate of 7.5% for 10 years

Total revenue generated from customers (@ 5 Rs. per 15 minutes) = 250 X 4 X 10 X 30 = 3, 00,000/- (at present)

Total revenue collected per month = 9, 50, 000/-

III. RESULTS AND CONCLUSION

The following are the conclusions of the present study:

- The average total illegal parking for Novelty area is found out to be 1478 vehicles.
- The average parking volume for Novelty area is found out to be 7600 vehicles per day.
- The average parking index for Novelty area is found out to be 2.18.
- As per the space available at Novelty market the most suitable parking scheme could be a multi-level parking system.
- The average revenue which could be generated from the parking scheme is Rs.9, 50,000.

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Impact of an Atmosphere Rich in Sulfur Dioxide on a Foliose Lichen Species Flavoparmelia Caperata (L) Hale from the El Kala National Park (Northeast Algerian)

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ABSTRACT

Lichens are often exposed in their natural habitat to anthropogenic pollutants, including those from vehicles and industrial and agricultural activities. In the absence of outer protective barrier, such that the waxy cuticle has evolved in vascular plants. The thallus of these organisms is sensitive to the penetration of suspended substances, some of which are essential for the functioning of cells, while others can be toxic. Accordingly, lichens can disappear within and around urban and industrial areas. Lichens can be used for early detection of stress caused by air pollution. To better characterize the impact of SO2 pollution in lichens. We began our study by highlighting the accumulation of sulfur dioxide by the thallus of foliose species Flavoparmelia caperata (L) Hale using the immersion method designed by Deruelle and Lallemand, which involves immersing lichens in SO2 -saturated atmosphere at different concentrations . Thereafter, we performed morphological observations and measurements of some physiological parameters (chlorophyll, total protein and as biomarkers of oxidative stress such as antioxidant enzymes system).

Our results indicate physiological and biochemical morphological alterations of lichens exposed to SO2, including

- discolorations and necrosis weaknesses frond splitting them into small clusters
- Disturbances contents chlorophylls (a, b and (a + b))
- Activation detoxification systems (APX, CAT and GPX);
- Increased levels of proteins.

Keywords: Lichen, Biomarkers, SO2, Oxidative Stress, Pollution.

I. INTRODUCTION

The importance of lichens grew thanks to their quality biological indicators of air pollution. Their sensitivity to phytotoxic agents exceeds that of vascular plants for several reasons (1) , because it does not have stomata or cuticle . Their gas exchange with the atmosphere takes place freely and quickly across the surface of the thallus , the limited amount of chlorophyll and slow metabolism of lichens makes them vulnerable to phytotoxic agents. They are limited to a slow recovery, when the damage is reversible. All these factors confirm the sensitivity of lichens in polluted environment (2).

Therefore, lichens are good examples for assessing air pollution (3). Several approaches are proposed according to the scale of observation considered (4). Thus, there is ecological scale biological response of individuals (bioindicators) or communities (biointegration), scale geochemical by the accumulation of contaminant (bioaccumulation).

To estimate the impact of SO2 pollution at the Annaba region fig 1 that is under the influence of several sources of much anthropogenic and natural pollution such as urbanization , a strong industrial sector presented by

various complexes such as iron and steel complex METAL STEEL and complex FERTIAL phosphate fertilizer.

Given the limited number of chemical sensors in our region , their failure common in recent years and their very expensive cost , we preferred to use the lichen bio-monitoring which reveals today a complementary tool in order to estimate the impact of pollution.

While submitting lichens polluted atmospheres (immersion method recommended by (5), we can evaluate the effect of pollution on lichens that results in a change of morphology, physiological and biochemical which also justifies their use as bioindicators .

II. METHODS AND MATERIAL

A. Plant Material

The lichen species used for this study is Flavoparmelia caperata (L.) Hale, a Ascolichen foliaceus developing on zeen oak in the forest of Bougous part of the family Parmeliacea.

Figure 1 : Ascomycota - Lecanoromycetideae - Lecanorales - Parmeliaceae

Chemistry: Medulla and soralies K ± yellow, C-, KC ± red, P + yellow-orange to red.

Thallus: foliose green yellowish, sometimes greenish yellow frankly, ± rosette up to 20 cm in diameter, with broad lobes, those of the periphery rounded, 0.5 to 1.3 cm wide, upper surface ± irregularly wrinkled, especially towards thallus central lower side on the free edge of rhizines black except at the margin of the lobes where it is brownish few mm. No isidia; soralies facial granular surface and rather coarse (especially towards the center of the thallus) Photosymbiote: trébouxioïde.

Apothecia not observed. Very rare. Single spores, hyaline, 15-20x9-10 microns.

Habitat: arboreal on hardwoods, rarely on conifers, sometimes on rocks or on non-calcareous soils, usually in forests, photophile not nitrophilous. Very common species except in cold regions and high mountains. **(6) .**

B. Original Site

The Flavoparmelia caperata harvested at the El Kala National Park and specifically in foret Bougous on zeen oak.

El Kala National Park. "belongs to the northeastern part of the Algerian Tell, It covers an area of about 76,438 ha, bounded on the north by the Mediterranean Sea, to the east by the Algerian-Tunisian border and south by the mountains of Medjerda . The western boundary of the Park is drawn to encompass the watershed of Oued Bougous to the south and the city of El Tarf further north, then continues west along the RN44 road to the village of Bouteldja and extends north to the immediate west of Cape Rosa. (Fig 1)
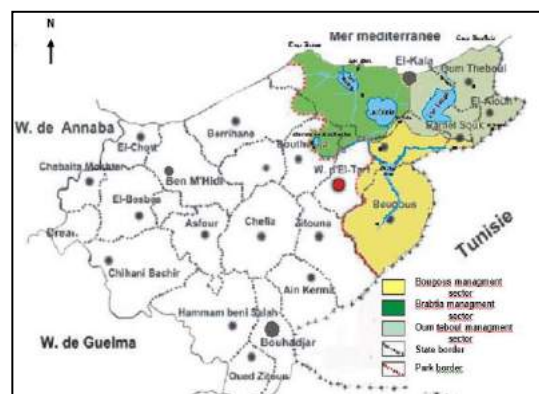
Figure 2 : Situation of El Kala National Park (Source: PNEK, 2005)

C. Study Method

1) Immersion lichens in a solution of SO2: Knowing that sulfur dioxide (SO2) gas which is lichens are more sensitive . We stated our case this gas dissolved in distilled water through an immersion method **(5)**.

This is to introduce a known mass of sodium disulfite ($Na_2S_2O_5$) powder in water and immersing the lichen . Knowing that the SO2 concentration of an aqueous solution to a value equivalent to gaseous SO2 thousand times less, we performed serial dilutions:

We conducted serial dilutions to submit Flavoparmelia caperata the following concentrations Flavoparmelia caperata the following concentrations:

Crystallizer 1: 5.10^{-3} mol/L
Crystallizer 2: 5.10^{-5} mol/L
Crystallizer 3: 5.10^{-6} mol/L
Crystallizer 4: distilled water (control)

2) Analytical Method:

Determination of Protein

The proteins were quantified according to the method of **(8)** using Coomassie Brilliant Blue (G 250 , Merck) as the reagent and bovine serum albumin (BSA , Sigma) as standard protein . The absorbances are read at a wavelength of 595 nm .

Determination of Chlorophyll

We used for the extraction of chlorophyll by the method established **(9)**.

Weigh 1 g which is cut into small sheet pieces and when milled in a mortar with 20 ml of 80% acetone (CH_3COCH_3) and pinch of calcium carbonate ($CaCO_3$) total after grinding , and the solution was filtered kept in a dark black boxes to prevent oxidation of chlorophyll by light.

The assay is done by the removal of 3 ml of the solution in the tank spectrophotometer.

In the end it will play the two wave lengths of 645 and 663 nm, and calibration of the device is made by the witness acetone solution at 80 %.

The calculation value of chlorophyll is by the formula in **(10)**:

Chl.a = 12.7 (DO 663) - 2.69 (DO 645)
Chlb= 22.9 (DO 645) - 4.86 (DO 663)
Chl.a +Chlb = 8.02 + (DO 663) + 20.20 (DO 645)

Enzyme Assays

Preparation of enzyme extract

The appropriate method to obtain the enzyme extract of the plant is that of **(11)**. After 4 months our transplants and control samples were harvested and cold crushed using a mortar in a phosphate buffer (50ml NaK , pH = 7.2) at a rate of 1 ml buffer per 1 g of MF . the homogenate is then filtered using an adequate web prior to centrifugation at 12000 g for 20 min to cold (-16K

centrifuge 3 sigma) . supernatant extract obtained will be used as for the determination of different enzyme extracts.

Determination of ascorbate peroxidases activity (APX)

Ascorbate peroxidase activity is carried out according to the protocol adopted by **(12)** . The final reaction volume of 3 ml contains: 100μl of enzyme extract to 50μl of 0.3 % $H2O2$ and 2850μl NaK phosphate - ascorbate buffer (50 mM NaK , 0.5 mM ascorbate , pH = 7.2) . The calibration of the unit is done in the absence of the enzymatic extract . The reading is taken at 290 nm (Spectrophotometer JENWAY 63000) for 1 min and a molar extinction coefficient $\varepsilon = 2800M - 1.cm -1$, APX activity is expressed in nmol / min / mg protein.

Determination of catalase activity (CAT)

The catalase activity (CAT) is performed according to the method of **(13)** . The decrease of absorbance is recorded for three minutes by a spectrophotometer (JENWAY 6300) for a wavelength of 240 nm and a molar extinction coefficient $\varepsilon = 39400 M- 1.cm - 1$.The To a final volume of 3ml , the reaction mixture contains : 100μl of the crude enzyme extract , 50μl of hydrogen peroxide and 0.3% $H2O2$ in 2850μl of phosphate buffer (50mM , pH = 7.2) . The calibration of the unit is done in the absence of the enzymatic extract. The reaction is initiated by the addition of hydrogen peroxide. The catalase activity was expressed in nmol / min / mg protein.

Determination of peroxidase activity gaïacols (GPX)

The activity gaïacols peroxidase (GPX) is determined using the method of **(14)**. For a final volume of 3 ml, the reaction mixture contains: 100μl of enzyme extract , 50μl of 0.03% $H2O2$ and 2850μl of phosphate - Guaiacol (50 mM NaK , guaiacol 8mM, pH = 7.2) buffer . The calibration of the unit is done in the absence of the enzymatic extract. The reaction is initiated by the addition of hydrogen peroxide. The absorbance reading is performed at 470 nm (spectrophotometer Jenway 6300) and to a molar extinction coefficient linear $\varepsilon = 2470 M- 1.cm -1$. The GPX activity is expressed in nmol / min / mg protein.

Quantification of spectrophotometric measurements: The following formula is used in the quantification of different spectrophotometric measurements following enzymatic assays of GPX , APX and CAT **(15)**

$$Act. = (\Delta A.Vt) / (\varepsilon.\Delta t.Ve.p)$$

Act: Enzyme activity in nmol / min / mg Protein

ε : molar extinction coefficient of linear M

Δ : Difference in average absorbance

Vt : total volume of the reaction mixture in ml

Ve: Volume of enzyme extract in ml

L: width of the measurement vessel in cm

P : Protein content in mg

T: Reading time in min

III. RESULT AND DISCUSSION

A. Determination of chlorophyll (a, b & a + b)
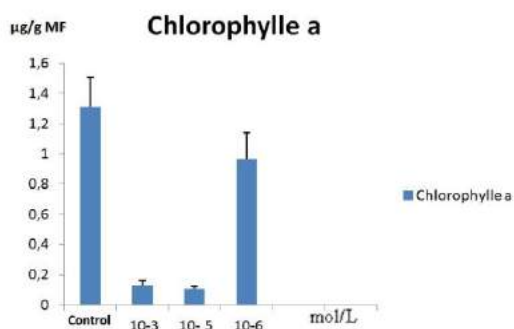
Figure 2: Variations of average chlorophyll a in different experimental batches of *Flavoparmelia caperata*

Fig 2 shows the variations in the rate of chlorophyll at different experimental batches Flavoparmelia caperata shows a decrease in chlorophyll a at all batches compared to control. However this decrease is very clear in the treated group at a concentration of 5.10^{-3} mol/L and 5.10^{-5} mol/L .

According to the ANOVA test, comparing the average grade of the level of chlorophyll a in different batches of the Flavoparmelia caperata shows that variations in average thereof are highly significant in space (0.000 *).
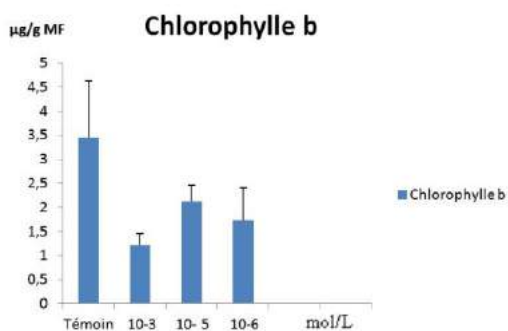
Figure 3: Variations of average chlorophyll b at different experimental batches of *Flavoparmelia caperata*

According to Fig 3, we observe changes in mean values of chlorophyll b but still down from the witness and that the degradation of chlorophyll b appears much more like a concentration 5.10^{-3} mol/L.

According to the ANOVA test, comparing the average grade of the rate of chlorophyll b in different batches of the Flavoparmelia caperata shows that variations in average thereof are highly significant in space (0.000 ***).
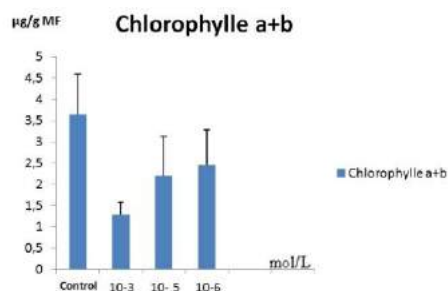
Figure 4: Variations of average chlorophyll a + b in the various experimental groups of Flavoparmelia caperata

Our results show that chlorophyll (a + b) follows the same trend as the other two chlorophylls a and b, a low production of chlorophyll pigments in all treated groups compared to the control and this decrease appears especially at a high concentration of SO_2 (5.10^{-3} mol/L) (Fig4).

According to the ANOVA test, comparing the average grade of the level of chlorophyll a + b in different batches of the Flavoparmelia caperata shows that changes in averages that are very highly significant in space (0.000 ** *).

B. Determination of the rate of total protein
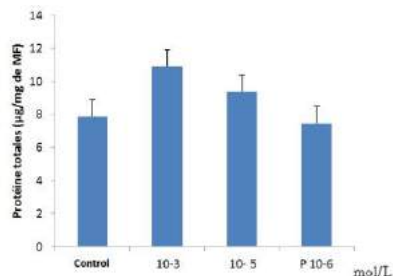
Figure 5: Variations of averages total protein at different experimental batches of *Flavoparmelia caperata*

We see from the results in increased levels of total protein in all treated groups compared to the control. According to the ANOVA test, the comparison of changes in protein levels in different batches of *Flavoparmelia caperata* shows that these variations are highly significant in space (0.000 ***) (Fig5).

C. Determination of the activity of different enzymes

1) Measurement of ascorbate peroxidases activity(APX):
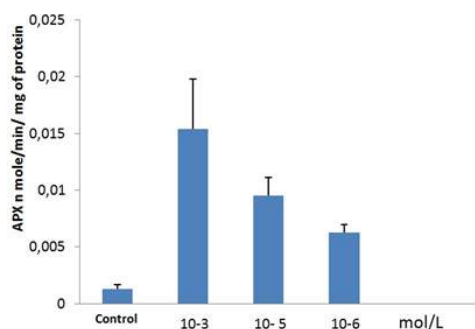
Figure 6 : Variations of averages Ascorbate peroxidase activity at different experimental batches of Flavoparmelia caperata

We note(Fig6), that the rate of ascorbate peroxidase activity is very high in lots immersed in a solution of SO2 concentration 10-3 mol / L with an average of 0.0153 nmol / min / mg protein According to the ANOVA test, comparing the average of ascorbate peroxidase activity in different batches of *Flavoparmelia caperata* shows that variations in average APX are highly significant in space (0.000 ***) .

2) *Measurement of Guaïcol peroxidases activity (GPX)*
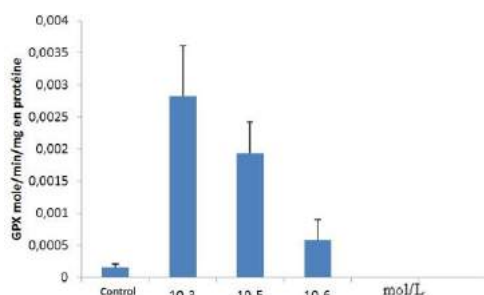
Figure 7: Variations of averages Guaïcol-peroxydase activity in different experimental batches of *Flavoparmelia caperata*

Our results show a clear increase in -peroxydase activity in lots immersed in a solution of SO_2 to 10^{-3} and 10^{-}

^{5}mol/L concentration, however, a slight increase of Guaïcol activity was observed in the treated immersion (10^{-6} mol/L) (Fig7).

According to the ANOVA test, comparing the average grade of the GPX activity in different batches of the Flavoparmelia caperata shows that variations averages of GPX are highly significant in space (0.000 ***)

3) **Measurement of catalase activity (CAT)**
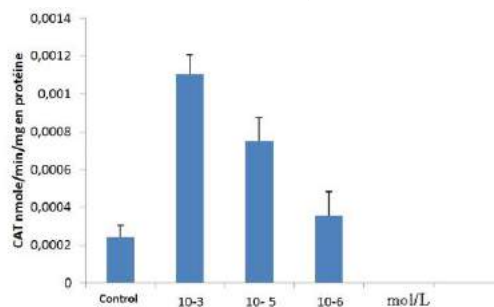
Figure 8: Variations of average Catalase activity at different experimental batches of Flavoparmelia caperata

From Fig 8 we see an increase in catalase activity in all treated versus control. Indeed the rate of CAT Password 0.0002 nmol / min / mg protein in the control to 0.001 nmol / min / mg protein in the treated concentration of 5.10^{-3} mol/L

Comparing the average grade of CAT activity in all treated groups of Flavoparmelia caperata shows that variations of CAT activity are highly significant in space (0.000 ***).

D. Observation Under Binocular Of Thallus Immersed:

Figure 9 : Control 5.10^{-3} mol/l Flavoparmelia caperata(L.) Hale

When the thallus Flavoparmelia caperata observed treated with a solution of 5.10^{-3} mol / 1 compared to the thallus witness, we note that there are significant morphological changes, among these changes: Color change to clear (chlorosis) on the majority of thallus accompanied by lines on the thallus;

Presence of several brown spots (necrosis) on all of thallus
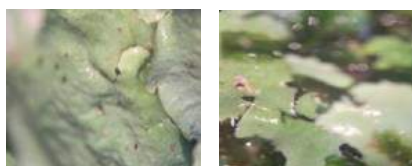
Figure 10 : Control. 10^{-5} mol/l *Flavoparmelia caperata* (L.) Hale

Thallus Treaty *Flavoparmelia caperata* by 5.10^{-5} mol / l solution becomes wrinkled green with some brown spots (necrosis) surrounding the lobes.

Figure 11 : Control 5.10^{-6} mol/l *lavoparmelia caperata* (L.) Hale

Thallus Treaty *Flavoparmelia caperata* by 5.10^{-6} mol / l solution becomes wrinkled green with some brown spots (necrosis) surrounding the lobes. At frond which are processed by the solution concentration of 5.10-6 mol / l, there is not a big change compared to the control; fronds are green .

According Arora et al 2002 , pollutants such as ozone(O_3), nitrogen oxide (NOx) and sulfur dioxide (SO2), involved in the formation of free radicals that promote stress oxidative . ROS can be harmful for most cellular components **(17)**. Cells have developed strategies of defense against ROS, they have significant antioxidant systems such as photosynthetic pigments, proteins and enzymes.

According to our results, the higher the concentration of the pollutant decreases, signs of disturbance are minimal. The chlorophyll degradation is generally related to the intensity of the pollution and the high concentration of sulfur dioxide. The air pollutants affect lichens through destruction of chlorophyll. This hypothesis was verified by **(18)**, upon exposure to some foliose lichens a concentration of 5 ppm SO2 for 24 hours.

Our results indicate a significant increase in total protein levels in all treated groups Flavoparmelia caperata . Based on analyzes of variance (ANOVA) statistically significant relationships were observed, the accumulation of total protein results from a general

stress suffered by the cell. An important synthesis of soluble proteins accompanies or completed the acquisition of resistance to stress, it results from slower growth and storage of molecules in the hyaloplasm or in some organelles (chloroplasts, mitochondria) . It seems that the synthesis of specific proteins is necessary for the hardening **(19)** .

Increasing protein levels can also be due to activation of a set of genes for the synthesis of specific proteins associated with stress proteins such as "LEA" which provide protection of all vital cell proteins **(20)**. According to **(21)**. The increase in total protein could be linked to induction of detoxification brought into play by a control system which consists of enzymes, protein and antioxidant molecules.

Oxidizing enzymes help protect cells against free products physiological manner during normal cellular metabolism radicals. Catalase, the APx and GPx belong to the primary defense mechanism against reactive oxygen species "ROS" by catalyzing the conversion of hydrogen peroxide H2O2 to H2O **(22)**, **(23)**. Our results reveal a very highly significant increase in ascorbate peroxidase activity, guaiacol peroxidase and catalase in batches treated by different concentrations of SO2, this increase is probably due to increased antioxidant activity in the cells. Indeed, APx is the only enzyme for decomposing H2O2 in chloroplasts **(17)**

The other enzyme studied in our study is the GPX. The gaïacol peroxidase enzyme is a key enzyme of the detoxification mechanism. The latter is localized in the cytosol and has an important role in the decomposition of hydrogen peroxide and the reduction of toxic hydroperoxides**(24)** . The components of the antioxidant system and especially catalase are known for their involvement against oxidative stress **(25)**.

Exposure of lichens to sulfur compounds **(26)**. is clearly reflected by morphological changes and several authors confirmed , according to **(27)**. The whole thallus dies shortly after the algal cells are damaged. **(28)** during a study of lichen transplantation in 3 different macro environments (Arambagh semi- urban , urban and industrial area in Burdwan Durgapur India) shows that damage the algal component of the thallus is a testament to its discoloration.

IV. CONCLUSION

Currently, immersed lichens, are used to estimate the damage caused by pollution and are then compared to those in the field. Actually comparing the results which we have achieved with a recent study (Serradj & al.,

2014) on the same lichen species Flavoparmelia caperata transplanted in areas with different levels of pollution in the region of Annaba (North East Algerian), we again see that the urban and the various sources of SO2 emissions have harmful and obvious influence on lichen vegetation of our area, this influence diminishes gradually and probably with the remoteness of these anthropogenic sources, on the other hand that the antioxidant enzymes remain early indicators of environmental stress by transplantation method or immersion lichens in polluted atmospheres.

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Studies and Research on Cyclone Separators: A Review

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ABSTRACT

Sustainable development is most commonly used term nowadays. The industrial growth is essential part of global economy. The chemical manufacturing sector is always under scanner of pollution control authorities and organizations because of emission of water and air pollutants. Removal of gases and particulate matter is necessary from social and regulatory point of view. The gases are normally removed by absorption or adsorption. The removal of particulate matter is often carried out by using electrostatic precipitator or cyclone separator. The cost involved for treatment is driving force for optimization and research on pollution control equipments. The present review summarizes research and studies on cyclone separators.

Keywords: Particulate Matter, Separators, Collection Efficiency, Operational Parameters

I. INTRODUCTION

Air pollution control is gaining increasing importance because of various diseases caused because of them. Air pollutants are classified as particulate matters and gases. Various industries emit different gases like hydrogen sulfide, carbon dioxide, sulphur dioxide, oxides of nitrogen and many other gases. Oxides of sulphur and carbon are commonly observed gases because of presence of carbon and sulphur in fuel. Also particulate matter emitting from chimneys of these industries is major environmental problem.

The gases like sulphur dioxide, hydrogen sulphide and carbon dioxide can be treated by absorption in suitable solvent [1, 2,]. Biofiltration is also interesting option [3, 4]. Flue gas treatment of gases is carried out for removal of the gases formed during combustion. Various methods like absorption, adsorption are used for removal of these gases [5, 6, 7]. The particulate matter removal can be carried out by using fabric filters, electrostatic precipitator, inertial separators etc.[8,9,10]. Cyclone separator is one of the important devices for removal of particulate matter. The present review summarizes research and studies carried out on cyclone separator.

II. RESEARCH AND STUDIES ON CYCLONE SEPARATORS : A REVIEW

Pandey and Ray carried out studies on hydrodynamics of a cyclone separator as element of a re-circulating fluidized bed circuit [11]. They investigated effect of the operating conditions on the suspension density in the cyclone and downcomer. They also studied suspension density profiles along the downcomer and riser height. They observed that the suspension density attains its maximum at the cyclone inlet. Also the suspension density decreases along cyclone axis in down ward direction and becomes minimum at cone region. It again increases in downward direction. Vekteris et.al. presented a novel concept of cyclone separator, where sound waves are used to agglomerate fine particles[12]. They presented results of numerical simulation of air flows inside conventional and acoustic cyclone separators. During investigation they observed that the average separation efficiency of conventional cyclone separator reaches 87.2% only, while separation efficiency of acoustic cyclone separator is approximately 97.5%.They proved that air flow inside cyclone separator can be investigated numerically. Qian et.al. carried out numerical study of gas-liquid micro-cyclone separator flow field[13]. They presented the distribution

of gas tangential velocity of the inside flow field and its effects on the movement of liquid droplets. They found that tangential velocity plays an important role in the three dimensional gas-liquid movement of the micro-cyclone separator. They concluded that the tangential degree in micro-cyclone separator basically line with the combination vortex motion. They also observed that from axis to wall, the tangential velocity first increased rapidly to nearly twice of the inlet flow rate, then decreased slowly near the wall.CFD modeling of cyclone separators was carried out by Brennan et.al.[14]. In their work they presented results from CFD simulations of an industrial classification hydrocyclone. They used the measurements like the feed pressure vs. feed flow rate and recovery to underflow vs. feed flow rate for validation.Verma et.al. Carried out investigation on design of cyclone separator under collection efficiency and air density effect [15]. They used rotational effects and gravity to separate mixtures of solids and fluids. According to them, the cyclone is probably the most widely used dust collector in industry because of its simplicity and low operating cost. They characterized cyclone performance as affected by design and operational parameters. With increasing particle mean diameter and density, increasing gas tangential velocity, collection efficiency increased.Gopani and Bhargava carried out studies on cyclone separator aimed at designing of high efficiency cyclone by using stairmand method for a tiny cement plant[16].According to them cyclone separator was reasonable option as it is cheaper and has low operating cost. They designed cyclone separator for 90 percent efficiency.

Jadhav et.al. carried out studies on design development of cyclone based on CFD[17]. They also carried out experimental trials. They carried out experimentation on the performance of flour mill cyclone for different flow rates. They designed cyclone with two symmetrical tangential inlets and a single tangential outlet at the barrel top area where impeller is mounted. Their results indicated that these new designs can improve the cyclone performance parameters significantly. Very interesting details were found on cyclone fluid dynamics properties. In their investigation, Ficici et.al. designed three cylinder-shaped vortex finders with diameters of 80, 120 and 160 mm[18]. They obtained a critical diameter of vortex finder in their investigation. They observed that there was a linear relationship between

length of vortex finder and pressure loss. In this investigation, the theoretical argument of critical vortex finder was experimentally proved. Tapkir and Kamble presented analytical and computational fluid dynamics calculation to predict and to evaluate the effects of change in dimensions on static pressure and collection efficiency[19]. They studied velocities, pressures, collection efficiency and the pressure drops according to change in inlet parameters. CFD method was used to generate the pressures and collection efficiency. They used three standard models for carrying out studies, namely Lapple Model, Swift Model and Starmand Model. They formulated a model, which indicated effect of change of cone dimensions along with proportionate change in inlet dimensions. They observed that the value of pressure and collection efficiency increased with the change in dimensions of inlet parameters. Shah carried out a review on gas solid cyclone separator parametric analysis [20]. Their review indicated various reasons for increasing the collection efficiency. Increase in particle size, density, speed of rotation, cyclone length and decreasing the diameter are reasons for that. They also observed that pressure drop and separation efficiency are affected by factors like solid loading ratio, gas inlet velocity flow field parameter. Funk and Baker conducted literature review on dust cyclone seperators[21]. Their emphasis was on cyclone seperators in cotton ginning industry. This industry faces stringent pollution control norms. The cost associated for the dust removal motivates more and more research for improving the efficiency and reducing cost. They reviewed various techniques used in other industries which can be beneficial for ginning industry.This review summarized dust cyclone designs, algebraic and computer models and recent experiments. They concluded that the energy consumption of control devices and not just stack total emissions needs to be considered in the implementation plan as producing electricity to operate control devices results in pollution where that electricity is generated.

Kouba and Shoham presented review on gas-liquid cylindrical cyclone (glcc) technology (22). They presented the status of the development of the the state-of-the-art GLCC, with respect to modeling the GLCC, and discussed current installations and potential applications. The lack of proven performance prediction tools which are valid over a wide range of conditions is

the single biggest impediment to the wide-spread implementation of the GLCC. According to their studies, CFD simulations can capture much detail of local hydrodynamics but are too computationally intensive, time consuming and complicated to apply to large systems. They concluded that the combination of CFD and mechanistic modeling provide a realistic approach to obtaining useful tools for design and performance predictions for the GLCC. The performance of oil-gas cyclone separators in oil injected compressor systems was studied by Gao et.al.[23]. They consider the breakup of oil droplets in oil-gas cyclone while carrying out simulation and experimental studies. They observed that the breakup of oil droplets, especially for the high inlet velocity has significant effect on the separation efficiency.

III. CONCLUSION

From the review of various investigations on cyclone separators, following conclusions can be highlighted – Tangential velocity plays an important role in the three dimensional gas-liquid movement of the micro-cyclone separator. The cyclone is probably the most widely used dust collector in industry because of its simplicity and low operating cost. With increasing particle mean diameter and density, increasing gas tangential velocity, collection efficiency increased. Pressure drop and separation efficiency are affected by factors like solid loading ratio, gas inlet velocity flow field parameter. The lack of proven performance prediction tools which are valid over a wide range of conditions is the single biggest impediment to the wide-spread implementation of the gas-liquid cylindrical cyclone, GLCC. The combination of CFD and mechanistic modeling provide a realistic approach to obtaining useful tools for design and performance predictions for the GLCC.

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Enumeration of Leafy Vegetables of Bhadravathi Taluk, Karnataka

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ABSTRACT

Bhadravathi taluk is situated in Malnad region of Karnataka and unique in their nature by having rich diversity of leafy vegetable plants. Leafy vegetables are low in calories and fat, and rich in protein , dietary fiber ,iron, vitamins and manganese. This paper provides the information of 41 species and 33 genera of 22 families. Among families Amaranthaceae is dominant with 12 species followed by Apiaceae, Brassicaceae and Fabaceae with 3 species each. In this study, herbs are dominant. The peoples of this area mainly depend on leafy greens as food source. Use of leafy vegetables may act as alternative food resources other than cultivated vegetables.
Keywords: Edible, Leafy Vegetables, Bhadravathi Taluk

I. INTRODUCTION

Nearly one thousand species of plants with edible leaves are known. Leaf vegetables most often come from short-lived herbaceous plants such as lettuce and spinach. Woody plants whose leaves can be eaten as leaf vegetables. The leaves of many fodder crops are also edible for humans, but usually only eaten under famine conditions. These plants are often much more prolific than more traditional leaf vegetables, but exploitation of their rich nutrition is difficult, primarily because of their high fibre content. This obstacle can be overcome by further processing such as drying and grinding into powder or pulping and pressing for juice (en.wikipedia.org).

Leaf vegetables contain many typical plant nutrients, but since they are photosynthetic tissues, their vitamin K levels in relation to those of other fruits and vegetables, as well as other types of foods, are particularly notable. The reason is that phylloquinone, the most common form of the vitamin, is directly involved in photosynthesis. This causes leaf vegetables to be the primary food class that interacts significantly with the anticoagulant pharmaceutical warfarin (en. wikipedia.org).

Green leafy vegetables have proved over time that they provide more protective energy to human body than any other vegetable. They not only rich in Vitamins A, B and C but also are the treasure houses of minerals like iron and calcium. There are nearly 20 leafy vegetables grown in this country all-round the year. They are very easy to grow and mostly propagated from the seeds through direct seeding (http://www.angoc.org/wp-conten).

No work has been carried out on traditional knowledge of edible leafy vegetables of the present study area. Hence, this study deals with leafy vegetables of Bhadravathi taluk of Karnataka and it is helpful for further research by scientific community.

II. METHODS AND MATERIAL

Bhadravati is situated at a distance of about 20 kilometres from the district headquarters Shimoga. It is an industrial town of Shimoga District of Karnataka . *Bhadravathi*, is located at 13° 52' N latitude and 75° 40' E longitude (Figure 1).

Ethno-botanical information was documented through questionnaires and discussion with the local villagers, farmers, old age peoples and housewives. The questions focused to be primarily on the knowledge of the usage of plants for consumption, collection, mode of food

preparations. The collection of plant specimens from the field along with photography and field notes for further taxonomical identification. Botanical identification of the collected species has been carried out by using relevant literatures (Saldanha,1984-1996; Sundriyal and Sundriyal, 2001; Prashanth Kumar and Shiddamallayya, 2014).
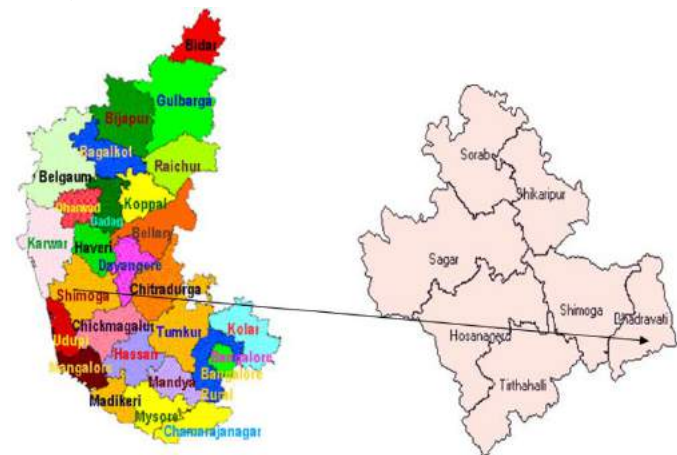
Figure 1: Study area map (source: www.afakarnataka.org; kssidc.in; www.veethi.com)

III. RESULT AND DISCUSSION

The present study shows 41 leafy vegetables belonging to 22 families and 33 genera and tabulated with botanical name and family of leafy edible plants (Table 1). Number of leafy vegetables in each family is depicted in Figure 2. Among the families Amaranthaceae is dominant with 12 species followed by Apiaceae, Brassicaceae and Fabaceae with 3 species each. The study area is rich in flora and includes various useful leafy vegetable species. In this study, leafy herbs are dominant and climbers are least in number.

Species, such as Amaranth and Basella, contain oxalic acid. They should not be eaten on a regular basis without boiling and discarding the water. Also plants containing oxalic acid should be cooked in a steel pot or pan, not in aluminum pots (Chenopodium giganteum, 2010).

Dark green leafy vegetables contain relatively large amounts of iron, but they also contain oxalates and phytates that inhibit the absorption of non-haem iron. The bioavailability of non-haem iron in plant foods is therefore low and the potential contribution of plant foods towards controlling iron deficiency in developing countries has been questioned (De Pee et al., 1996; Mieke Faber et al., 2007). Agricultural interventions to increase the supply and dietary intake of iron from plant foods are not popular. Instead, the production and consumption of animal foods are usually encouraged because of the high bioavailability of haem iron from animal foods (Ruel, 2001; Mieke Faber et al., 2007).
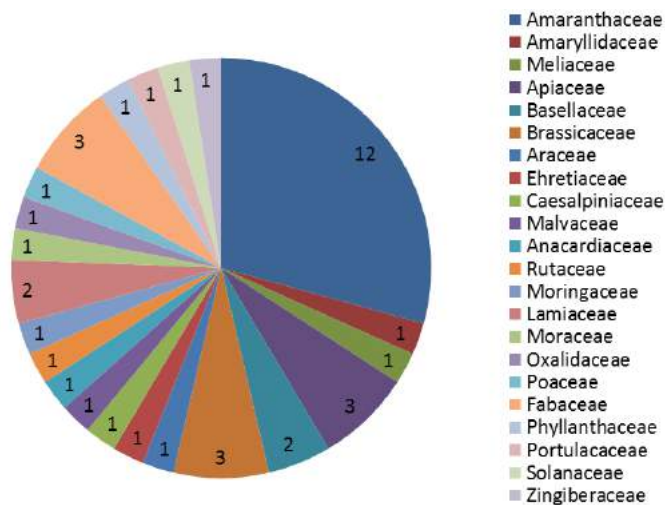
Figure 2: Number of leafy vegetables in each family

Roshan Adhikari et al.(2012) reported that Basella alba has been used from a long time back for the treatment of many diseases like dysentery, diarrhoea, anemia, cancer etc. It has also been utilized for different kinds of healing activities. The chemical composition of the leaf extract has been found to be: proteins, fat, vitamin A, vitamin C, vitamin E, vitamin K, vitamin B9 (folic acid), riboflavin, niacin, thiamine and minerals such as calcium, magnesium and iron. Some unique constituents of the plant are basellasaponins, kaempherol and betalain (Roshan Adhikari et al., 2012).

Figure 3: *Basella alba*

Figure 4: *Oxalis corniculata*

Figure 5: *Centella asiatica*

Figure 6: *Amaranthus spinosus*

Figure 7 : *Mentha arvensis*

Table 1: Leafy vegetables of Bhadravathi taluk, Karnataka

Sl.No	Scientific Name	Family
1.	*Amaranthus caudatus*	Amaranthaceae
2.	*Amaranthus cruentus*	Amaranthaceae
3.	*Amaranthus blitum*	Amaranthaceae
4.	*Amaranthus blitum var oleracea*	Amaranthaceae
5.	*Amaranthus viridis*	Amaranthaceae
6.	*Amaranthus sp.*	Amaranthaceae
7.	*Amaranthus spinosus*	Amaranthaceae
8.	*Achyranthes aspera*	Amaranthaceae
9.	*Allium cepa*	Amaryllidaceae
10.	*Alternanthera sessilis*	Amaranthaceae
11.	*Azadirachta indica*	Meliaceae
12.	*Anethum graveolens*	Apiaceae
13.	*Basella alba*	Basellaceae
14.	*Basella rubra*	Basellaceae
15.	*Brassica oleracea*	Brassicaceae
16.	*Brassica rapa*	Brassicaceae
17.	*Beta vulgaris*	Amaranthaceae
18.	*Coriandrum sativum*	Apiaceae
19.	*Colocasia esculenta*	Araceae
20.	*Centella asiatica*	Apiaceae
21.	*Carmona retusa*	Ehretiaceae
22.	*Celosia argentea*	Amaranthaceae
23.	*Cassia tora*	Caesalpiniaceae
24.	*Hibiscus cannabinus*	Malvaceae
25.	*Mangifera indica*	Anacardiaceae
26.	*Murraya koenigii*	Rutaceae
27.	*Moringa oleifera*	Moringaceae
28.	*Mentha arvensis*	Lamiaceae
29.	*Morus alba*	Moraceae
30.	*Oxalis corniculata*	Oxalidaceae
31.	*Ocimum basilicum*	Lamiaceae
32.	*Oryza sativa*	Poaceae
33.	*Phaseolus vulgaris*	Fabaceae
34.	*Phyllanthus emblica*	Phyllanthaceae
35.	*Portulaca oleracea*	Portulacaceae

36.	*Raphanus sativus*	Brassicaceae
37.	*Spinacia oleracea*	Amaranthaceae
38.	*Solanum nigrum*	Solanaceae
39.	*Tamarindus indica*	Fabaceae
40.	*Trigonella foenum*	Fabaceae
41.	*Zingiber officinale*	Zingiberaceae

IV. CONCLUSION

Several leafy vegetables can benefit local people not only as food, but also with their medicinal properties. These multi-valued resources are threatened by several anthropogenic and natural causes such as land-use change, habitat destruction, unscientific harvesting, over-grazing, and invasive species. Sustainable management of these resources for the wellbeing of the local communities as well as to conserve biodiversity is of the utmost importance and could also contribute to preserve cultural and genetic diversity (Uprety et al., 2012; Prashanth Kumar, and Shiddamallayya, 2014). Uses of leafy vegetables provide seasonal, staple foods and important alternative to the agriculturally cultivated crops. Leafy vegetables are not only sources of food and nutrients to the local communities, but could also be means of income generation, if managed sustainably (Uprety et al., 2012; Prashanth Kumar and Shiddamallayya ,2014).

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Chemical Flexi Not-So-Fantastic : A review on How the Versatile Material Harms the Environment and Human Health

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ABSTRACT

The review presented in this paper focuses on flex's impact on Human health and environment. The flex banners are made of poly-vinyl chloride. It causes a serious threat to the environment, as it is not bio-degradable. Flex cannot be re-used or recycled. Made of synthetic polymer, it has to be burnt. When burnt, they emit toxic fumes that have serious effects on health. It can cause cancer and infertility. The toxins released when the flex banners are burnt are carcinogenic (any substance, radionuclide, or radiation that is an agent directly involved in causing cancer. This may be due to the ability to damage the genome or to the disruption of cellular metabolic processes. Burning of flexi releases harmful pollutants like sulphates and nitrates. These pollutants are heavier than air and form a thick blanket reducing the supply of oxygen in the vicinity. PVC leaches out slowly into the soil and pollutes it. Usage of cloth banners could be encouraged as it would not only give a livelihood for painters and labourers, but also would not cause any environmental degradation. The purpose of this review is to 100% Environment-friendly Polyethylene Flexi banner materials must be developed and encouraged to the environmental sustainability.

Keywords: Flex Banners, Poly-Vinyl Chloride, Polyethylene, Cancer and Infertility.

I. INTRODUCTION

Visual pollution is the unattractive and man-made visual elements of a vista, a landscape, or any other feature that we may feel uncomfortable looking at. It can be caused not only by (giant) billboards, business signs, street signs, telephone and utility poles, electricity wires but also garbage (think littered beaches, rivers, roadsides, or overflowing garbage containers, plastic stuck in fences or trees, a pile of cigarette butts outside bars, clubs or on beaches), open-pit mines, dog poo, rubbish dumps, mobile phone towers [1].

Visual pollution can be present in any area from the home to a hectic city street. It can be bad shadow on a television camera, or it can be a large pile of trash on the side of the road that interrupts the view of nearby mountains. Visual pollution is dependent on the person and the situation. For example, one person may not mind seeing a city street lined with thousands of billboards

and advertisements, while another person may be bothered by this sight and may prefer to look at an uncluttered country road. Depending on the situation, it can be hazardous to drivers and other people. A building that is made entirely of glass can reflect sunlight, creating visual pollution for the people driving by the building. Billboards and advertisements on highway roads can be a visual pollution issue that causes drivers to become distracted while traveling on roadways. These distractions and issues can be fatal and can lead to automobile accidents as a result of the seconds it takes to look at a billboard [2-3].

Flex banner printing is widely used these days in almost all kind of small budget events. We are also witnessing flex banner being used in events like birthday parties and maturity functions. Flex printing future is on rise in almost all cities in India may it be Hyderabad, Mumbai, Delhi, Chennai, Kolkata, and find them even in villages. Earlier flex printing was confined only to the banner printing for political parties at the time of election but

everyday hundreds of modern water proof flex boards and banners mushroom using for several causes and reasons. Interestingly, most of them are from the leaders of the ruling front, conveying their personal achievements or to send seasonal and festival wishes to the public. Taking the cue fan clubs of movie stars are constantly vying for public attention by hoisting huge cut-outs and posters. Generally Flex banner is relatively cheaper as compared to other medium of printing. It is stretchable as well which multiply its use. But owing to the advantages, the printers prefer flex over cloth banners. Unlike cloth, we can generate high quality desired graphics and designs on flex in a very short span of time. Also the output quality would be superior and the material is durable .Flex is quite similar to plastic. Though it has many advantages over cloth, it is highly hazardous and it can cause imbalance to the natural ecosystem. We are protesting right from the beginning and to save our ecology this should be banned. Plastic or flex by itself is not harmful. The problem begins when they are not recycled. They can choke the earth or clog the drain and when burnt, can release toxic fumes. Incineration (burning at very high temperature) is an option but it can be expensive though we can look at options to do it on a large scale. . Flex banners deliver high-quality digital prints, but they are not bio-degradable and when they burn, they emit toxic fumes that have serious effects on health. The toxins released when the flex banners are burnt are carcinogenic. The flex banners are made of Poly Vinyl Chloride (PVC) which is non-biodegradable [4-5]. When burnt they release gases that are harmful, cause cancer and infertility. The PVC requires a temperature of 299 degree Celsius to burn the flexi and it also raises the temperature of the surroundings. According to experts, the burning of flexes releases harmful pollutants like sulphates and nitrates. These pollutants are heavier than air and form a thick blanket reducing the supply of oxygen in the vicinity.

Since burning flex is a cheap option, many do so without considering the harmful results Environment is not a priority for either the people or the government and suggests that we can use flex made of starch (it helps in degradation), though it may not be a very durable option. As the country seems to have no control over usage of flex banners, their numbers are increasing by the day and could easily be estimated to be a few lakhs. The

numbers are now on the rise, what with the elections just around the corner. Since these banners deliver high-quality digital prints, they are much in demand but the realisation that they are not bio-degradable and emit toxic fumes that have serious effects on health when burnt is hardly being propagated. The toxins released when the flex banners are burnt are carcinogenic. Recycling post-consumer PVC is difficult [6-7].

II. METHODS AND MATERIAL

Types of Banners printing materials

1. Cloth banner :- Cloth banners are employed in Tier 1 and Tier 2 cities but it is being fast replaced by flex as flex printing machine are not that costly and are readily available everywhere. Wrinkle-Free Fabric Banners & Backdrop Printing - Now Dye Sublimated! Durable 100% polyester woven fabric offers a great substitute for canvas with the print performance of vinyl. Fabric Banners can also be folded and stored eliminating the need for banner tubes. Our dye sublimated fabric is a three layered woven fabric that is 100% Polyester. This fabric is wrinkle resistant with minimal light reflection and now, washable! The minimal space between threads on this fabric allows for exceptional print quality and opacity, more than other standard fabrics. Fabric is suitable for table tops, photo backdrops, and elegant pop displays.

2. Flex banners:- Flex banners are omnipresent and there are few printers who print only a minimum 100 sq ft of flex else they charged exorbitantly for lesser quantity like even a flex which is 1ft x 1ft will cost minimum 3 sq ft as flex comes in roles with fix width which is minimum 3 ft.

3. Star Flex banners:- If your design art work has background color, text color, logo, picture and images then you need to choose star flex instead of normal flex as star flex prints color better than flex. Not Just "Recyclable" Banners But "Already Recycled "Banners Known as the manufacturer of supreme quality Coated and Laminated banners, Star flex is proud of launching a recycled banner range -starflex®discovery Media. No compromise on its performance in printing quality & resistance, but its dedication to the environment is unique. With 50% less consumption of new PVC

resin in the final banner product, it allows less new PVC production, less consumption of Oil, less emission of gas, less production of by-chemicals, more energy saving, but also less after-use-period PVC banners in the landfilling or incineration. The front printing side is Star flex standard white film, using 100% virgin new PVC.

4. Vinyl banners: - Vinyl material is non-stretchable and better quality material as compared to flex material and can be used both indoors and outdoors for different event banner printing. Same rates are for both vinyl without sticker also called self-adhesive sticker and without sticker. Vinyl banners today have gained a lot of popularity as an effective corporate marketing tool, primarily because of its versatile and sturdy nature. According to printing consultants and experts at Documedia online printing services, the sturdy nature of the material is what makes it usable in various forms – vinyl banners can be connected, hung or mounted in a number of ways. Another one of the major benefits of using vinyl banners is that they can be used both indoors as well as outdoors quite effectively because of its durability. Here in this article we will take a look at the various types of vinyl used for printing banners.

a) Vinyl Banner Printing: Vinyl Options; Here are the various types of vinyl used for vinyl banner printing -

b) Scrim Vinyl - This type of vinyl is known for its durability and strength which makes it a great option for outdoor applications.

c) Gloss Vinyl – This kind of vinyl is used for multi coloured vibrant images and pictures which require a glossy surface. Glossy vinyl can be used for a wide range of banner applications and is ideal for usage in various weather conditions.

d) Matte Vinyl - This type of vinyl has a glare and water resistant coating which allows for vibrant and beautiful images.

e) Blackout Vinyl - Blackout vinyl as the name suggests has a black vinyl layer enclosed in between the two outer layers of vinyl.

f) Mesh Vinyl – Mesh vinyl is quite similar to conventional vinyl. However, mesh vinyl banners are capable of enduring harsher weather conditions as compared to conventional vinyl.

5. Eco solvent material:- Eco solvent vinyl is used for indoor shop banners, at hotels for indoor events and exhibition and are pasted on the foam surface, pasted on plastic frame or, wooden frame. Eco Solvent inks provide several benefits for consumers seeking a sustainable solution to high resolution printing and have increased greatly in popularity in recent years. These inks are highly durable, environmentally friendly and available in a wide variety of colors. Below are some key benefits to using eco solvent ink.

a) Eco Friendly (compared to heavy solvent inks): Heavy solvent inks are typically not ideal for use in printing areas with minimal air flow, due to the fumes and odours they produce. Eco Solvent inks, on the other hand, do not produce fumes and are generally regarded to be friendly to the environment by comparison.

b) Ideal for billboards and other forms of outdoor signage: Eco Solvent ink is highly durable and adheres well to both coated and uncoated surfaces, producing high resolution images that are ideal for billboards and other forms of outdoor signage [8,9,10].

2.1 The harms of Flex

a) Almost all hoardings contain flex -- a material that damages environment and is a risk to health. The flex banners are made of poly-vinyl chloride. It causes a serious threat to the environment, as it is not bio-degradable.

b) Flex cannot be re-used or recycled. Made of synthetic polymer, it has to be burnt. When burnt, they emit toxic fumes that have serious effects on health. It can cause cancer and infertility.

c) The toxins released when the flex banners are burnt are carcinogenic (any substance, radionuclide, or radiation that is an agent directly involved in causing cancer. This may be due to the ability to damage the genome or to the disruption of cellular metabolic processes.)

d) Polyvinyl chloride or 'PVC' leaches out slowly into the soil and pollutes it.

e) Experts say flex is dangerous because it doesn't dissolve on its own.

f) Usage of cloth banners could be encouraged as it would not only give a livelihood for painters and

labourers, but also would not cause any environmental degradation [11].

2.2 Associated Materials in Ink used in flex Production

These compounds include styrene acrylate copolymer, polymethyl methacrylate (PMMA), iron oxide, amorphous silica, carbon black, paraffin wax, diethylene glycol, and 2-pyrrolidone. Each of these compounds is made by the chemical industry and each compound's use in flex printing. They are also synthesized differently with varying energy inputs as well as associated by products and waste. First, we will give an overview of the synthesis of the primary compounds used in flex printing; their health and environmental effects will be discussed in later sections of this report [12].

2.3 Styrene Acrylate

Styrene acrylate copolymer is makes up approximately 80% of the mixture that is used in flex printing. The chemical formulas of the bases styrene and acrylate to make the numerous trade secret polymersare respectively C6H5CH=CH2 and CH2=CHCOO. The styrene base is made via steam cracking of ethane. Ethane (C2H6) isa derivative hydrocarbon of natural gas. The product of ethane cracking is ethylene which is one component of ethylbenzene ($C_6H_5CH_2CH_3$). Once ethylbenzene has been made, it then can be converted into styrene. There are many different hydrocarbons by products that are made during this process which are used themselves as energy inputs for the synthesis process. Thus the total process is considered to be very efficient with a production yield of 97% [13].

2.4 Carbon Black

It is used in in flex printing as a key pigment. The synthesis of carbon black is an energy intensive process as it requires burning hydrocarbons at extremely high temperatures –approximately 2000 degrees Celsius –in order to obtain elemental carbon. The feedstock hydrocarbon can come from tar, coal tar, ethylene cracking tar, and a small amount from vegetable oil. Each of these sources has a high carbon to hydrogen ratio. Burning a secondary feedstock of natural gas creates a superheated air stream which vaporizes and pyrolyzes the primary carbon black feedstock resulting in elemental carbon.The suspended carbon black is then removed from the air stream and condensed into pellets to be used in various applications, with one of the main applications being pigments for ink and toner. The emissions from this process mainly come from the superheated air stream and include CO_2, H_2O,N_2, NOx, SOx, VOCs, and significant amounts of particulate matter from reducing the primary feedstock [14].

Carbon black is the most dangerous compound that the plant workers handle. Carbon black is produced by incomplete combustion of gaseous or liquid hydrocarbons. Workers collect this leftover powder and process the powder either into a liquid for inks or a more condensed powered form for toners. Before the carbon black is processed to make the ink or toner, the compound is in an unbound state .The unbound state of carbon black is the most harmful to human health and the EPA and numerous health institutes have classified it as a Class 2B carcinogen if a person is chronically inhaling the substance. Unbound carbon black has been linked to several cancers such as breast, throat, lung, and liver cancer. In its bound state, carbon black is significantly less toxic, causing mild nose and throat irritation if constantly inhaled. If leaked into water sheds carbon black can also act as an endocrine disruptor. It does not dissolve in water and researchers for the chemical company Rohm and Haasin California observed the effects of carbon black via a compound called Thixon on rainbow trout. Thixon is an adhesive agent that is largely composed of carbon black. The researchers found an increase in reproductive disorders such as developmental mutations and increased transgender populations [15]

2.5 Paraffin Wax

It is used in the xerographic process to provide a medium to fuse the toner onto the paper with the help of heat from the printing device. Paraffin wax is a by-product of the refining of coal and oil. It is either a colorless or white, in some cases translucent, wax composed of solid straight chain hydrocarbons. It is obtained from either petroleum by de waxing light lubricating oils, or from coal gas via the Fischer-Tropsch reaction which converts a mixture of carbon monoxide and hydrogen into liquid hydrocarbons. This 28process creates various hydrocarbons that have other uses for

industry .Paraffin wax is petroleum based wax and is an ingredient found in both toner and ink. Paraffin Wax is regarded to be fairly safe in its solid form, however there are many toxic chemicals released if the wax is melted or burned. These chemicals include toluene, formaldehyde, benzene, methyl ethyl ketone, and particulate matter. For example formaldehyde, benzene and toluene can cause major respiratory problems such as nose and throat irritation and acute bronchitis. Specifically, these carcinogens have been linked to breast and throat cancers .As long as paraffin wax is not lit on fire, the environmental impacts are low. When the wax is burning, it releases many toxic and/or carcinogenic substances as well as small amounts of carbon dioxide and methane which are greenhouse gases [16].

2.6 Polyvinyl Chloride, or 'PVC'

It is one of the most widely used polymers in the world. Due to its highly versatile nature, PVC is used extensively in many industries including construction, automotive, electronics, packaging, fashion and design amongst others. However once it enters the waste stream, it has traditionally been seen as a cause of harmful emissions from incineration.

2.6.1. Chemical reactions
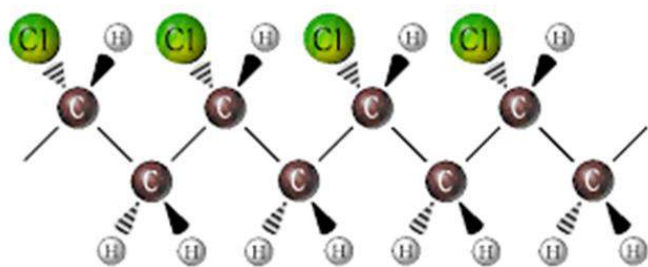
Figure 1: Structure of Polyvinyl chloride, or 'PVC'

This focus on PVC was due to the presence of chlorine, which leads to the production of dioxins, the emission of HCl and the production of solid hazardous waste because of the presence of heavy metals from the additives used in various formulations. Polyvinyl chloride contains significant quantities of chlorine (up to >50%) and so one of the main products of combustion is hydrochloric acid (HCl)

Solid polyvinyl chloride (PVC) plastic first melts with increasing temperature, then at a certain point the polymer structure starts to unzip. Next the chlorine and hydrogen start to be released (forming HCl) . If there is sufficient oxygen around the carbon oxidizes and forms carbon dioxide (CO2) and some carbon monoxide (CO) . Soot formation happens when there is insufficient oxygen for ideal combustion and so the carbon concentrates into joined aromatic rings (polycyclic aromatic hydrocarbons PAH's) and ultimately into elemental carbon (carbon with no hydrogen or oxygen).The presence of chlorine complicates matters and with some oxygen present, dioxins & furans will form. The air that gets involved with combustion beside supplying oxygen also has nitrogen (78%), at high temperatures nitrogen compounds begin to form (nitrogen oxides (NOx) and hydrogen cyanide (HCN).As the hydrocarbon base starts to loose hydrogen, the carbon begins to form more concentrated carbon molecules (aromatic hydrocarbons such as benzene [17-18].

PVC (in flexi) + air (oxygen) + Heat $\rightarrow$ $CO_2 + H_2O$ + HCl+ CO + NOx + SOx + benzene + HCN + PAH's + Dioxins + heavy metals.
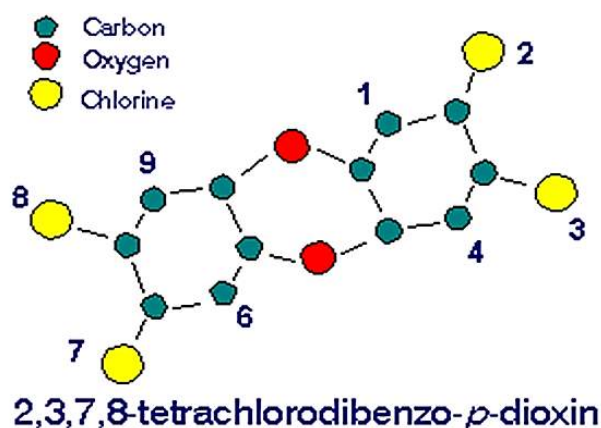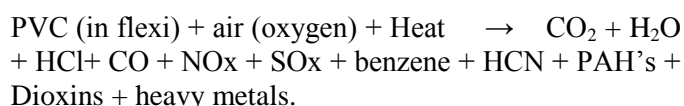
Figure 2: Structure of Dioxins (Polychlorinated dibenzodioxins)

Table 1. Measurement of hazardous chemicals released from flexi at fire [18]

Exposure	concentration	Environmental standard
Benzene	0.26 ppm	0.0001 ppm
Hydrogen chloride	0.62 ppm	0.067 ppm
PAH's (as B[α]P)	0.5-1.0 ng/m^3	1.5 ng/m^3
Dioxins/furans (as TEQ)	2.8-19.3 pg/m^3	5.0 pg/m^3
Lead	10.1 μg/m^3	2.0 μg/m^3
Chromium	5.7 μg/m^3	1.5 μg/m^3
Nickel	6.4 μg/m^3	2.0 μg/m^3

Among all other chemicals, Dioxins, are toxic, persistent, and bio accumulative chemical that was found in the environment- including air, water and soil- in amounts sufficient to result in adverse health and environmental effects. Dioxins are the one of the by-products of the combustion of flexi, Dioxin is a known human carcinogen and the most potent synthetic carcinogen ever tested in laboratory animals. A characterization by the National Institute of Standards and Technology of cancer causing potential evaluated dioxin as over 10,000 times more potent than the next highest chemical (diethanol amine), half a million times more than arsenic and a million or more times greater than all others. Chemicals added to plastics are absorbed by human bodies. Some of these compounds have been found to alter hormones or have other potential human health effects [19, 20].

2.7 Impacts on Environment

Plastics used in flex are very long-lived products that could potentially have service over decades, and yet our main use of these lightweight, inexpensive materials are as single-use items that will go to the garbage dump within a year, where they'll persist for centuries. Different types of synthetic Materials used in the flex making have always sows adverse impact on nature and the atmosphere. More recent uses synthetic materials those more and more man-made synthetic colours could in their life-time enter our atmosphere, soil or water environments (causes the water and soil pollution. The risk of synthetic coloured Materials entering these environments, as well as the effects on human health from people having contact with the flex, needs to be assessed and researched in the following areas:-

1. The detection of the particles in the environment
2. The measurement of emissions of flex
3. The life-cycle of the particles in the environment
4. The toxicity of the particles to the environment
5. The impact on the immediate and longer range environment

We've researched the environmental impact of printing and what we have found is quite shocking. Here are some facts about the shadier side of ink and toner:

- Ink cartridges in landfills can take up to a millennium to decompose, as they contain resin
- Toner cartridges contain toxic ingredients such as volatile organic compounds in the form of solvents
- It takes almost a gallon of oil to make a single laser ink cartridge
- Manufacturing a single toner cartridge releases 4.8 Kilograms of carbon dioxide into the atmosphere

Despite digitization movements and eco-friendly programs, printing continues in the world increasing rates. To help offset the negative impact of printing, companies and individuals can use Dimples to reduce the amount of ink and toner used in printing over 30%. Using a third less ink means lessening the environmental impact from ink and toner by a third [21-22] .

2.8 Global Warming

The pollutants that contribute to global warming are commonly known as greenhouse gas emissions. Carbon dioxide is probably the best known greenhouse gas, but methane, nitrous oxide and fluorinated gases also play a role in driving climate change. Human activities that cause global warming pollution can be best understand by examining the various sources of each type of greenhouse gas. Carbon dioxide represents 85 percent of all greenhouse gas emissions emitted from human sources. Globally, the largest source of carbon emissions is the combustion of fossil fuels like coal, natural gas and oil for energy. Electricity production is the single biggest generator of carbon. Carbon dioxide is also emitted naturally by animal and plant respiration, including humans [23].

Apart from that, PVC is used extensively in many industries including construction, automotive, electronics, packaging, fashion, and design amongst others and especially used in flex making. All commercial organic polymers will degrade in air when exposed to sunlight, although there is a very wide range of photo-oxidative susceptibilities. It is usually the absorption of near ultraviolet (UV) wavelengths which leads to bond-breaking reactions and the concomitant loss of useful physical properties and/or discoloration .Exposure to sunlight can have adverse effects on the useful great interest of plastic products. Ultraviolet (UV)

radiation can break down the chemical bonds in a polymer. Photo-degradation causes cracking, chalking, color changes and the loss of physical properties [24].

The flex which are made of with PVC plastic and synthetic colours are not ecofriendly. Where we find flexes are more, the temperature of particular atmosphere is high due to reflection of incident sunrays on flex. The chemicals used in the flex are easily entered in to the soil and cause the ground water pollution. Flex banners deliver high-quality digital prints, but they are not bio-degradable and when they burn, they emit toxic fumes with bad odour (causes the air pollution) that have serious effects on Environment

Solid polyvinyl chloride (PVC) plastic first melts with increasing temperature, then at a certain point the polymer structure starts to unzip. Next the chlorine and hydrogen start to be released (forming HCl) . If there is sufficient oxygen around the carbon oxidizes and forms carbon dioxide (CO2) and some carbon monoxide (CO) which causes global warming [25] .

$$PVC \text{ (in flexi)} + air \text{ (oxygen)} + heat \rightarrow CO2 + CO$$

2.9 Health effects in humans

In addition to cancer, exposure to dioxin can also cause severe reproductive and developmental problems (at levels 100 times lower than those associated with its cancer causing effects). Dioxin is well-known for its ability to damage the immune system and interfere with hormonal systems. Dioxin exposure has been linked to birth defects, inability to maintain pregnancy, decreased fertility, reduced sperm counts, endometriosis, diabetes, learning disabilities, immune system suppression, lung problems, skin disorders, lowered testosterone levels and much more.

Table 2: Plastics used in making flex and their Adverse Health Effects [26 and 27]

Plastic	Common Uses	Adverse Health Effects
Polyvinylchloride	Food packaging, plastic wrap, containers for toiletries, cosmetics, crib bumpers, floor tiles, pacifiers, shower curtains, toys, water pipes, garden hoses, auto upholstery, inflatable swimming pools and making flex	Can cause cancer, birth defects, genetic changes, chronic bronchitis, ulcers, skin diseases, deafness, vision failure, indigestion, and liver dysfunction
Phthalates (DEHP, DINP, and others)	Softened vinyl products manufactured with phthalates include vinyl clothing, emulsion paint, footwear, printing inks, non-mouthing toys and children's products, product packaging and food wrap, vinyl flooring, blood bags and tubing, IV containers and components, surgical gloves, breathing tubes, general purpose labware, inhalation masks, many other medical devices and making flex	Endocrine disruption, linked to asthma, developmental and reporoductive effects. Medical waste with PVC and pthalates is regularly incinerated causing public health effects from the relese of dioxins and mercury, including cancer, birth defects, hormonal changes, declining sperm counts, infertility, endometriosis, and immune system impairment.
Polycarbonate, with Bisphenol	Water bottles and making flex	Scientists have linked very low doses of bisphenol A exposure to cancers, impaired immune function, early onset of puberty, obesity, diabetes, and hyperactivity, among other problems (Environment California)
Polystyrene	Many food containers for meats, fish, cheeses, yogurt, foam and clear clamshell containers, foam and rigid plates, clear bakery containers, packaging "peanuts", foam packaging, audio cassette housings, CD cases, disposable cutlery, building insulation, flotation devices, ice buckets, wall tile, paints, serving trays, throw-away hot drink cups, toys and making flex	Can irritate eyes, nose and throat and can cause dizziness and unconsciousness. Migrates into food and stores in body fat. Elevated rates of lymphatic and hematopoietic cancers for workers.
Polyethelyne	Water and soda bottles, carpet fiber, chewing gum, coffee stirrers, drinking glasses, food containers and wrappers, heat-sealed plastic packaging, kitchenware, plastic bags, squeeze bottles, toys and making flex	Suspected human carcinogen
Polyester	Bedding, clothing, disposable diapers, food packaging, tampons, upholstery and making flex	Can cause eye and respiratory-tract irritation and acute skin rashes
Urea-formaldehyde	Particle board, plywood, building insulation, fabric finishes and making flex	Formaldehyde is a suspected carcinogen and has been shown to cause birth defects and genetic changes. Inhaling formaldehyde can cause cough, swelling of the throat, watery eyes, breathing problems, headaches, rashes, tiredness

Polyurethane Foam	Cushions, mattresses, pillows and making flex	Bronchitis, coughing, skin and eye problems. Can release toluene diisocyanate which can produce severe lung problems
Acrylic	Clothing, blankets, carpets made from acrylic fibers, adhesives, contact lenses, dentures, floor waxes, food preparation equipment, disposable diapers, sanitary napkins, paints and making flex	Can cause breathing difficulties, vomiting, diarrhea, nausea, weakness, headache and fatigue
Tetrafluoro-ethelyne	Non-stick coating on cookware, clothes irons, ironing board covers, plumbing and tools and making flex	Can irritate eyes, nose and throat and can cause breathing difficulties

2.9.1 Management practices in controlling plastic usage and ink usage in flex making:

Only 5% of the world's plastic is recycled and the remaining 96% ends up in landfills, or even worse, as litter or in the oceans. But one can and one has to, reduce its use, and reduce the impact it has on the environment. There are several aspects to this effort and can make a good start by following the basic environmental edicts: Reduce, Reuse, and Recycle [28].

Based on the review done on the environmental and human health effects of Synthetic and traditional inks used in flex making , as well as the research done on new technologies, we propose several recommendations to reduce visual pollution .The best option for is to start purchasing ink that is more environmentally friendly. There are several options for eco-purchasing, one of the best options being soy-based inks. This reduces the amount of chemicals in the toners as well as the health effects to the manufacture workers and environmental effects of producing and disposing of the toner cartridges. Another option for eco-purchasing is to buy solid ink compatible devices. Solid ink is vastly more environmentally friendly than traditional inks. Solid ink is made from cleaner burning waxes than the paraffin waxes in inks used in flex making [29-32].

III. CONCLUSION

1. Green is the new black! Green cars, green shoes, green bags, green hair, green beer, green food, Green energy, green people, green printing and green everything... green is poised to become the most favoured colour of the century! The human race suddenly became greenophilic when exposed to an imminent horror of total extinction. And it is a pity that we took so long to realize the consequences of our reckless lifestyle - depleting the natural resources and contaminating the earth.

2. Plastics used in flex offer considerable benefits for the future, but it is evident that our current approaches to making, use and disposal are not sustainable and present concerns for environment and human health. Set an example to others and encourage them to help. They are useful and popular materials which can be produced with relatively little damage to the environment. The problem is the excessive use of plastics in flex in one-off applications together with careless disposal.

3. Unfortunately, it seems that nobody, even the authorities or the public are bothered about the flex or its impact on the environment. To an extent, the country dwellers are also quite engrossed in the visual explosion created by these huge hoardings. While traffic pollution, noise pollution have become constant subjects of discussion, visual pollution is one such that doesn't get much attention. The visual pollution refers to anything like banners, huge cut outs and flexes hoardings that would hamper the visual beauty, affect the environment and sometimes even pose threat to life. Some billboards are obscene and these banners are found at vantage points in the country – sometimes even distracting motorists. In some place, even footpaths have not been spared and this causes huge inconvenience to pedestrians. Accidents due to any of these cannot even be identified.

4. Another avenue to develop for reduction of flex usage by media people, politicians, faculty, staff and students, and all other individuals, is to increase awareness of flex usage and the associated health and environmental effects. To this end, the most impressive points of our findings could be converted into education and outreach campaigns for behavioural change. The health and environmental effects of flex usage is another area full of potentially shocking information that could

encourage environmentally concerned individuals to reduce flex making. Several systems are already available in the industry to support environmentally-friendly printing. We can call these systems Green Printing Agents (GPAs) as they assist in the transition to Green Printing. But there lies the big stumbling block as green printing comes with additional investments! Days are gone when one can take such technologies as a luxury... now they became a necessity.

5. Usage of cloth banners could be encouraged as it would not only give a livelihood for painters and labourers, but also would not cause any environmental degradation. 100% Environment-friendly Polyethylene Flex banner materials must be developed and encouraged to the environmental sustainability.

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V. BIOGRAPHY

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Effect of Antibiotics Overuse in Animal Food and its Link with Public Health Risk

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ABSTRACT

Antibiotics are a group of antimicrobial substances that are used in treatment of bacterial infections and prevent diseases. Use of antibiotics in poultry have been observed since 1940, the purpose of the usage was initially for treatment of infection but gradually taking this drug increased dramatically in animal husbandries especially in poultry in the second half of the twentieth century for increasing economic benefits because these antibiotics have ability to work as hormone growths. Meanwhile at the end of the century, more than 70 percent of all produced antibiotics consumed in animal husbandries.. Overuse and abuse of these medications in poultry have dangerous effect on human health as consumers of these products because of strong relationship between use of antibiotic in animal food and it's resistance in human's body. In this paper we focused on different types of antibiotics used in poultry and discussed possible overuse of antibiotics in animal husbandries which result in threatening human health in order to encourage establishing organizations Supporting Restrictions on the Use of antibiotics in animal husbandries to save human health in this order.
Keywords: Antibiotics, Overuse, Animal Husbandries, Antibiotic Resistance, Human Health

I. INTRODUCTION

An antibiotic is a substance that erase or slows the bacteria growth. There are various types of antibiotics that are playing role in destroying bacteria in different ways. The antibiotics belonging to the same class generally possess similar mechanism of action, effectiveness, resistance and the same target (bacteria 's type).Antibiotics are classified into two groups base on their spectrum for treating range of infections : broad – spectrum antibiotics and narrow-spectrum antibiotics which treat inclusive range of infection and limited range of infection respectively.[1-3] Antibiotics used in animal food are classified in to following major groups:

Aminoglycosides: Aminoglycosides are derivation of different species of Streptomyces bacteria. Their mechanism of action is blocking the proteins vital synthesis to bacterial growth. These antibiotics persist in digestive tract so are active and useful in enteric infections treatmnet. Examples include spectinomycin, and streptomycin, neomycin, gentamycin [1-3]

Bambermycins : Bambermycins are derivation of Streptomyces bambergiensis. Their mechanism of action is inhibition of bacterial cell wall synthesis. Examples are bambermycin and flavophospholipol,

Beta-Lactams: This class include Pencillins and cephalosporins as two major classes.

Penicillins : This antibiotics was the first one to be discovered and derived from the mod Penicillium notatum. Their mechanism of action is inhibition of bacterial cell wall formation. Examples are Amoxicillin and ampicillin. Penicillins are useful in the treatment of sinusitis and chronic respiratory disease in poultry.

Cephalosporins : This group are structurally close to penicillins. This class is classified into three generations which possess a large spectrum of action than the one before (first, second and third generation).

Glycopeptides: Activity of this class is done by interrupting with protein synthesis as well as cell-wall formation. The only member of this class which is available in US is Vancocin which is effective for MRSA infections in humans. FDA-CVM issued an

order regarding prohibiting extra lable use of this class in food animals in 1997.

Ionophores : This class of antibiotics are effective for treatment of coccidiosis which is a disease in poultry and caused by Eimeria(Protozoan Parasite) invading poultry intestine's cells. This class are not used in human medicine and are used as antimicrobial in poultry.

Lincosamides : Lincosamides are derived from Streptomyces lincolnensis. This class shows the same antimicrobial activity (effect) with Macrolides, although they are structurally different. Lincomycin has effective activity against bone and joint infections, as well as necrotic enteritis caused by Clostridium perfringens.

Macrolides: Macrolides are derivation of the Streptomyces bacteria and their mechanism of action is interrupting in protein synthesis.

Polypeptides : Polypeptides are effective against bacilli..

Quinolones : Fluoroquinolones are not derived from bacteria or fungi but are synthetic antibiotics. Their mechanism of action is prevention of DNA replication of bacteria.Examples include enrofloxacin, danofloxacin, flumequine, norfloxacin, and difloxacin. Fluorquinolones are effective against colibacillosis, fowl cholera, salmonellosis,, and Pseudomonas aeruginosa infections. Baytril (enrofloxacin; This drug is prohibited for animal use in the United States.)

Streptogramins : Streptogramins are derived from Streptomyces species and made of two structurally unrelated molecules. One inhibits protein synthesis, and the other, cell-wall formation.. The drug virginiamycin is a streptogramin that has effective activity against necrotic enteritis.

Sulfonamides (sulfa drugs): Sulfonamides are developed by chemical synthesis.. Their mechanism of action is interfering with RNA and DNA, which are essential for cell growth and replication. Sulfonamides, such as trimethoprim, are effective against Salmonella, Staphylococcus species, Pasteurella,, E coli and. Streptococcus species,

Tetracyclines : Tetracyclines are produced by the bacteria Streptomyces. Their mechanism of action is prevention of bacteria from multiplication while the host animal's immune system copes with the original infection. Examples are chlortetracycline (Aureomycin) and oxytetracycline (Terramycin).[1-4]

II. METHODS AND MATERIAL

The Overuse of Antibiotics in Food Animals and its effect on public health

The use of antibiotics has been observed since 1940s which resulted in a broad reduction in diseases and death from infections. But from other aspect, according to the federal Interagency Task Force on Antimicrobial Resistance, overuse of these antibiotics has led to drug(antibiotic) resistance that threatens public health. So since antibiotic use has been observed widely and for so long. Antibiotics resistance has become a major public health risk. [5-6]. As a feedback, there has been a united effort by the Centers for Disease Control and Prevention(CDC) and other organization to excite doctors and patients to use antibiotics more carefully. Unfortunately less progress has been observed for reduction of antibiotics use on farms, where most of these antibiotics are used. Approximately 80 %of the antibiotics sold in the United States are administrated in meat and poultry production. The broad mass is used on healthy (not ill) animal for promotion of growth or prevention of disease in unsanitary or crowded conditions. The main question raised from above note is that can antibiotic abuse in animals stimulate the evolution of hardened-to-cure antibiotic-resistant superbugs that cause people sick? And if it can, are the diseases rare existences and the risk theoretical, or could current use of antibiotics in animal cause a serious threat to human health. Consumers Union has concluded that overuse of antibiotics in animal food and its link with public health threat is evident and growing. [7-8].Human's health is at the risk due to potential occurrence of strong viruses in meat and poultry and to the general transfer of strong viruses (superbugs) into the environment, where they are able for transmitting their genetic immunity to antibiotics to other bacteria, including bacteria that make people infected. Diverse health organizations like the American Public Health Association, American Medical Association,, Infectious Disease Society of America, and the World Health Organization comply and have alarmed for serious reductions in antibiotics use in animal. Conclusion of scientific qualified organizations for more than two decades showed that there is a link between use of antibiotics in animals and less effectiveness of these antibiotics in human medicine. In 1988, one conclusion

by the institute of Medicine has been shown that according to the obtained data, there is a flow of distinct salmonella clones from farm animals treated with antibiotics, through food products, to humans, who gain clinical salmonellosis. After ten years, the National Research Council showed a conclusion that there is a relationship between antibiotic use in animal food, evolution of resistant bacteria in those animals and zoontic spread of pathogenic microorganisms to human. In 2003, the World Health Organization in association with FDA and OIE demonstrated one conclusion that there is a clear documentation of adverse human health consequences including infections due to resistant microorganisms developing from non-human use of antibiotics. In 2010, the U.S. FDA,U.S. Department of Agriculture, and the CDC all announced before Congress that there is a link between the general use of antibiotics for production of meat and the reducing effectiveness of antibiotics for human.[9-11]. In 2012, the FDA announced that abuse and overuse of antibiotics cause selective evolutionary pressure that lead to increasing ability in number rapidly of antimicrobial resistant bacteria than antimicrobial susceptible bacteria thus increases the opportunity for people to become infected by resistant microorganisms.[12].Nevertheless, the argument of the livestock industry continues that it is not an important issue for human health and little change in present practices are required. In addition to above expert attitudes about effect of antibiotics on human health, different studies also supported this opinion. For example. *When superbugs enter the farm, they mostly move from farm to the kitchen via uncooked poultry and meat. Some reports on chickens in 2006 and 2010 showed widespread occurrence of antibiotic resistant microorganisms in retail poultry products, in both years, contamination with Salmonella* and/or *Campylobacter was found about more than two thirds of the samples* in which about 60% of those pathogens were resistant to one or more antibiotics. Although there was an argument by industry that there is no any concern on it because people have knowledge of cooking poultry carefully. Although they do it well but dripping packages in the refrigerator or contamination of cutting boards and other problems support previous opinion of antibiotic effect on human health. Also scientists showed that 20 % of examined

chicken breast samples contained - resistant *Camplobacter* in 1999(this bacteria cause a disease). Finally after along arguments in the courts, FDA blocked use of the ciprofloxacin in 2005 and after this action in 2010, the resistance to this antibiotic decreased to 13.5 percent while it was nearly 30 percent in 2005. Generally during feeding antibiotics to animals, bacteria (Pathogenic Microorganisms) in and around them are exposed to the antibiotic, and most of them killed by it. But there are always some bacteria that do not kill by the drug and survive and multiply.Voila, superbugs. [13-17]Some of these survived microorganism infect people some not but generally there are two ways through which infection is done one is direct way, in meat and poultry products and the other one is an indirect way through the environment.One another report for supporting this issue is that a strain of *Salmonella* resistant to four different antibiotics, ampicillin, streptomycin, tetracycline and gentamicin caused about 136 illness and one death in turkey in 2011. Another report was occurred in New England in 2011 linked to 19 infections and seven hospitalization at least due to by a strain of *Salmonella* resistant to multiple antibiotics, including sulfisoxazole, ampicillin, cefoxitin, ceftriaxone,, kanamycin, streptomycin, and amoxicillin/clavulanic acid found in ground beef from the Hannaford grocery store chain.Via environmental transmission, spread of superbugs beyond farm is possible which threaten public health. This transmission and infection can occur in different routes, especially via farm runoff or workers. Farm born superbugs can transfer their genetic material to other bacteria and make them resistant too. This event can occur in many places like in human digestive tract, wild animal or lakes. In comparison to other colony members, the workers are more likely to transfer resistant bacteria from animal to elsewhere. For example one study demonstrated that poultry workers in the Delmarva peninsula were 32 times more likely for carrying gentamicin-resistant Escherichia coli *and more than 5 times more likely for carrying multi antibiotic resistant* E.Coli *in comparison with other colony member*s. One more case in Midwest demonstrated that there is possibility for resistant bacteria like methicillin-resistant *Staphylococcus aureus* (MRSA) in which the resistant *Staphylococcus aureus* evolved in human and jumped into pigs where it obtained resistance to the

antibiotics like methicillin and tetracycline and then gone back to human where it called livestock-associated MRSA (LA-MRSA).Additionally, escaping of resistant bacteria can also happen from a large livestock operation (CAFO) via various ways like fertilizers, flies attracted to the fertilizer, wind leaving hog facilities and trunks transporting animals. Exchange of genetic material for antibiotic resistance is possible between bacteria and their neighboring bacteria. Some times in some cases gene coding for antibiotics resistance are available on mobile genetic elements like plasmids, transposons and integrons which can do easily movement between bacteria of the same or different class or species which in turn do facilitation of spreading antibiotic resistance by multiple species of bacteria.[18-23]

III. RESULT AND DISCUSSION

Use of antibiotics in animal food poses a risk to human health. Antibiotic use causes promotion of superbugs development and proliferation which result in contamination of meat and poultry and in turn lead in hard to treat illness in human which make human health at risk. Although poultry industry argues that antibiotics are used in poultry they are not used in human medicine and not harmful for human but various health organizations supported this opinion and examined different studies in support of use of antibiotics lead in human health risk. This infection can appear in direct or indirect routes and superbugs can exit via wildlife. Farm workers. Wind and run off. May be they do not immediately cause infection and disease but they are able to exchange their genetic material via plasmids with other bacteria and make them antibiotic resistance. This knowledge and awareness of ability of superbugs to threat human health via exchanging genetic material and make other become resistance to multiply antibiotics help poultry industries and other related industries to be careful in management antibiotic use in their production which is very important to save human health. For this reason that FDA and public health community proposed limitation on use of antibiotics in animal food for more than three decades. Of course we should pay attention and make action on decreasing antibiotic use in animal foods to prevent disease in both animal and human and prevent from antibiotic resistance problems to treat emerging diseases easily and do not face hard to cure diseases in human.

IV. CONCLUSION

Overuse and abuse of antibiotics pose a risk to human health. Promotion of development of superbugs which cause contamination of meat and poultry and hard to treat disease in human evolved by abuse of antibiotics. Hence public health community and FDA and other organizations proposing limit use and correct use of antibiotics in poultry and meat production in order to control harmful effect of this abusing to save human health. In addition to it, for reduction of hard cure disease in human which arise from animal food, knowledge of correct use and limit use of antibiotic help people to have a safe and healthy life both for themselves and animal too.

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Prosthodontic Management in Parkinson's disease - A Review

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ABSTRACT

Parkinson's disease is neurological disorder characterizedby rigidity, tremors, postural instability and bradykinesia. Parkinson's disease is seen in about 6.3 million people of all races and culture. Impaired motor skills and cognition effects the diet of patient, nutrition and therefore compromises the general health and oral hygiene of the patient. As a result dental caries, Periodontitis and finally edentulism is commonly seen. Diligent handling with "Tender, Love and care" are required for treating such patients. The family of the patient should also be educated about the disease. This article reviews the etiology, clinical features, orofacial findings and the prosthodontic management of such patients.
Keywords: Paralysis, Xerostomia, Over Denture, Implants

I. INTRODUCTION

Parkinson's disease also called as paralysis agitans first described by Dr. James Parkinson in 1817. It is a progressive neurogenerative disorder effecting musclecontrol, movement, balance and many other non-motor functions. It is also called Shaking palsy. Parkinson's disease is the most ccommon movement disorder and the second most common neurogenetic disorder[1]. The depletion of neurotransmitters, nor epinephrine and dopamine in the basal ganglion results in the Parkinson's disease[2,3].

II. METHODS AND MATERIAL

EPIDEMIOLOGY

Parkinson's disease occurs most commonly at the age of 50-60 years, but can also be seen in middle age group. The prevalencein general population is 0.1%but in persons above 65 years of age is 1%. In Canada about 100, 00 people suffer from Parkinson's disease. In US about 1.5 million people suffer from Parkinson's disease as reported by National Institute of Neurological Disorder and Stroke (NINDS), in which the percentage for the age group above 60 years is 1-2% while as for the age group above 85 years is 3-5%. Annually about 50,000 new cases of Parkinson's disease are diagnosed in US. It is more prevalent in Caucasians than that of Oriental Asian ancestry or black Africans. Men are affected twice as compared to that of women. Few authors have also suggested the role of genetic and chemical exposure in minority of cases. [1-5]

ETIOLOGY

The two major factorsconsidered by the Parkinson's disease foundation to be the causes of Parkinson's disease are genetic and environment factors. Ciarrociaetal [6] in 2003 suggested that Parkinson's disease may be due to the combinedeffects of genetic predispositions, accelerated aging, head injuries, exposure to neurotoxins or pesticides or an abnormal oxidative mechanism. Parkinson's disease is also seen in

the persons with the occupation of welding, cleaning or farming. Drinking water containing more concentrationof heavy metals like mercury, Iron, Zinc, and Manganese can also increase the incidence of Parkinson's disease.

CLINICAL FEATURES

Parkinson's disease is gradual in onset and is unilateral initially. Early signs of disease are mild stiffness and resting tremors. "Pill-rolling" movement between thumb and fingers is the typical feature of Parkinson's disease. The tremors then spread to mandible, tongue, legs and face. Allen and Leuck described the flexed posture of these patients due to rigidity. These patients are also unable to initiate voluntary and involuntary movements, this is called as Alkinesia[7]. These patients exhibit a different gait which is often slow and shuffling with stooped posture. These patients tend to walk with shorter steps at fast speed. Autonomic dysfunctions where seen in such patients which include varied Blood Pressure, Bladder and Bowl dysfunction and excessive sweating[8].

OROFACIAL FEATURES

These patients exhibit a typical "Mask like" appearance due to the reduced movements of facial muscles. Other symptoms include lip pursing and tongue thrusting. There is a change in voice which becomes soft which is barely audible due to rigidity. These patients take more time to consume food due to reduced tongue movement, slow chewing movement and dysphagia. Medicationan alter the taste perception of the patient. Saliva drools from the corners of mouth which leads to angular cheilitis, fetid odor and skin irritation. Choking can result due to the accumulation of food and saliva at the back of tongue. Orofacialmuscle tremors and Levodopa medication can lead to bruxism, attrition and some craked tooth[8]. Xerostomia is another symptom of Parkinson's disease which is due to the medication used in Parkinson's disease like anticholinergics, Levodopa and dopaminergics. 25% of Parkinson patient's exhibit Burning mouth syndrome. Symptoms like burning sensation of hard palate, tongue, cheeks, lips, floor of mouth and edentulous alveolar ridge is almost noted in all the patients whether the patient is dentate, edentulous or denture wearer[9].

PROSTHODONTIC MANAGEMENT

Physician consultation should be taken for any modification in the treatment plan before starting dental treatment. Written consent should be taken from the patient or caregiver. Early morning appointments should be given for such patients as the symptoms are least bothersome for 60 to 90 minutes after taking the medicine. Duration of the appointment should be less than 45 minutes. Patient should empty bladder to prevent incontinence and urinary urgency. Patient should be kept in upright sitting position to avoid orthostatic hypotension. Such patients can show anxiety or frustration behavior, this can be avoided by using relaxation and diversion methods[10]. Sometimes the dentist need to identify himself each time, use short sentences, simple words and avoid wearing face mask. Direct eye contact, smiling and gentle touch can help. To reduce the anxiety the caregiver of the patient should be allowed to sit next to the patient[11]. Since such patients are unable to keep their mouth wide open for long time, drooling of saliva occurs and also the tongue and head movement can interfere with the treatment procedure. An intraoral rubber bite block or extra oral ratchet type prop should be used to keep the mouth of the patient open for the convenience of the procedure. 45 degree inclined chair position should be preferred to facilitate the patients swallowing. Saliva should be aspirated regularly using aspirating tip under the rubber dam[12]. Because of the impaired manual dexterity the oral hygiene maintenance of such patients is compromised. Oral hygiene maintenance such as regular use of tooth brush, flossing method and fluoride application should be advised for the patient and also the caregiver of the patient should be advised for the same.[8]

Removable Prosthodontics
Due to the drooling of saliva, tremors and rigidity of orofacial musculature it is difficult for the patient to control and retain the prosthesis. In such patients the retention, stability and support of the prosthesis is always compromised. Quick setting impression materials should be used to record the impression especially in severe cases. Wax and compound should be used to record Jaw relations after properly training the patient. Flange technique and Neutral zone techniques should be used, and monoplane occlusion is preferred for maximum inter cuspation to avoid

interferences[13]. These techniques also improve the stability and retention of the denture. Turner et al[14] advised the use of artificial salivary substitutes and moisture based denture bases for severe xerostomic patients. Metal denture bases or high impact denture base resins are preferred. Denture cleansers should be prescribed and patients oral and denture hygiene should be properly inspected[15].

Fixed Prosthodontics

Supra gingival or equi gingival margin of the preparations are preferred. For maximum retention and resistance form full coverage restorations should be given. The use of rubber dam and suction aids is compulsory especially when there is drooling of saliva. Al Hamad et al[16] in 2008 suggested that the retraction of gingival sulcus should be done using an expanding Vinyl polysiloxane. Over contouring of the prosthesis should be avoided as it may cause plaque accumulation resulting in gingival hyperplasia. Resin fused to metal or gold bridges should be used in the patients with bruxism. The retainers and the pontic of the prosthesis should be designed for being self cleansing. Fixed partial dentures should be cemented using resin cements as it reduces miroleakage.

Implant Surgeries

The use of implant supported prosthesis has greatly improved the general as well as oral health of the patient; masticatory ability of the patient is also improved with the use of such prosthesis[17,18]. Use of magnetic attachments in the mandibular over dentures is very helpful to the patient as it is easy to insert and remove for the patient[19].

III. CONCLUSION

As discussed earlier Parkinsonism is a degenerative disorder effecting muscles of face, pharynx, tongue and palate. Such patients can be very difficult to treat due to their behavioral or psychological pattern which is associated with the disease. Careful approach with diligent handling of the patient during the treatment results in the success of the prosthesis. Patient education and motivation about the post insertion instructions helps in the long term success of the treatment.

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How Web Aesthetics Impact Online Shopping

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ABSTRACT

The business world is changing rapidly and it is getting restructured at an astonishing pace. Internet penetration has resulted in the commencement of a new era and has brought a completely new and important source of income for small, medium and big companies by servicing their customers through internet whether they are in their work place or at home. It is getting used as an easy and affordable means to transact business without any limitation of time, place or situation. Online shopping has created a new platform for the expansion and growth of business. This study examines the role and impact of aesthetic design in online shopping stores. Designing online shopping sites involves the application of knowledge from diverse fields such as marketing and human-computer interaction. This article is a collation of research findings from different areas to investigate the role of web aesthetics in shaping the mood and perception of consumers in favour of online shopping companies.

Keywords: Aesthetics, Consumer Behavior, Online Shopping, Human-Computer Interaction, Marketing, Web-Store Design.

I. INTRODUCTION

With the growing popularity and penetration of online shopping, businesses all over the globe are now trying to enhance their competitive advantages by focusing their resources on the virtual business environment. Armed with the power of telecommunications and information technologies, consumers can now access information and data of innumerable vendors more easily than ever before. Moreover, new software tools make it easy for consumers to compare and assess the quality, image, and price of products. In the academic literatures, website aesthetics and quality have generally been recognized as critical factors to drive business online. As such, numerous studies have been carried out to determine the impact of website quality and aesthetics on consumer perceptions about different online shopping sites. The crowded field of competitors in the online shopping industry indicates that achieving long-term success in Web retailing requires e-vendors to adhere to traditional economic and marketing principles and apply traditional marketing strategies. These trends increase the importance of how potential consumers view Web-stores. Previous studies have indicated that design decisions made by a retailer influence consumer perceptions of the retailer and their intentions to shop at those sites (**Jarvenpaa and Tractinsky 1999; Zhang and von Dran 2000**). Consumers weigh various store attributes differently when shopping for low or high-risk products (**Jarvenpaa et al. 2000; Lowengart and Tractinsky 2001**). According to **Zhang et al. (2001),** consumers also weigh design attributes of online shopping sites differently, depending on the type of products or services offered by those sites. While there is now a growing body of research on the impact of consumer behavior in electronic retail settings, little research has been done to date on the specific question of why consumers prefer and adopt one specific Web-based retailer over a competing retailer. According to **The American Heritage Dictionary of the English Language,** aesthetics is "an artistically beautiful or pleasing appearance". The design of online shopping sites should take aesthetic considerations into account. The Internet has emerged as a potent shopping channel in recent years. Besides, Internet shopping sites are also becoming entertainment and stimulation centers. The importance of beauty has been recognized since time immemorial. Modern social science has established the

importance of aesthetics in everyday life. **Dion, Berscheid, and Walster (1972**demonstrated that a person's physical appearance influences other aspects of the social interaction.

II. METHODS AND MATERIAL

Objectives of the Study:

The objectives of this article regarding online shopping are mentioned below:

a) To investigate if the aesthetic qualities of an online shopping site matter in terms of consumer behavior in Web shopping;

b) To find out how different aesthetic aspects of online shopping sites interact with different characteristics of products, stores and consumers.

Literature Review:

Previous studies have pointed out that some of the most used key dimensions of online service quality research were navigability, playfulness, information quality, trust, personalization and responsiveness **(Nusair & Kandampully, 2008).**

E-retail aesthetics is conveyed mainly through the web-site's interface, which serves as the "facade" **(Hooper 1986**of the e-store. Users experience the aesthetics of this interface immediately **(Lindgaard et al. 2006).** Research in website design suggests that providing richer media with more real environment has more positive influence with user's involvement **(Hausman & Siekpe, 2009).** Study of the design aspects of online retail sites have emphasised aspects of information content and its impact on consumer cognition and decision processes, as well as usability issues, such as ease of navigation and interface consistency **(Bellman, Loshe and Johnson 1999; Lohse, Bellmand and Johnson 2000; Lohse and Spiller 1998; Nielsen 2000; Spiller and Lohse 1998; Spool et al. 1998).**

McKnight, Choudhury, and Kacmar (2002found that perceptions of the site design and quality were strong predictors of trusting beliefs in the retailer and in consumer intentions to buy from the site.

Consumers may be motivated by the desire to maintain a positive mood **(Meloy 2000**or to increase the hedonic value of the shopping experience **(Babin, Darden, and Griffin 1994).**So, aesthetic design of online stores may create a positive mood and create pleasant feelings during the shopping process **(Porat and Tractinsky 2006).**

Web page color and background images were found to affect consumer choice **(Mandel and Johnson 2002).** Aesthetics may affect perceptions by inducing affective response, which, in turn, influences evaluations of other attributes of the object and attitudes towards the object in general **(e.g., Norman 2004; Rafaeli and Vilnai-Yavetz 2004; Vilnai-Yavetz and Rafaeli 2006).**

The aesthetic dispositions of consumers are major determinants of their perceptions of the design's aesthetics and can be based on individual sensitivities to aesthetics **(Bloch et al. 2003**or on social or cultural factors (e.g., nationality or age groupthat affect those sensitivities.

For first-time consumers, an aesthetic design can create favorable first impressions **(Norman 2004; Postrel 2002**that may trigger a positive affect **(Pham 2004**and create a favorable bias in the consumer's decision making process **(Loken 2006; Yeung and Wyer 2004). Lavie and Tractinsky (2004**showed that online users perceive two high-level, aesthetic subdimensions. The first sub dimension, which they termed "classical" aesthetics, is associated with clean and orderly design and with user perceptions of the Web site's usability (i.e., eases, of use). The second aesthetic subdimension, termed "expressive," represents designs perceived by users to be original and creative. This dimension contributes to the uniqueness of the site's appearance. To promote hedonic shopping, online stores need to improve sensory stimulation, create the feeling of fantasy and arousal as well as enjoyment and pleasure **(Babin et al. 1994).**

The new age research works suggest that aesthetics is correlated with user satisfaction **(Lindgaard and Dudek 2003; Tractinsky et al. 2000**and pleasure **(Hassenzahl 2003; Lavie and Tractinsky 2004).**

Zhang and von Dran (2000 found that certain aesthetic elements of a Web site serve as purchase motivators, while other aesthetic elements serve as hygienic factors (i.e., necessities in purchase decisions from e-retailers.

Porat and Tractinsky (2006 and Vilnai-Yavetz and Rafaeli (2006 found that aesthetics influenced consumers' emotional states and attitudes towards Web stores.

Aesthetics may elicit moods that stimulate consumers to form an affect-based initial impression that is later used as a basis for judgments (Loken 2006).

The design characteristics of the store are objective properties of the design (e.g., shape, color, size, etc. and may be used to intentionally affect user perceptions (Park et al. 2005 or they might be interpreted in ways that were unintended by the designer.

According to Lavie and Tractinsky (2004), the expressive aesthetics of Web sites convey a sense of creativity and uniqueness. This type of aesthetics is likely to serve an important role when shopping for specialty goods, an activity during which consumers engage in a relatively intense process of information gathering.

The dimension of classical aesthetics represents order, clarity, and clean design (Lavie and Tractinsky 2004). These characteristics are considered valuable in most shopping environments, perhaps somewhat more so in upscale shopping, where attention to detail is likely to be higher.

Expressive aesthetics can facilitate the marketing of fashion items as it can contribute in conveying the special image and identity desired by consumers of this type of apparel (Schroeder 2002).

In Creusen and Schoormans' (2005 words, "aesthetic value often will be important to consumers for durable products, as these products are often used for many years and are visible in consumer's homes or to other people".

Visual design is one of the most important factors that can influence feelings in the virtual world. Thus, aesthetic design can be instrumental in creating such environments which generate these feelings (Arnold and Reynolds 2003; Lavie and Tractinsky 2004; Zhang and von Dran 2000).

The store's visual design may serve to increase trustworthiness by serving as an indicator of site credibility (Fogg et al. 2002).

If aesthetics is perceived as relevant (e.g., shopping for products that stress aesthetic design or is indicative of the store's professionalism (e.g., attention to detail), it should be consequential to the decision process (Petty and Wegener 1999).

During the search stage, well-organized website structure and the attractive design are important things to persuade consumers to be interested in buying product and service (Koo et al.).

Shergill and Chen (2005 identified website design characteristics as the dominant factor which influences consumer perceptions of online purchasing.

Turban et al. (2002 argue that elegant design of website will serve better to its intended audiences.

According to Kin and Lee (2002 the website design describes the appeal of the user interface design presented to customers so that they are willing to visit more often and stay longer with attractive websites (Shaw et al., 2000). Following them, Than and Grandon's (2002 study found that quality website design is crucial for online shopping.

III. DISCUSSION & CONCLUSION

Incorporating aesthetics into online shopping sites does come with a cost, which may not be justified by each and everybody. Hence, to help e-retailers negotiate the benefits and costs of designing aesthetic sites, the suggestion will be for the e-retailers to adopt a focused approach to this aspect of the Web store. Depending on the type of products and services they sell and the type of customers they target, some stores may require heavy investment in aesthetic design. Similarly, some other stores may have to invest in the more innovative aspect

of aesthetic design, while other stores' investment should be concentrated more towards more conservative aesthetics. Correctly understanding the time and process to emphasize upon proper aesthetic design would result in luring new customers and retaining existing consumers, improving consumer attitudes and increasing potential purchases, as well as in reducing attrition rate. The literature review suggests that e-retailers should configure their Web-store design according to combinations of consumer and product characteristics. This can be achieved by customizing shopping sites that would offer similar products for different consumer groups. Such customization would help e-retailers adapting better to the various parameters of the shopping context. This potential rapid growth of online stores for the same retailer might seem as a case of spreading resources instead of consolidation. However, this strategy incorporates better segmentation schemes that not only increase the parity between consumer shopping needs and e-retailer offerings, but also serves as a means for better pricing schemes for different consumer groups.

Clearly, this paper does not exhaust the role of aesthetics in online shopping. Future research can improve our knowledge about additional areas in the online shopping environment that can be affected by the aesthetics of online sites, and additional analyses can shed some more light on this phenomenon.

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Expressions of Some Complicated Integrals

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ABSTRACT

In this paper, we study two types of indefinite integrals. The analytic solutions of the two indefinite integrals can be obtained mainly using differentiation with respect to a parameter and integration term by term. In addition, we propose two examples to demonstrate the calculations. The research method adopted in this study is to find solutions through manual calculations and verify our answers using Maple. This method not only allows the discovery of calculation errors, but also helps modify the original directions of thinking.

Keywords: Indefinite Integrals, Analytic Solutions, Differentiation with Respect to a Parameter, Integration Term by Term, Maple

I. INTRODUCTION

The computer algebra system (CAS) has been widely employed in mathematical and scientific studies. The rapid computations and the visually appealing graphical interface of the program render creative research possible. Maple possesses significance among mathematical calculation systems and can be considered a leading tool in the CAS field. The superiority of Maple lies in its simple instructions and ease of use, which enable beginners to learn the operating techniques in a short period. In addition, through the numerical and symbolic computations performed by Maple, the logic of thinking can be converted into a series of instructions. The computation results of Maple can be used to modify our previous thinking directions, thereby forming direct and constructive feedback that can aid in improving understanding of problems and cultivating research interests.

In calculus and engineering mathematics, there are many methods to solve the integral problems, for example, change of variables method, integration by parts method, partial fractions method, trigonometric substitution method, etc. This paper considers the following two types of indefinite integrals which are not easy to obtain their answers using the methods mentioned above.

$$\int (\ln x)^m x^a \cosh x^b dx, \qquad (1)$$

$$\int (\ln x)^m x^a \sinh x^b dx, \qquad (2)$$

where a, b, x are real numbers, $a > -1$, $b > 0$, $x > 0$ and m is a positive integer. We can obtain the analytic solutions of these two indefinite integrals mainly using differentiation with respect to a parameter and integration term by term; this is the major result of this study (i.e., Theorem A). Adams et al. [1], Nyblom [2], and Oster [3] provided some techniques to solve the integral problems. On the other hand, Yu [4-31], Yu and Chen [32], and Yu and Sheu [33-35] used complex power series method, integration term by term theorem, Parseval's theorem, area mean value theorem, and generalized Cauchy integral formula to evaluate some types of integral problems. In this paper, two examples are used to demonstrate the proposed calculations, and the manual calculations are verified using Maple.

II. MAIN RESULTS

First, some formulas used in this paper are introduced below.

2.1 $\cosh x = \sum\limits_{n=0}^{\infty} \frac{1}{(2n)!} x^{2n}$, where x is any real

number.

2.2 $\sinh x = \sum\limits_{n=0}^{\infty} \frac{1}{(2n+1)!} x^{2n+1}$, where x is any

real number.

2.3 Leibniz rule: Let m be a positive integer. If $f(x), g(x)$ are functions such that their p-th derivatives $f^{(p)}(x), g^{(p)}(x)$ exist for all $p = 1,...,m$. Then the m-th derivative of product function $f(x)g(x)$,

$$(fg)^{(m)}(x) = \sum_{k=0}^{m} \frac{(m)_k}{k!} f^{(m-k)}(x) g^{(k)}(x),$$

where $(m)_k = m(m-1)(m-2)\cdots(m-k+1)$ for $k = 1,\cdots,m$, and $(m)_0 = 1$.

Next, we introduce two important theorems used in this study which can be found in ([36, p283]) and ([36, p269]) respectively.

2.4 Differentiation with respect to a parameter: Suppose that c, d, λ, β are real numbers and the function $f(a,x)$ is defined on $[c,d] \times [\lambda, \beta]$. If $f(a,x)$ and its partial derivative $\frac{\partial f}{\partial a}(a,x)$ are continuous functions on $[c,d] \times [\lambda, \beta]$. Then $F(a) = \int_{\lambda}^{\beta} f(a,x)dx$ is differentiable on the open interval (c,d). Moreover, $\frac{d}{da}F(a) = \int_{\lambda}^{\beta} \frac{\partial f}{\partial a}(a,x)dx$ for all $a \in (c,d)$.

2.5 Integration term by term: Assume that $\{g_n\}_{n=0}^{\infty}$ is a sequence of Lebesgue integrable functions defined on I. If $\sum\limits_{n=0}^{\infty} \int_I |g_n|$ is convergent, then $\int_I \sum\limits_{n=0}^{\infty} g_n = \sum\limits_{n=0}^{\infty} \int_I g_n$.

In the following, we determine the analytic forms of the indefinite integrals (1) and (2).

Theorem A *Suppose that a, b, x are real numbers, $a > -1$, $b > 0$, $x > 0$, m is a positive integer, and C is a constant, then*

$$\int (\ln x)^m x^a \cosh x^b dx$$

$$= m! \sum_{n=0}^{\infty} \sum_{k=0}^{m} \frac{(-1)^{m-k}}{k!(2n)!(2bn+a+1)^{m-k+1}} (\ln x)^k x^{2bn+a+1} + C,$$

(3)

and

$$\int (\ln x)^m x^a \sinh x^b dx$$

$$= m! \sum_{n=0}^{\infty} \sum_{k=0}^{m} \frac{(-1)^{m-k}}{k!(2n+1)!(2bn+a+b+1)^{m-k+1}} (\ln x)^k x^{2bn+a+b+1} + C.$$

(4)

Proof Since $\int x^a \cosh x^b dx$

$$= \int \sum_{n=0}^{\infty} \frac{1}{(2n)!} x^{2bn+a} dx$$

(by Formula 2.1)

$$= \sum_{n=0}^{\infty} \frac{1}{(2n)!} \int x^{2bn+a} dx$$

(by integration term by term)

$$= \sum_{n=0}^{\infty} \frac{1}{(2n)!(2bn+a+1)} x^{2bn+a+1} + C.$$

(5)

Using differentiation with respect to a parameter, differentiating m times with respect to a on both sides of Eq. (5), then

$$\int (\ln x)^m x^a \cosh x^b dx$$

$$= \sum_{n=0}^{\infty} \frac{1}{(2n)!} \sum_{k=0}^{m} \frac{(m)_k}{k!} \left(\frac{1}{2bn+a+1}\right)^{(m-k)} (x^{2bn+a+1})^{(k)} + C$$

(by Leibniz rule)

$$= \sum_{n=0}^{\infty} \sum_{k=0}^{m} \frac{(m)_k}{k!} \frac{(-1)^{m-k}(m-k)!}{(2n)!(2bn+a+1)^{m-k+1}} (\ln x)^k x^{2bn+a+1} + C$$

$$= m! \sum_{n=0}^{\infty} \sum_{k=0}^{m} \frac{(-1)^{m-k}}{k!(2n)!(2bn+a+1)^{m-k+1}} (\ln x)^k x^{2bn+a+1} + C.$$

Similarly, by Formula 2.2, integration term by term, and differentiation with respect to a parameter, Eq.(4) is easily obtained. q.e.d.

III. EXAMPLES

Next, for the integral problems discussed in this study, two examples are proposed and we use Theorem A to determine their analytic solutions. Additionally, we employ Maple to calculate the approximations of some definite integrals to verify our answers.

Example 1 Using Eq. (3) yields

$$\int (\ln x)^3 x^2 \cosh x^4 dx$$
$$= 6 \sum_{n=0}^{\infty} \sum_{k=0}^{3} \frac{(-1)^{3-k}}{k!(2n)!(8n+3)^{4-k}} (\ln x)^k x^{8n+3} + C.$$

(6)

Therefore, the definite integral

$$\int_2^3 (\ln x)^3 x^2 \cosh x^4 dx$$
$$= 6 \sum_{n=0}^{\infty} \sum_{k=0}^{3} \frac{(-1)^{3-k}}{k!(2n)!(8n+3)^{4-k}} \left[(\ln 3)^k 3^{8n+3} - (\ln 2)^k 2^{8n+3} \right]$$

(7)

Next, we use Maple to verify the correctness of Eq. (7).

> evalf(int((ln(x))^3*x^2*cosh(x^4),x=2..3),18);

$$8.2760244498\ 0242495 \cdot 10^{33}$$

> evalf(6*sum(sum((-1)^(3-k)/(k!*(2*n)!*(8*n+3)^(4-k))*((ln(3))^k*3^(8*n+3)-(ln(2))^k*2^(8*n+3)),k=0..3), n=0..infinity),18);

$$8.2760244498\ 0242492 \cdot 10^{33}$$

Example 2 By Eq. (4), we have

$$\int (\ln x)^7 x^3 \sinh x^2 dx$$
$$= 7! \sum_{n=0}^{\infty} \sum_{k=0}^{7} \frac{(-1)^{7-k}}{k!(2n+1)!(4n+6)^{8-k}} (\ln x)^k x^{4n+6} + C.$$

(8)

Hence, the definite integral

$$\int_3^4 (\ln x)^7 x^3 \sinh x^2 dx$$
$$= 7! \sum_{n=0}^{\infty} \sum_{k=0}^{7} \frac{(-1)^{7-k}}{k!(2n+1)!(4n+6)^{8-k}} \left[(\ln 4)^k 4^{4n+6} - (\ln 3)^k 3^{4n+6} \right].$$

(9)

Using Maple to verify the correctness of Eq. (9) as follows:

> evalf(int((ln(x))^7*x^3*sinh(x^2),x=3..4),18);

$$2.8293478110\ 3768031 \cdot 10^8$$

> evalf(7!*sum(sum((-1)^(7-k)/(k!*(2*n+1)!*(4*n+6)^(8-k))*((ln(4))^k*4^(4*n+6)-(ln(3))^k*3^(4*n+6)),k=0..7),n=0..infinity),18);

$$2.8293478110\ 3768031 \cdot 10^8$$

IV. CONCLUSION

In this paper, some techniques: differentiation with respect to a parameter and integration term by term are used to evaluate two complicated integrals. In fact, the applications of the two methods are extensive, and can be used to easily solve many difficult problems; we endeavor to conduct further studies on related applications. In addition, Maple also plays a vital assistive role in problem-solving. In the future, we will extend the research topics to other calculus and engineering mathematics problems and solve these problems using Maple. These results will be used as teaching materials for Maple on education and research to enhance the connotations of calculus and engineering mathematics.

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Integral Problems of Trigonometric Functions

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ABSTRACT

The article considers six types of integrals related with the powers of trigonometric functions. We can obtain the infinite series expressions of these integrals by using Taylor series expansions and integration term by term theorem. Moreover, we propose some integrals to do calculation and evaluate some definite integrals practically. On the other hand, Maple is used to calculate the approximations of these definite integrals and their infinite series expressions for verifying our answers.

Keywords: Integrals, Trigonometric Functions, Infinite Series Expressions, Taylor Series Expansions, Integration Term by Term Theorem, Maple

I. INTRODUCTION

As information technology advances, whether computers can become comparable with human brains to perform abstract tasks, such as abstract art similar to the paintings of Picasso and musical compositions similar to those of Beethoven, is a natural question. Currently, this appears unattainable. In addition, whether computers can solve abstract and difficult mathematical problems and develop abstract mathematical theories such as those of mathematicians also appears unfeasible. Nevertheless, in seeking for alternatives, we can study what assistance mathematical software can provide. This study introduces how to conduct mathematical research using the mathematical software Maple. The main reasons of using Maple in this study are its simple instructions and ease of use, which enable beginners to learn the operating techniques in a short period. By employing the powerful computing capabilities of Maple, difficult problems can be easily solved. Even when Maple cannot determine the solution, problem-solving hints can be identified and inferred from the approximate values calculated and solutions to similar problems, as determined by Maple. For this reason, Maple can provide insights into scientific research.

In calculus and engineering mathematics, there are many methods to solve the indefinite integrals including change of variables method, integration by parts method, partial fractions method, trigonometric substitution method, etc. This paper considers the following six types of integrals related with the powers of trigonometric functions, which are not easy to obtain their answers using the methods mentioned above.

$$\int \theta \cos\theta \sin^r \theta d\theta, \qquad (1)$$

$$\int \theta \sin\theta \cos^r \theta d\theta, \qquad (2)$$

$$\int \theta \sec^2\theta \tan^r \theta d\theta, \qquad (3)$$

$$\int \theta \csc^2\theta \cot^r \theta d\theta, \qquad (4)$$

$$\int \theta \tan\theta \sec^{r+1}\theta d\theta, \qquad (5)$$

$$\int \theta \cot\theta \csc^{r+1}\theta d\theta, \qquad (6)$$

where r, θ are real numbers. The infinite series expressions of these integrals can be obtained mainly using Taylor series expansions and integration term by term theorem; these are the major results of this article (i.e., Theorems 1-3). Adams et al. [1], Nyblom [2], and Oster [3] provided some techniques to solve the integral problems. Moreover, Yu [4-31], Yu and Chen [32], and Yu and Sheu [33-35] used complex power series method, integration term by term theorem, Parseval's theorem, area mean value theorem, and generalized Cauchy integral formula to evaluate some types of integral problems. In this paper, some examples are used

to demonstrate the proposed calculations, and the manual calculations are verified using Maple.

II. PRELIMINARIES AND RESULTS

Formulas and Theorems:

The followings are the Taylor series expansions of six inverse trigonometric functions:

2.1.1 Inverse sine function

$$\sin^{-1} x = \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)n!n!} x^{2n+1}, \text{ where}$$

$|x| \le 1$.

2.1.2 Inverse cosine function

$$\cos^{-1} x = \frac{\pi}{2} - \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)n!n!} x^{2n+1}, \text{ where}$$

$|x| \le 1$.

2.1.3 Inverse tangent function

$$\tan^{-1} x = \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1} x^{2n+1}, \text{ where } |x| \le 1.$$

2.1.4 Inverse cotangent function

$$\cot^{-1} x = \frac{\pi}{2} - \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1} x^{2n+1}, \text{ where } |x| \le 1.$$

2.1.5 Inverse secant function

$$\sec^{-1} x = \frac{\pi}{2} - \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)n!n!} x^{-2n-1},$$

where $|x| \ge 1$.

2.1.6 Inverse cosecant function

$$\csc^{-1} x = \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)n!n!} x^{-2n-1}, \text{ where}$$

$|x| \ge 1$.

2.1.7 Integration term by term theorem ([36, p269]):

Suppose that $\{g_n\}_{n=0}^{\infty}$ is a sequence of Lebesgue integrable functions defined on I. If $\sum_{n=0}^{\infty} \int_I |g_n|$ is convergent, then $\int_I \sum_{n=0}^{\infty} g_n = \sum_{n=0}^{\infty} \int_I g_n$.

In the following, we determine the infinite series expressions of the integrals (1) and (2).

Theorem 1 *Suppose that* r, θ *are real numbers, and* r *is not a negative even integer, then*

$$\int \theta \cos\theta \sin^r \theta d\theta$$

$$= \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+r+2)n!n!} \sin^{2n+r+2} \theta + C,$$

(7)

where $-\pi/2 \le \theta \le \pi/2$ *and* $\sin^r \theta$ *exists.*

$$\int \theta \sin\theta \cos^r \theta d\theta = \frac{-\pi}{2(r+1)} \cos^{r+1} \theta$$

$$+ \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+r+2)n!n!} \cos^{2n+r+2} \theta + C,$$

(8)

where $r \ne -1$, $0 \le \theta \le \pi$ *and* $\cos^r \theta$ *exists.*

Proof $\int \theta \cos\theta \sin^r \theta d\theta$

$$= \int x^r \sin^{-1} x dx \text{ (where } x = \sin\theta)$$

$$= \int \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)n!n!} x^{2n+r+1} dx$$

(by Formula 2.1.1)

$$= \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+r+2)n!n!} x^{2n+r+2} + C$$

(by integration term by term theorem)

$$= \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+r+2)n!n!} \sin^{2n+r+2} \theta + C.$$

On the other hand,

$$\int \theta \sin\theta \cos^r \theta d\theta$$

$$= -\int x^r \cos^{-1} x dx \text{ (where } x = \cos\theta)$$

$$= -\int \left(\frac{\pi}{2} x^r - \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)n!n!} x^{2n+r+1} \right) dx$$

(by Formula 2.1.2)

$$= \frac{-\pi}{2(r+1)} x^{r+1} + \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+r+2)n!n!} x^{2n+r+2} + C$$

(by integration term by term theorem)

$$= \frac{-\pi}{2(r+1)} \cos^{r+1} \theta + \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+r+2)n!n!} \cos^{2n+r+2} \theta + C.$$

q.e.d.

Using the same proof as Theorem 1, we can easily obtain the infinite series expressions of the integrals (3), (4), (5) and (6) respectively.

Theorem 2 *If the assumptions are the same as Theorem 1, then*

$$\int \theta \sec^2 \theta \tan^r \theta d\theta$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)(2n+r+2)} \tan^{2n+r+2} \theta + C,$$

(9)

where $-\pi/4 \le \theta \le \pi/4$ *and* $\tan^r \theta$ *exists.*

$$\int \theta \csc^2 \theta \cot^r \theta d\theta$$

$$= \frac{-\pi}{2(r+1)} \cot^{r+1} \theta + \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)(2n+r+2)} \cot^{2n+r+2} \theta + C,$$

(10)

where $r \neq -1$, $\pi/4 \le \theta \le 3\pi/4$ *and* $\cot^r \theta$ *exists.*

Theorem 3 *If* r, θ *are real numbers, and* r *is not a non-negative even integer, then*

$$\int \theta \tan \theta \sec^{r+1} \theta d\theta = \frac{\pi}{2(r+1)} \sec^{r+1} \theta$$

$$- \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(-2n+r)n!n!} \sec^{-2n+r} \theta + C,$$

(11)

where $r \neq -1$, $0 \le \theta \le \pi$, $\theta \neq \pi/2$ *and* $\sec^r \theta$ *exists.*

$$\int \theta \cot \theta \csc^{r+1} \theta d\theta$$

$$= - \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(-2n+r)n!n!} \csc^{-2n+r} \theta + C,$$

(12)

where $-\pi/2 \le \theta \le \pi/2$, $\theta \neq 0$ *and* $\csc^r \theta$ *exists.*

III. EXAMPLES

In the following, for the six types of integrals in this paper, we will propose some examples and use Theorems 1-3 to obtain their infinite series expressions. On the other hand, we use Maple to calculate the approximations of some definite integrals and their solutions for verifying our answers.

Example 1 By Eq. (7), we have

$$\int_{-\pi/3}^{\pi/4} \theta \cos \theta \sin^8 \theta d\theta$$

$$= \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+10)n!n!}$$

$$\times \left[\left(\sin \frac{\pi}{4} \right)^{2n+10} - \left(\sin \frac{-\pi}{3} \right)^{2n+10} \right].$$

(13)

Next, we use Maple to verify the correctness of Eq. (13).

\> evalf(int(theta*cos(theta)*(sin(theta))^8,theta=-Pi/3..Pi/4),18);

$$-0.0240652927573701435$$

\>evalf(sum((2*n)!/(4^n*(2*n+1)*(2*n+10)*n!*n!)*((sin(Pi/4))^(2*n+10)-(sin(-Pi/3))^(2*n+10)),n=0..infinity), 18);

$$-0.0240652927573701436$$

On the other hand, using Eq. (8) yields

$$\int_{\pi/6}^{2\pi/3} \theta \sin \theta \cos^{10} \theta d\theta$$

$$= \frac{-\pi}{22} \left[\left(\cos \frac{2\pi}{3} \right)^{11} - \left(\cos \frac{\pi}{6} \right)^{11} \right]$$

$$+ \sum_{n=0}^{\infty} \frac{(2n)!}{4^n (2n+1)(2n+12)n!n!} \left[\left(\cos \frac{2\pi}{3} \right)^{2n+12} - \left(\cos \frac{\pi}{6} \right)^{2n+12} \right].$$

(14)

We also use Maple to verify the correctness of Eq. (14).
\>evalf(int(theta*sin(theta)*(cos(theta))^10,theta=Pi/6..2*Pi/3),18);

$$0.0121788362110693046$$

\>evalf(-Pi/22*((cos(2*Pi/3))^11-(cos(Pi/6))^11)+sum((2*n)!/(4^n*(2*n+1)*(2*n+12)*n!*n!)*((cos(2*Pi/3))^(2*n+12)-(cos(Pi/6))^(2*n+12)),n=0..infinity),18);

$$0.0121788362110693045$$

Example 2 It follows from Eq. (9) that

$$\int_{-\pi/6}^{\pi/8} \theta \sec^2 \theta \tan^6 \theta d\theta$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)(2n+8)}$$

$$\times \left[\left(\tan \frac{\pi}{8} \right)^{2n+8} - \left(\tan \frac{-\pi}{6} \right)^{2n+8} \right].$$

(15)

Using Maple to verify the correctness of Eq. (15) as follows:

>evalf(int(theta*(sec(theta))^2*(tan(theta))^6,theta=-Pi/6..Pi/8),22);

$$-0.13213375360178073 18229$$

>evalf(sum((-1)^n/((2*n+1)*(2*n+8))*((tan(Pi/8))^(2*n+8)-(tan(-Pi/6))^(2*n+8)),n=0..infinity),22);

$$-0.0013213375360178073 18214$$

In addition, by Eq. (10) we obtain

$$\int_{\pi/3}^{5\pi/9} \theta \csc^2 \theta \cot^4 \theta d\theta$$

$$= \frac{-\pi}{10}\left[\left(\cot\frac{5\pi}{9}\right)^5 - \left(\cot\frac{\pi}{3}\right)^5\right]$$

$$+ \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)(2n+6)}\left[\left(\cot\frac{5\pi}{9}\right)^{2n+6} - \left(\cot\frac{\pi}{3}\right)^{2n+6}\right].$$

(16)

>evalf(int(theta*(csc(theta))^2*(cot(theta))^4,theta=Pi/3..5*Pi/9),18);

$$0.0144844991268631037 9294$$

>evalf(-Pi/10*((cot(5*Pi/9))^5-(cot(Pi/3))^5)+sum((-1)^n/((2*n+1)*(2*n+6))*((cot(5*Pi/9))^(2*n+6)-(cot(Pi/3))^(2*n+6)),n=0..infinity),18);

$$0.0144844991268631037 9290$$

Example 3 Using Eq. (11) yields

$$\int_{\pi/9}^{\pi/4}\theta \tan\theta \sec^6\theta d\theta$$

$$= \frac{\pi}{12}\left[\left(\sec\frac{\pi}{4}\right)^6 - \left(\sec\frac{\pi}{9}\right)^6\right]$$

$$- \sum_{n=0}^{\infty} \frac{(2n)!}{4^n(2n+1)(-2n+5)n!n!}\left[\left(\sec\frac{\pi}{4}\right)^{-2n+5} - \left(\sec\frac{\pi}{9}\right)^{-2n+5}\right].$$

(17)

We employ Maple to verify the correctness of Eq. (17).

>evalf(int(theta*(tan(theta))*(sec(theta))^6,theta=Pi/9..Pi/4),22);

$$0.7178214890303578935 149$$

>evalf(Pi/12*((sec(Pi/4))^6-(sec(Pi/9))^6)-sum((2*n)!/(4^n*(2*n+1)*(-2*n+5)*n!*n!)*((sec(Pi/4))^(-2*n+5)-(sec(Pi/9))^(-2*n+5)),n=0..infinity),22);

$$0.7178214890303578935 174$$

On the other hand, by Eq. (12) we have

$$\int_{\pi/8}^{3\pi/8} \theta \cot\theta \csc^{12}\theta d\theta$$

$$= -\sum_{n=0}^{\infty} \frac{(2n)!}{4^n(2n+1)(-2n+11)n!n!}$$

$$\times \left[\left(\csc\frac{3\pi}{8}\right)^{-2n+11} - \left(\csc\frac{\pi}{8}\right)^{-2n+11}\right].$$

(18)

Using Maple to verify Eq. (18) as follows:

>evalf(int(theta*cot(theta)*(csc(theta))^12,theta=Pi/8..3*Pi/8),18);

$$3641.86251813817729$$

>evalf(-sum((2*n)!/(4^n*(2*n+1)*(-2*n+11)*n!*n!)*((csc(3*Pi/8))^(-2*n+11)-(csc(Pi/8))^(-2*n+11)),n=0..infinity),18);

$$3641.86251813817794$$

IV. CONCLUSION

In this study, we use Taylor series expansions and integration term by term theorem to solve some types of integrals. In fact, the applications of the two methods are extensive, and can be used to easily solve many difficult problems; we endeavor to conduct further studies on related applications. On the other hand, Maple also plays a vital assistive role in problem-solving. In the future, we will extend the research topics to other calculus and engineering mathematics problems and use Maple to verify our answers.

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Effects of Macro and Micro Minerals on Reproduction in Dairy Cattle
A Review

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ABSTRACT

Minerals are very important nutrients for dairy animal production. Deficiency of minerals may leads to certain structural, physiological or immunological disorder affecting growth, production and reproductive health of animals. Minerals deficiency is an area specific problem and supplementation strategy must be revised accordingly. In dairy cows, minerals requirements are influenced by several factors including age, stage of pregnancy and stage of lactation. Requirements of minerals for reproduction and immunity are generally higher than maintenance requirement of animals. Supplementation of minerals requires correct knowledge of bioavailability, sources, requirement of animal and mineral interactions with other nutrients. Current review highlighted the recent updates on mineral requirements of dairy animals for reproduction with special reference to their requirements, metabolic functions and mineral interactions.

Keywords: Dairy Cattle, Macro and Micro Minerals, Production, Reproduction

I. INTRODUCTION

Minerals are structural components of body and play significant role in activities of enzyme, hormone, as constituents of body fluids and tissues, and as regulators of cell replication and differentiation. Mineral deficiencies, imbalances and toxicity of certain mineral elements may cause reproductive disorders as minerals play an important role in health and reproduction of the livestock (M. C Sharma *et al*, 2007). After energy and protein, minerals are the major nutrients required and should be given priority in order to optimize reproduction in dairy cattle (Y. R. Bindari, *et al*, 2013). Beside energy and protein, deficiency of these elements such as calcium, phosphorus, iron, zinc and copper etc in blood have been reported to be a predisposing factor for the occurrence of retention of placenta and repeat breeding in dairy cows (A. S. Kumar, 2014). As per their requirement, minerals are divided in to two categories i.e. macro minerals required in large quantities (more than 100 ppm) in diet and these are *calcium, phosphorus, magnesium, potassium, sodium and chloride.* The second category is trace or micro minerals

such as *cobalt, copper, iodine, manganese, selenium, zinc, molybdenum, chromium, iron, sulfur, silicon and vanadium*; and is required very small amount (less than 100 ppm) diet of animals. Minerals such as arsenic, beryllium, lead and tungsten are toxic to the animals. Animals obtain minerals through the consumption of natural feeds, fodders and supplementation of inorganic salts in the ration. Mineral deficiencies and imbalances have long been held responsible for low production among cattle and buffaloes. This paper reviewed current finding with regarding requirement of minerals for reproduction and immunity for better productivity of dairy animals.

II. MACRO MINERALS

1. Calcium (Ca)

Calcium plays a very importance role in structural and physiological functions. Lactating cows must be provided with adequate amounts of Ca to maximize production and minimize health problems. Other function of Ca is to allow the muscle contraction. A

reduction in muscle contractility affects rumen function; lower nutrient intake thus leads to negative energy balance. This results in increase in fat mobilization leading to fatty liver syndrome and ketosis. Muscle tone in the uterus will also be adversely affected with cows experiencing prolonged calving and retained placenta. Uterine involution may also be impaired giving rise to fertility problems. The major concern in feeding of dry cows is to provide adequate Ca and P to avoid occurrence of milk fever.

Hypocalcaemia in periparturient animals is major cause of decline in smooth muscle contraction, suppression of dry matter intake, increase in body fat mobilization in the form of non-esterified fatty acids, reduction of neutrophil function and thus leads to an increased incidence of periparturient disease (N. Martinez *et al*, 2012). Recent study has demonstrated dietary Ca concentration is not only risk factor for milk fever, the dietary cations, especially K, induce metabolic alkalosis in the prepartum dairy cow and thus reduces the ability of the cow to maintain Ca homeostasis. Hypocalcemia is also responsible for impaired immune function. It has been suggested that 48 h of parathyroid hormone stimulus is required to mobilize Ca from skeleton (J. P. Goff, 1999) and this lag phase play important role in the development of milk fever (P. J. DeGaris and I. J. Lean, 2008). NRC has recommended that Ca content should be 0.65% of the total ration on DM basis for high producing cows.

The Ca: P ratio, alteration may affect ovarian function through its blocking action on pituitary gland. This results in prolongation of first estrus and ovulation, delayed uterine involution, increased incidence of dystocia, retention of placenta and prolapse of uterus (Sathis Kumar, 2003). Moreover low calcium level in blood is also associated with anoestrus whereas excess of calcium can affect the reproductive status of animal by impairing absorption of phosphorus, manganese, zinc, copper and other elements from gastro intestinal tract. Milking cows should always be provided adequate amounts of calcium to maximize production and minimize health problems. A major concern in the mineral feeding of dry cows relates to providing optimum levels of calcium and phosphorus in order to decrease the occurrence of milk fever. Prevention of

milk fever is an important consideration in maximizing reproductive efficiency (J. P. Goff, 1999).

2. Phosphorus (P)

It is the second most abundant mineral element in the body with 80 to 85% of P found in the teeth and bones. Phosphorus is involved in a number of metabolic reaction and energy transfer within the body. A deficiency of P leads to decline in fertility rate, feed intake, milk production, ovarian activity, irregular estrous cycles, increased occurrence of cystic ovaries, delayed sexual maturity and low conception rates (N. Martinez *et al*, 2012). Hypophosphatemia have been a contributing factor for typical periparturient diseases of dairy animals such as the downer cow syndrome and postparturient hemoglobinuria (S. Kachhwaha and R. K. Tanwar, 2010). Increasing phosphorus supplementation from 0.4% to 0.6% of the ration had no effect on days to first estrus or services per conception. NRC (2001) has revised the recommendation for dairy cattle from 0.3 to 0.4%. Increasing the concentration of dietary phosphorus above requirement (more than 0.38-0.40%) does not improve reproductive performance. A recent study reported that lowering dietary P from 0.57 to 0.37% did not negatively affect milk production, but did significantly reduce P excretion into environment (C. Wang *et al*, 2014).

This mineral has been most commonly associated with decreased reproductive performance in dairy cows. Inactive ovaries, delayed sexual maturity and low conception rates have been reported when phosphorus intakes are low. In a field study when heifers received only 70-80% of their phosphorus requirements and serum phosphorus levels were low, fertility was impaired (3.7 services per conception). Services per conception were reduced to 1.3 after adequate phosphorus was supplemented. Phosphorus is stated to be one of important element for normal sexual behavior (Sathish Kumar, 2003). Delayed onset of puberty and silent or irregular estrus in heifers, failure of estrus and long inter calving period in cows and still born or weakly expelled calves or even embryonic death due to lack of uterine muscle tone are reported to be some of important clinical manifestation exhibited by the animals from phosphorus deficient areas. On the contrary the excess of phosphorus renders the endometrium

susceptible for infection (S. Chaudhary and A. Singh, 2004). Reduced fertility and reduced or delayed conceptions are the prime signs of phosphorus deficiency and this can be overcome with proper phosphorus supplementation. Whereas moderate deficiency may lead to repeat breeding condition and poor conception rate (Sathish Kumar, 2003).

3. Potassium (K)

Potassium is the third most abundant mineral element in the animal body after Ca and P. Potassium concentrations in cells exceed the concentration of Na by 20 to 30 times. Outside the cell the reverse is true. K is about 5% of the total mineral content of the body. Deficiency of potassium is well known to cause muscular weakness and thereby affect the musculature of female genital tract causing impairment in the normal reproductive process (S. Chaudhary and A. Singh, 2004). The dairy cow's minimum requirement for K is 0.90% to 1.0% of the ration on DM basis (NRC 2001). The maximum tolerable level is about 3.0%. Feeding of high levels of potassium (5% DM basis) may delay the onset of puberty, delay ovulation, impair corpus luteum (yellow body) development and increase the incidence of anestrus in heifers. Lower fertility was noticed in cows fed high levels of potassium or diets in which potassium-sodium ratio was too wide. In dry period during the last 2 to 3 weeks prepartum can predispose the fresh cow to milk fever, displaced abomasum, uterine problems, and other metabolic disorders (P. J. DeGaris and I. J. Lean, 2008). K requirement increases in diets with higher Na and Cl levels. K is essential for rumen microorganisms. The suboptimal level of K in the ration decreases feed intake in ruminants. The K requirement in tropical summer is increased as high as 1.9% for high producing cows (S. Chaudhary and A. Singh, 2004).

4. Magnesium (Mg)

Magnesium usually does not have direct impact on the reproductive status of animals, since in body it remains in almost antagonistic relation with calcium and any disturbance in Ca-P-Mg homeostasis can impart some influence on reproduction. Moreover reduced reproductive efficiency encountered loss of appetite due to magnesium deficiency (Sathish Kumar, 2003).

5. Salt (NaCl)

Salt contains sodium (Na) and chloride (Cl) and is often supplemented in concentrate or as free lick. These elements are indirectly related to reproduction in animals as the deficiency of sodium can affect the normal reproductive physiology by preventing the utilization of protein and energy. Na functions are maintaining osmotic balance, cellular uptake of glucose and amino acid transport (NRC, 2001). Lactating dairy animals in the tropics may require more Na due to the hot and humid climatic conditions. The daily salt requirements for dairy cattle are met easily by adding 1 percent salt to concentrate mixture and offering additional salt lick. Lactating cows need 2 g salt/kg milk production. Dry cows need 40 g salt daily or 0.3% Na per kg DM. Salt deficiencies can affect the efficiency of digestion and indirectly the reproduction performance of cows. Na and Cl content of feedstuffs often are not enough to meet animal requirements and should be provided free choice at all times (C. C. Elrod and E. R. Butler, 1993). W. Thiangtum *et al*. (2011) recommended 1.2 g of Na/kg of DM for dairy cows under tropical conditions.

III. Trace or Micro Minerals

1. Copper (Cu)

Copper is one of the important trace mineral for reproduction point of view as such its deficiency is reported to be responsible for early embryonic death and resorption of the embryo (J. K. Miller et al, 1988), increased chances of retained placenta and necrosis of placenta (L. O'Dell, 1990) and low fertility associated with delayed or depressed estrus (J. K. Miller et al, 1988). In addition to this, proper copper supplementation is must for quality semen production (R. Puls, 1994). Copper treatment is reported to improve conception rate as the copper treated cow require 1 service and the untreated cow require 1.15 services per conception (A. P. Hunter, 1977). Cu also plays an important role in the immune system. Cu and Zn have a significant correlation with reproductive hormones (progesterone and estradiol) (C. S. Prasad *et al*, 1989). A Cu deficiency in cattle is generally due to the presence of dietary antagonists, such as S, Mo and Fe that reduce Cu bioavailability. Deficiencies of Cu have also been associated with retained placenta, embryonic death and

decreased conception rates and anestrus (V. Mudgal *et al*, 2014). Dairy cows with higher serum Cu levels had significantly less days to first service, fewer services per conception and fewer days to open. Proper copper supplementation of the sire is needed for production of quality semen. Feeding a total of 10 to 15 ppm copper in the ration dry matter or supplementing with 10 ppm copper should meet dairy cattle needs. The following mineral ratios may be helpful in maintaining Cu levels in blood: Zn: Cu 4:1, Cu: Mo 6:1 and Fe: Cu 40:1 (M. F. Hutjens, 2000).

2. Cobalt (Co)

Cobalt deficiency is associated with an increased incidence of silent heat, nonfunctional ovaries, delayed onset of puberty, decreased conception rate, abortion and delayed uterine involution (Sathish Kumar, 2003). Inadequate cobalt levels in the diet have been correlated with increased early calf mortality. Mn, Zn, I and monensin may reduce cobalt deficiency. The recommendation for cobalt requirement in dairy cows varies between 0.10 mg/kg DM (NRC, 2001). Cobalt supplementation of up to 50 mg daily in Holstein cow have been reported to improve feed digestion in heat stress depression in feed digestibility, fat yield and milk yield (K. Karkoodi, 2010). Infertility is likely to arise as secondary consequences of debility conditions such as severe cobalt deprivations through reduced general metabolism.

3. Iodine (I)

Iodine is an essential trace element for dairy animals. Iodine is incorporated into the thyroid hormones, which have multiple functions as cell activity regulators. Iodine deficiency affects reproductive capacity, brain development and progeny as well as growth. I requirement is important in the development of fetus and maintenance of general basal metabolic rate by synthesis of thyroid hormone. Iodine deficiency leads to delay in puberty, suppressed or irregular estrus (R. Puls, 1994), failure of fertilization, early embryonic death, still birth with weak calves, abortion, increased frequency of retained placenta in females and decrease in libido and deterioration of semen quality in males (Sathish Kumar, 2003). Inadequate thyroid function reduces conception rate and ovarian activity. Thus, I deficiency impairs

reproduction and iodine supplementation has been recommended when necessary to insure that cows consume 15-20 mg of iodine each day. Recently, Excessive I intakes have been associated with various health problems including abortion and decreased resistance to infection and disease. Signs of subclinical iodine deficiency in breeding females include suppressed estrus, abortions, still births, increased frequency of retained placentas and extended gestation periods (B. W. Hess *et al*, 2008). A number of studies have reported beneficial effect of lugol's iodine in treatment of silent estrus, repeat breeding and conception rate (P. Pandey *et al*, 2011).

4. Manganese (Mn)

Manganese is an activator of enzyme systems in the metabolism of carbohydrate, fats, protein and nucleic acids. Mn appears to have a vital role in reproduction. It is necessary for cholesterol synthesis (L. C. Kappel and S. Zidenberg, 1999), which in turn is required for synthesis of the steroids, estrogen, progesterone and testosterone. Insufficient steroid production results in decreased circulating concentrations of these reproductive hormones resulting in abnormal sperm in males and irregular estrus cycles in females. The corpus luteum has high Mn content and thus may be influenced by Mn deficient diet. Deficiency cause poor fertility problem in male and female. It is responsible for silent estrus, anoestrus or irregular estrus (L. Corrah, 1996), reduced conception rate (H. H. Patterson *et al*, 2003), birth of deformed claves and abortions in females and absences of libido and improper or failure of spermatogenesis in males (Sathish Kumar, 2003). Post-partum anestrus in dairy cows has proven to be reduced following manganese supplementation (L. Corrah, 1996). The maintenance requirement for absorbed Mn was set at 0.002 mg/kg of body weight (1.2 mg/day for an average Holstein cow), the growth requirement was set at 0.7 mg/kg of growth, pregnancy requirement was set at 0.3 mg/d, and the lactation requirement was set at 0.03 mg/kg of milk (NRC, 2001). Gestating cattle may need up to 50 mg of Mn/Kg of DM because it helps in skeletal cartilage and bone formation of fetus (J. Schefers, 2011).

5. Selenium (Se)

Selenium is an important trace element and its deficiency is associated with poor growth, fertility, health in dairy animals and (W. P. Weiss *et al*., 1990). Both deficiency and excess Se causes weak, silent or irregular estrus, retained fetal membranes, early embryonic death, still birth or weak offspring and abortions in females (S. S. Randhawa and C. S. Randhawa, 1994) and detrimental to normal spermatogenesis and reduced sperm mortality in males (M. C. Wiltbank *et al*, 2007). A low levels of Se in diet leads to effect on antioxidant system with subsequent detrimental consequences in terms of animal health (J. W. Spears, 2000). A marginal Se deficiency in pregnant animals will lead to abortion, or calves will be weak and unable to stand or suckle. Selenium toxicity will produce abortions, stillbirth, weak and lethargic calves (H. H. Patterson *et al*., 2003). Low Se has also been associated with poor uterine involution, and weak or silent heats. Se deficiency in dry cows has been reported to cause retained placenta.

Se supplementation reduces the incidence of retained placentas, cystic ovaries, mastitis, metritis and Improvement in conception rate, at first service in females (T. J. McClure et al, 1986). In males, Se supplementation has been shown to increase semen quality (R. Puls, 1994). The dietary requirement of Se for most of the species is about 0.1 ppm. Revised requirement of selenium for better immune response in dairy animals is 0.3 ppm (W. P. Weiss, 1990). Vitamin E and Se supplements in diets have a protective effect against acute infections mammary gland (N. Ata and M. S. Zaki, 2014). Retained placenta decreased in an Ohio study when selenium deficient herds received supplemental selenium (50 mg) and Vitamin E (680 IU) injections at 20 days prior to calving or were fed with 1 mg of selenium per day concluded that retained placenta was reduced by selenium supplementation. In herds where selenium levels are extremely low, injections are often required to rapidly return blood selenium levels to normal. After injection, feed Zinc supplements may provide enough selenium to maintain adequate blood levels in the cow (Sathish Kumar, 2003)

6. Zinc (Zn)

Zinc is an essential component involved in metabolism of carbohydrate, protein and nucleic acid metabolism, epithelial tissue integrity, cell repair and division, vitamin A and E transport and their utilization. In addition, Zn plays a major role in the immune system and certain reproductive hormones. Zn has also been shown to increase plasma β-carotene level which is correlated to improvement in conception rates and embryonic development (R. E. Short and D. C. Adams, 1988).

Zinc is known to be essential for proper sexual maturity (development of secondary sexual characteristics), reproductive capacity (development of gonadal cells) in males and all reproductive events (estrus, pregnancy and lactation), more specific with onset of estrus in female. Among these decreased fertility and abnormal reproductive events are of prime importance in females (Sathish Kumar, 2003). A deficiency of Zn in males reduces testicular development and sperm production, poor semen quality and libido (G. B. Martin *et al*, 1994). Apart from this zinc has a critical role in repair and maintenance of uterine lining following parturition and early return to normal reproductive function and estrus (L. W. Greene et al, 1998).

A severe Zn deficiency in cattle results in slow growth, reduced feed intake, loss of hair, skin lesions that are most severe on the legs, neck, head, around the nostrils, scaly lesions and impaired reproduction (J. W. Spears, 2000). The recommended dietary content of Zn for dairy cattle is typically between 18 and 73 ppm depending upon the stage of life cycle and dry matter intake. Cu, Cd, Ca and Fe reduce Zn absorption and interfere with its metabolism (H. H. Patterson *et al*, 2003). Requirement of Zn in diet of dairy cows is 40 ppm (NRC, 2001).

7. Molybdenum (Mo)

The reproductive performances affected due to molybdenum deficiency are decreased libido, reduced spermatogenesis and sterility in males and delayed puberty, reduced conception rate and anoestrus in females (Sathish Kumar, 2003).

8. Chromium (Cr)

Effect of insulin is potentiated by chromium by increasing the uptake of glucose and amino acids by the cells in the body (B. J. Stoecker, 1990) thereby improves the energy balance which in early lactation leads to

improved reproduction. Moreover chromium also exerts a significance influence on follicular maturation and luteinizing hormone release (S. Chaudhary and A. Singh, 2004). A low serum insulin, high glucagon and growth hormone (J. H. Herbein *et al*, 1985), and high plasma NEFA concentrations (R. R. Grummer, 1993) in early lactation dairy cows indicates high catabolic activities and negative energy balance. This leads to increased gluconeogenesis and glycogenolysis in the liver and increased mobilization of protein reserves from muscle tissue (R. J. Collier *et al*, 1984). This metabolic pattern starts near parturition (M. Vazquez-Anon *et al*, 1994).

Several studies reported insulin resistance begins before parturition and continues during early lactation. Thus, during the periparturient period, insulin resistance may be an important factor in the initiation of catabolic activities (P. Holstenius, 1993). At this stage, Cr supplementation (0.5 ppm) may enhance the action of insulin and, consequently decrease NEFA and liver triglyceride concentrations in blood and improve glucose tolerance, which may result in improvement of performance and production during the periparturient period.

IV. CONCLUSION

Efficient production in domestic animals requires that the essential nutrients in a diet be provided in appropriate amounts and in forms that are most biologically useful. The minerals that affect reproduction in cattle are generally found within the trace element group, although deficiencies of calcium and phosphorus can also affect fertility. Fertility in dairy animals is affected by a number of factors such as nutrient intake, physiological conditions, management and climatic conditions. Mineral requirements of animal depend upon age, species, breed, physiological conditions of animals. Supplementation of minerals to meet normal growth, production and reproduction requirement is of utmost importance. Mineral requirement for reproduction and immunity have recently been explored in number of studies.

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"Dental Metal Allergy" - A Review

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ABSTRACT

Dental metal allergies are very rare to occur, and many times are left undiagnosed and left in the hands of dermatologists. This article reviews about the signs and symptoms of dental metal allergies which help to diagnose the condition, weather it may be local or systematic.

Keywords: Allergic Contact Dermatitis, Lichen Planus, Glossodynia

I. INTRODUCTION

Allergic contact dermatitis (ACD) is defined as an inflammatory process of the skin caused by contact with exogenous substances, generally having a low molecular weight [1]. It is the most common occupational and environmental skin disease. ACD manifests for about 10%[2] of all the dermatological disorders, and about 50% of all occupational dermatosis depending on geographical areas, industries, sex, age and patient distribution etc.[3]

The allergic diseases caused by reaction of dental metal materials are termed as dental metal allergy. While as dental material allergy is described to the allergic symptoms due to other dental material like organic compounds. Cytotoxicity and /orallergization are the various factors which are to be taken in consideration while performing safety evaluations involving biomaterials [4],[5]. The first clinical case of dental metal allergy was documented by Fleishmann [6] in 1928, which was due to the intra oral amalgam restorations. The symptoms wherestomatitis and dermatitis around the anus. Hubler and Hubler5 in 1983, Lundstorm[7] in 1984 Magnusson et al[8] in 1982 and wisenfeld et al [9] in 1984 where the various authors from different countries who reported variety of symptoms which occurred with use of different metals. Nickel, palladium, mercury, chromium and cobalt are the most common metals used in dentistry and were seen associated with allergic reactions not only intra orally but also in skin of hand, feet or sometimes entire body was seen to be involved. [10],[11],[12]

II. EPIDEMIOLOGY

The prevalence rates of Ni, Cr and Co Allergic Contact Dermatitis in Europe are 20% for Ni, 4% for Crand 7% for Co[13] , while as in US the prevalence for Ni is 14%, for Cr is 4% and for Co it is 9%[14],[15]. Due to ear piercing and jewellery females are more affected by Ni and Co than that of males, while as males are more affected to Cr allergy due to occupational exposure [16]. Of all the metals the most allergens are present in Ni, Cr, Co and mercury. Gold, Platinum group elements are called as emerging allergens. While as Aluminium and Titanium are said to be rare allergens.[17]

Pathogenic Mechanism

Fisher [18] in 1973 classified the metal allergy as type IV allergic reaction, which is equal to that of ordinal contact dermatitis. Few cases have been reported where the removal of intraoral dental material resulted in the relieve from the symptoms of asthma or atopic dermatitis.It means that metal allergies may contain the pathogenic mechanism of type I allergic reaction [19], [20]. A chemically stable metallic material does not cause allergic reaction. It is always an ionized metal where from an electron is removed from its external

shell and becomes allergen. This ionized metal binds with the protein and fromshepaten. This hepaten when recognized by T-cells results in the allergic reaction [21],[22]. The metallic restoration is always surrounded by the electrolytic solution i.e. saliva where phregularly fluctuates according to the type of diet taken. Hence it is difficult to prevent the changes of dental metal material which causes allergic.

Pathology

Symptoms :- The symptoms of the metal allergies show a varied appearance.The symptoms can present on a limited area of body like on oral mucosa, palm hands, neck or back or it can see over the entire skin surface.Symptoms are not specific with any specific metal and no correlation has been seen with a class of metal and clinical symptoms. The following symptoms are seen with the allergies due to dental metals.

1. Pustulosis Palmaris Etplantaris and Dyshidrotic eczema

It presents in the form of erythematic, blisters with pustules, crust and scales on the palm andplanter. Itching, heat and painful sensations can be seen along with sterile pustules, Osteoarthritis can also be found in some occasions. Lymphocytic infiltration in epidermis and also the spongy degeneration is seen on histological examination in the early stages of disease. Once the blisters are formed and when these blisters reach h orney cell layer, pustules start developing and also neutrophils appear.

2. Lichen planus

Dyskeratosis of skin, oral and external genitalia mucosa can occur as chronic inflammatory disease. On oral mucosa it presents are lace or stitch pattern keratinizations and is also accompanied by ulceration and erosions. When it appears on skin it is in form of red are purple red papules. These papules are present at the internal area of joint extremities and trunk. Few of the papules are painless while some may have pain, burning sensation or itching. Lichen planus is most commonly seen on buccal mucosa. But with time this keratirization pattern can spreed to entire oral muscosa. When it is due to the dental metal allergy it is usually seen attached to the metal restoration that contains allergy positive metal. Parakeratosis and liquefaction degeneration of basal cells is seen on histological examination. T-Lymphocyte infiltration is also seen under the epithelial cells.Etiopathology of lichen planus is not still clear but the suspected predisposing factors are metal allergy. Mechanicalstimulation and hepatitis C virus (HCV).30% of these patients have been reported to have HCV antibody. Liver function test and HCV antibody tests should be performed is all the inveterate cases of lichen planus.

3. Stomatitis, Glossitis, Cheilitis

The chemical and histological findings of these symptoms are same as that of ordinal oral inflammation. These symptoms can be seen in approximation with any dental prosthesis containing any allergy positive metal elements. It may present as red halo glossitis or cheilitis. It can also be seen in the areas away from the prosthesis. Such cases also show the recurrence of the inflammatory conditions.

4. Glossodynia

Pain, Twitching and burning sensation of tongue are the main symptoms which a patient comes across in glossodynia. Sometimes there may not be any organic change. It may represent in the form of tongue flare or atrophic filiform papilla as is observed in geographic tongue. Galvanic shock, Psychological factors, mechanical stimulation, dental metal allergy from any prosthesis or nutritional deficiency may be the possible predisposing factor.

5. Generalized eczema and pseudo atopic dermatitis

It represents as intractable itching dermatitis usually seen all over the skin. First case of pseudoatopic dermatitis was reported by Shannon [23] in 1965. It was a chronic allergy due to shoe leather and cement and the clinical appearance was general eczematoid dermatitis. This type of dermatitis is clinically same as that of atopic dermatitis, but without atopic diathesis. And also the radioimmunosorbent test shows low value of immunoglobulin (IgE). Once the allergen is absorbed in the body it spreads through blood circulation resulting in

generalized eczema and urticaria. Some times it is associated with heat, itching and painful sensation.

6. *Atopic dermatitis*

Chronic eczema with itching sensation is the typical symptom of atopic dermatitis these patients show increased serum Ig E. Positive reaction to the metal reagent is observed in patch test in intractable cases. Remission of symptoms taken place after removing the metal restoration containing allergy positive metal. In atopic dermatitis the skin barrier function is compromised and is not able to prevent sensitization and infection, hence metal allergy in such case can be complicated.

III. CONCLUSION

All the dental treatments that involve the use of material or a metal are associated with risk of developing allergies. All the preventive measures should be taken before starting the treatment, history of the patient should be properly taken and if any such condition is encountered proper investigations should be done and the treatment should be planed accordingly.

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Polyester/ Vinylester Blended Hybrid Nanocomposites Reinforced with Carbon Fibre on Characterization

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ABSTRACT

This paper presents a polymer blended hybrid nanocomposites prepared by mixing of polyester and vinylester filled with nanoclay and carbon fibre. Hybrid nanocomposites was filled with different clay weight ratios such as 0, 2, 2.5, 3, 3.5, 4, 5, 6wt.% using rule of hybrid mixtures. Two different systems using hand layup technique such as blend plus clay as the first system and blend plus carbon fibre plus nanoclay is the second system. Flexural and compression properties and morphology properties were studied on effect of miscibility and clay loading. Clay dispersion was uniform and also fibre blend interactions were also significantly improved for the later system. Clay wt.% was varied with respect to the modified blend. It was observed that flexural strength was increased linearly from 0wt.% to 4 wt.% and then decreases for the former system whereas for the later system linearly increases from the 0wt.% to 5wt.% and then decreases. Flexural modulus was optimised at 5wt.% for system one and system two and the reason were attributed that addition of clay increases the modulus but excess clay produces high viscosity that makes difficult to flow the modified mixture. Compression strength and modulus were increased from 0wt.% to 5wt.% for duo systems and then decreases and the reasons were attributed that due to poor flowability of the modified mixture as a result of the increased viscosity may causes the decrease in performance. Fractured surfaces were analysed through the morphology studies to see that fiber/blend, polymer/polymer, blend/clay interactions and agglomerations, pull outs, voids as these are things which reduces the stress concentration limits.
Keywords: Nanocomposites; Polyester/polyester blend; SEM; Flexural Properties; Compression Properties.

I. INTRODUCTION

Especially for nanoparticles, favourable thermodynamics of mixing are essential since these ultrasmall particles are held together with very high apparent attractive forces when immersed in liquid or polymeric media, and purely mechanical methods of mixing are not expected to be effective. Moreover, given the extensive amount of surface area that imposes entropic penalties for adsorbed, physisorbed, or intercalated macromolecules, the dispersion of nanofillers necessitates sufficiently favourable enthalpy contributions to overcome the entropic penalties. In general, the degree of dispersion of the clay platelets into the polymer matrix determines the structure of nanocomposites. Depending on the interaction between the clay and the polymer matrix, two main idealized types of polymer–clay morphologies can be obtained: namely, intercalated and exfoliated. The intercalated structure results from penetration of a single polymer chain into the galleries between the silicate layers, resulting in formation of alternate layers of polymer and inorganic layers. An exfoliated structure results when the individual silicate layers are completely separated and dispersed randomly in a polymer matrix. Usually exfoliated nanocomposites are preferred because they provide the best property improvements. MMT, hectorite, and saponite are the most commonly used layered silicates. Layered silicates have two types of structure: tetrahedral-substituted and octahedral substituted. In the case of tetrahedrally substituted layered silicates the negative charge is located on the surface of silicate layers, and hence, the polymer matrices can react interact more readily with these than with octahedrally-substituted material. Carbon fiber or carbon fibre (alternatively CF, graphite fiber or

graphite fibre) is a material consisting of fibers about 5–10 micrometres in diameter and composed mostly of carbon atoms. To produce carbon fiber, the carbon atoms are bonded together in crystals that are more or less aligned parallel to the long axis of the fiber as the crystal alignment gives the fiber high strength-to-volume ratio (making it strong for its size). Several thousand carbon fibers are bundled together to form a tow, which may be used by itself or woven into a fabric. The properties of carbon fibers, such as high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion, make them very popular in aerospace, civil engineering, military, and motorsports, along with other competition sports. However, they are relatively expensive when compared to similar fibers, such as glass fibers or plastic fibers. Carbon fibers are usually combined with other materials to form a composite [16-24]. When combined with a plastic resin and wound or molded it forms carbon-fiber-reinforced polymer (often referred to as carbon fiber) which has a very high strength-to-weight ratio, and is extremely rigid although somewhat brittle. However, carbon fibers are also composited with other materials, such as with graphite to form carbon-carbon composites, which have a very high heat tolerance. Most polyester resins are viscous, pale coloured liquids consisting of a solution of polyester in a monomer which is usually styrene. The addition of styrene in amounts of up to 50% helps to make the resin easier to handle by reducing its viscosity. The styrene also performs the vital function of enabling the resin to cure from a liquid to a solid by 'cross-linking' the molecular chains of the polyester, without the evolution of any by-products. These resins can therefore be moulded without the use of pressure and are called 'contact' or 'low pressure' resins. Polyester resins have a limited storage life as they will set or 'gel' on their own over a long period of time. Often small quantities of inhibitor are added during the resin manufacture to slow this gelling action. Vinylester resins are similar in their molecular structure to polyesters, but differ primarily in the location of their reactive sites, these being positioned only at the ends of the molecular chains. As the whole length of the molecular chain is available to absorb shock loadings this makes vinylester resins tougher and more resilient than polyesters. The vinylester molecule also features fewer ester groups. These ester groups are susceptible to water degradation by hydrolysis which means that vinylester exhibit better resistance to water and many other chemicals than their polyester counterparts, and are frequently found in applications such as pipelines and chemical storage tanks [25-29]. According to the literature there are several articles were published regarding nanocomposites with different polymers with new fillers and all were discussed the reasons for optimization of performance of the composites. Recently mixing two different polymers (i.e. Blends) brought lot of attention on the researchers. Thus in the present research work focus is made on the blended nanocomposites in which polyester and vinylester were blended in addition to that clay was dispersed into the modified blended system. Thus couple of systems were made in which system (a) Blend+ NC and (b) Blend + Carbon fibre + NC. Mechanical and morphological properties were studied.

II. METHODS AND MATERIAL

Materials

Polyester (Ecmalon 9911,Ecmas Hyderabad, with 2% cobalt accelerator, catalyst 50% methyl ethyl ketone peroxide (MEKP) in 10% DMA solution, ratio of the resin/accelerator/catalyst:100/2/2. The resin has a density of 1335 kg/m^3, Young's modulus of 450 MPa, tensile strength of 15.3MPa and elongation at break of 3.3%. In addition, exfoliated montmorillonite clay (product No.:682659; brand: Aldrich, USA; product name: Nanoclay, hydrophilic bentonite; formula: H2Al2O6Si; Molecular weight: 180.1 g/mol; Appearance (Colour): Light tan to brown; appearance (form): powder; loss on drying: ≤18.0%; density: 600-1100 kg/m^3; size: ≤ 25 microns), surface modified with 25-30% trimethyl stearyl ammonium, was used as filler material. The vinylester resin used was HPR 8711 grade, a Bakelite Hylam product. Methy ethyl ketone peroxide (MEKP), Co-napthenate and N, N dimethylamiline were used as the catalyst, accelerator and promoter respectively. Montmorillonite clay (1.28E) surface modified with 25-30% trimethyl stearyl ammonium (supplied by Nanocar Inc., Aldrich, nanomer, USA was used as a nanofiller. Carbon fiber is defined as a fiber containing at least 92 wt % Carbon, while the fiber containing at least 99 wt % carbon is usually called a graphite fiber[11]. Carbon fibers generally have excellent tensile properties, low densities, high thermal

and chemical stabilities in the absence of oxidizing agents, good thermal and electrical conductivities, and excellent creep resistance. Carbon fiber was obtained from the Sree composites, Miyapur, Kukatpalli, Hyd and it has the following properties.(Specific gravity:1.5-1.6 g/cm^3, flexural strength:850-1400 N/mm^2, Flexural modulus:70,000- 130,000 N/mm^2,Tensile strength:900-2500 N/mm^2, Tensile modulus:88,000-245,000 N/mm^2 , Compressive strength:120-420 N/mm^2, Impact strength: 90-240KJ/m^2, Water absorption:0.01-0.2 %)

Methods

Flexural strength was measured using Instron Universal Testing Machine-3369 and the specimen size was 100x20x.3mm^3 ensured in addition that cubical specimens 10x10x10mm^3 sizes was prepared for the compression specimens and these are maintained on par with ASTM standards[12]. A Jeol JSM-6400 Japan scanning electron microscope (SEM) at15kv accelerating voltage equipped with energy dispersive spectroscopy (EDS) was used to study the dispersion of clay particles in the blended nanocomposites. The fractured surfaces were coated with a thin film of gold to increase the electrical conductance [24].

Polymer Blended Hybrid Composite Preparation

A mould was prepared with ASTM standards, and it was coated with a mould releasing agent to facilitate the easy removal of the casting after curing. Nanoclay was kept in the oven for 1hr at 50º C to remove the moisture out of it. Predetermined amounts of clay was weighed and kept aside and followed by 80wt. and 20wt. of polyester and vinylester respectively were mixed together with spatula for about 30min under the presence of room temperature. Clay was added into the modified mixture (i.e. blend) with the help of mechanical stirrer for about 45 min, then followed by probe type ultra-sonication for about 45min to get uniform distribution of the clay particle. Artificial cooling system was employed to control rise in temperature during the sonication process [23]. Then the accelerator/catalyst/promoter (100:2/2/2) parts by weight was added to the modified polyester/vinylester mixture. The mixture was poured into the mould. The carbon fibers were wetted by a thin layer of blend (i.e. polyester/vinylester filled with clay) suspension in a mould. A stack of carbon fibers were

carefully arranged in a unidirectional manner after pouring some amount of resin against the mould to keep poor impregnation at bay. The remaining blend was poured over the carbon fiber. Brush and roller were used to impregnate the fiber. The closed mould was kept under pressure for 24 h at room temperature. To ensure complete curing, the composite samples were post-cured at 70˚C for 1 h and test specimens of required size were cut out from the sheet.

III.   RESULT AND DISCUSSION

Flexural strength (FS) for system-1 are calculated as a function of clay loadings shown in the **Fig.1** and their performance was assess based on their magnitudes. FS for 2wt.% clay dispersion was 21.44 MPa, and also FS was linearly increasing right from the 2wt.% clay to 4 wt..% clay loading. At 5wt.% clay loading FS was observed as 28.52 MPa and FS was increased up to 57.14% for 4wt.% when compared with 2wt.% clay loading. However after 4wt.% FS was decreasing. Flexural strength (FS) for system-2 are calculated as a function of clay loadings.. FS for 2wt.% clay dispersion was 41.25 MPa, and also FS was linearly increasing right from the 2wt.% clay to 5 wt.% clay loading [21].
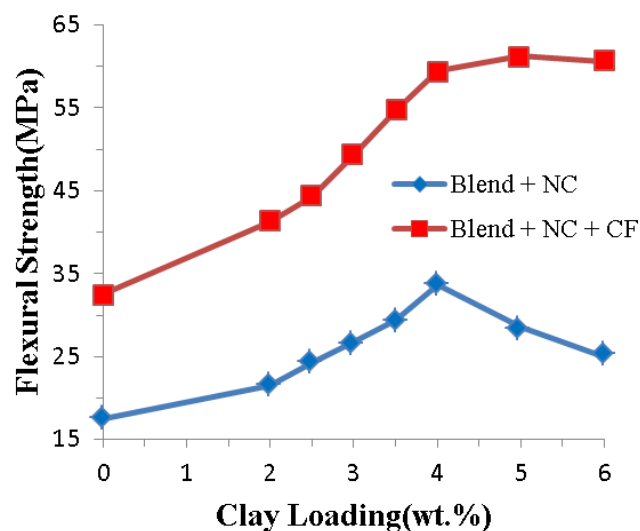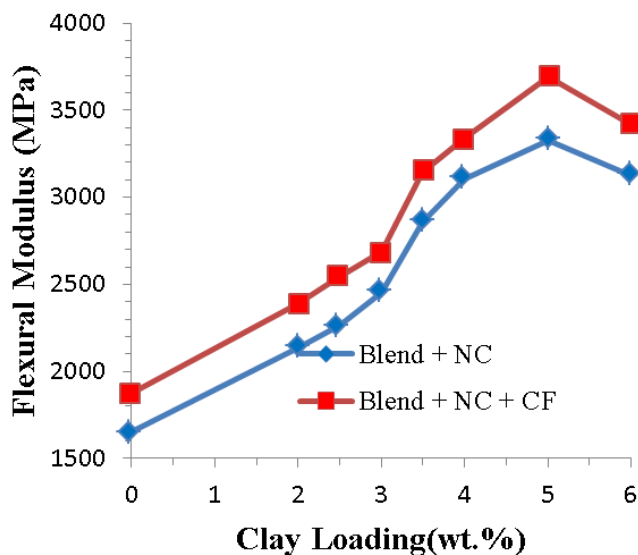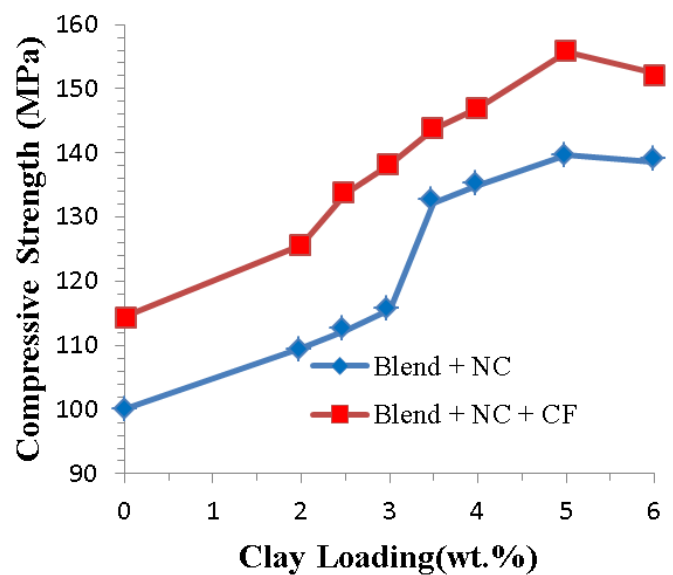

Figure 1: Evaluation of Flexural Strength of Blended Nanocomposites Reinforced with CF as a Function of clay percentage weight.

At 5wt.% clay loading FS was observed as 61.23MPa and FS was increased up to 48.44% for 5wt.% when compared with 2wt.% clay loading. However after 5wt.%

FS was decreasing. Under the present processing conditions, it was observed that an increased viscosity is due to the addition of a high content of nanoclay and made resin degassing difficult. This allows the entrapment of small air voids within the blend and also causes a poor dispersion of the fillers further high deformability, resulting in the formation of agglomerates in the matrix. Another possibility is that because the clay has a much greater modulus than the blended polymer, stress concentration may have existed at the interfaces of the clay and blend. Therefore, under flexural loading, cracks can initiate at those weak points and cause the specimen to fail at relatively low strains. It appears that the variation of modulus with the degree of exfoliation of clay is small and the modulus is controlled primarily by the volume fraction of clay rather than by its exfoliation. Another possibility is, this might due to the fact that the viscosity of the room temperature cured resin would not be low enough to allow diffusion of the monomer into the planar structure of the nanoclay particles. Thus agglomeration may be caused during the curing process of composites. Same observations were noticed by literature. Flexural Modulus (FM) for system-1 were calculated as a function of clay loadings shown in the **Fig.2**.

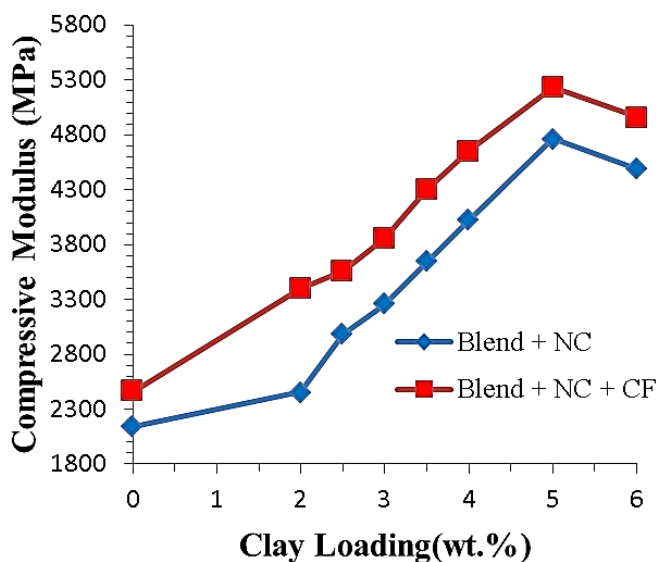**Figure 2:** Evaluation of Flexural Modulus of Blended Nanocomposites Reinforced with CF as a Function of clay percentage weight.

FM for 2wt.% clay dispersion was 2136.45 MPa, and also FM was linearly increasing right from the 2wt.% clay to 5 wt.% clay loadings. At 5wt.% clay loading FM was observed as 3325.88 MPa and FM was increased up to 55.67% for 5wt.% when compared with 2wt.% clay loading. However after 5wt.% FM was decreasing for at 6wt.% clay. Silicate particles of clay was added into to the matrix its modulus increases(i.e. stiffness), it was optimised at 5wt.% clay loading, however it is decreasing when dispersing further is due to the change of nature when they from ductile to brittle nature might have ensured the decrease in strength. Flexural Modulus (FM) for system-II are calculated as a function of clay loadings shown thereof. FM for 2wt.% clay dispersion was 2385.63 MPa, and also FM was linearly increasing right from the 2wt.% clay to 5 wt.% clay loading. At 5wt.% clay loading FM was observed as 3688.42 MPa and FM was increased up to 54.61% for 5wt.% when compared with 2wt.% clay loading. However after 5wt.% FSM was decreasing. Compression strength (CS) for system-I are calculated as a function of clay loadings shown in the **Fig.3**. CS for 2wt.% clay dispersion was 109.53 MPa, and also CS was linearly increasing right from the 2wt.% clay to 5 wt.% clay loadings[28].

Figure 3: Evaluation of Compressive Strength of Blended Nanocomposites Reinforced with CF as a Function of clay percentage weight.

At 5wt.% clay loading CS was observed as 139.64 MPa and CS was increased up to 27.49% for 5wt.% when compared with 2wt.% clay loading. However after 5wt.% CS is decreasing for further addition of clay. Compression strength (CS) for system-2 are calculated as a function of clay loadings shown thereof. CS for 2wt.% clay dispersion was 125.63 MPa, and also CS was linearly increasing right from the 2wt.% clay to 5 wt.%

clay loadings. At 5wt.% clay loading CS was observed as 155.65 MPa and CS was increased up to 23.89% for 5wt.% when compared with 2wt.% clay loading. However after 5wt.% CS is decreasing for further addition of clay. Compression Modulus (CM) for system-1 is calculated as a function of clay loadings shown in the **Fig.4**. CM for 2wt.% clay dispersion was 2456.75MPa, and also CM was linearly increasing right from the 2wt.% clay to 5 wt..% clay loadings gradually. At 5wt.% clay loading CM was observed as 4764MPa and CM was increased up to 93.91% for 5wt.% when compared with 2wt.% clay loading. However after 5wt.% CM is decreasing for further addition of clay. This result indicates that nanocomposites have higher strength with lower filler content.

Figure 4: Evaluation of Compressive modulus of Blended Nanocomposites Reinforced with CF as a Function of clay percentage weight.

Such enhancement is contributed to the fact that interface between the fiber and matrix forms a transition layer between fillers and polymers, which can transfer stress efficiently, timely eliminate the stress concentration, consequently inproves the strength [23]. The phenomena can be caused by the reaction that occurs among blend, carbon fiber and nanoclay. Compression Modulus (CM) for system-2 is calculated as a function of clay loadings shown thereof. CM for 2wt.% clay dispersion was 3401.89MPa, and also CM was linearly increasing right from the 2wt.% clay to 5 wt.% clay loadings gradually. At 5wt.% clay loading CM was observed as 5236.44MPa and CM was

increased up to 53.93% for 5wt.% when compared with 2wt.% clay loading. However after 5wt.% CM is decreasing for further addition of clay. **Fig. 3/4** shows the effect of PBNC on the compression strength of nanoclay reinforced with carbon fibres composites[26]. It can be seen that the trend of the PBNC is similar to that of BNC cast, which also indicates that blended nanocomposites have higher strength with lower nanoparticles content. In these composites, there are two factors to be taken into account that affect their strength behaviour: the matrix and the interface. The matrix properties are influenced by nanoclay particles and the addition of nanoclay can enhance the strength of carbon blended matrix, as mentioned earlier, because the nanoparticles form a tortuous fracture path. On the other hand, the stronger the interface formed between the matrix and fibres, the proper stronger the strength of the blend/fibres nanocomposites [15].
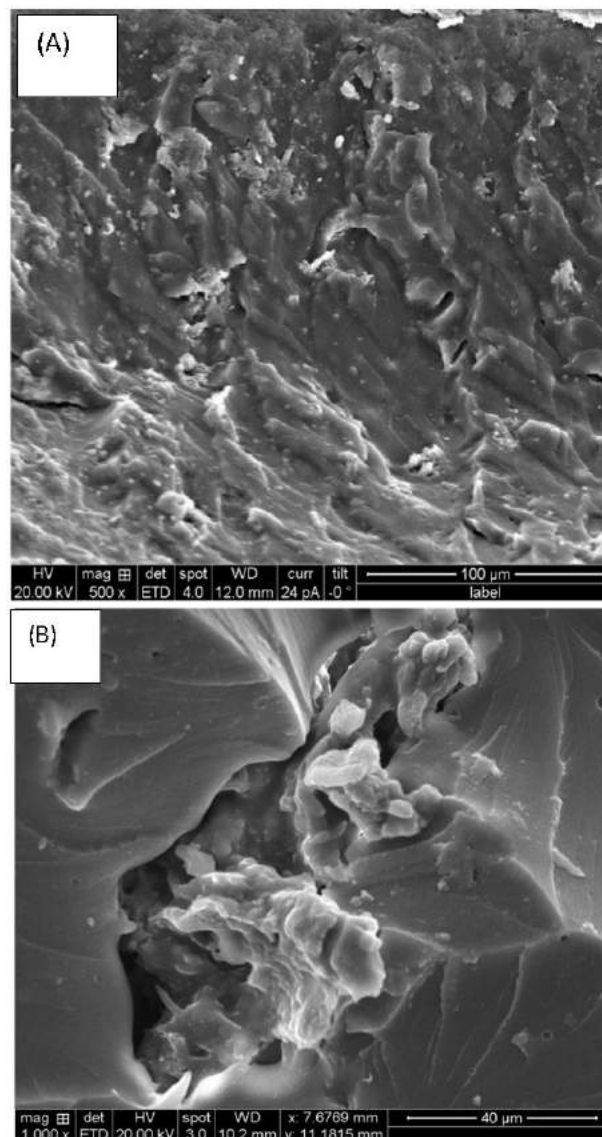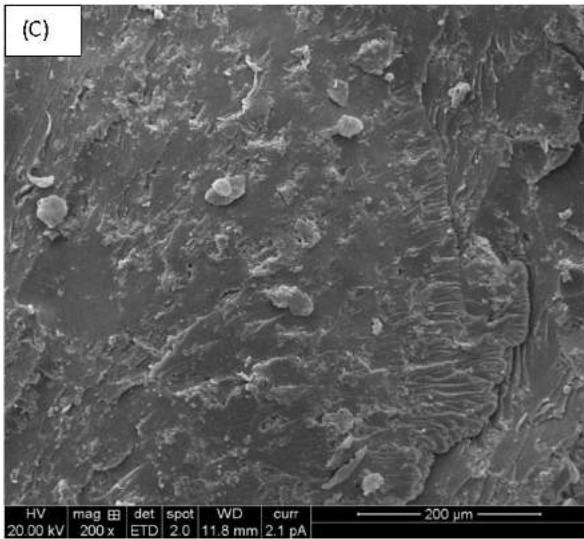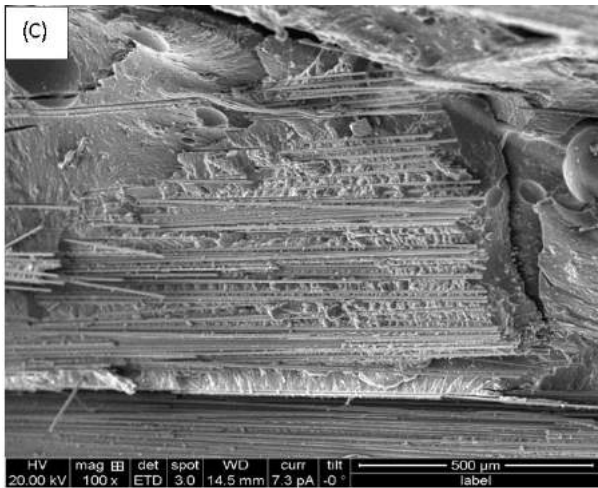
Figure 5: Scanning Electron Microscope Images of (Blend+ Clay)for (a)4wt.% (b) 5%wt.% and (c) 6wt.% blended Nanocomposites as a Function of Clay Loading.

Fig. 5(a) shows the SEM images of 4wt.% clay loading of system-1. The micrographs have been taken on the impact fracture surface. Thus, the impact behaviour of the PBHNC materials should be attributed to the semi-ductile failure. PBHNC composite containing 4wt% clay particles, the tough characteristics were demonstrated with a rough fracture surface due to the severely deformed blended polymer/polymer matrix. **Fig.5(b)** indicates the SEM images of the 5wt.% clay loadings of system-1 indicates the partially smooth surface and partially changed the appearance of exposed nanoclay particles were seen as they were completely embedded with the blend. This is another indication of increased bonding strength [23]. **Fig. 5(c)** indicates the SEM micrographs of 6wt.% clay loaded PBNC(system-1) as a function of clay. It was observed that few voids were identified in some places. It is mainly due to the air entrapment due to increased viscosity by addition of more clay it is very difficult to flow polymer/polymer blend. Rough, brittle failure with agglomerated particles was observed. The effect of carbon fibers of PBHNC on the compression strength as a function of nanoclay which also indicates that blended hybrid nanocomposites have higher strength with lower nanoparticles content when compared with conventional nanocomposites. Because by mixing two different polymers certainly there is scope of interest in performance besides it adds to actual magnitude of performance. In these composites, there are two factors to be taken into account that affect their strength behaviour: the matrix and the interface. The matrix properties are influenced by nanoclay particles and the addition of nanoclay can enhance the strength of epoxy blended matrix, as mentioned earlier, because the nanoparticles form a tortuous fracture path. On the other hand, the stronger the interface formed between the matrix and fibres, the proper stronger the strength of the blend/fibres nanocomposites [18]. **Fig.6(a)** shows the SEM images of 4 wt.% (Blend+ 4wt.% Clay + CF) blended nanocomposites as a function of clay, in which interface was strong between the fibre and the matrix.
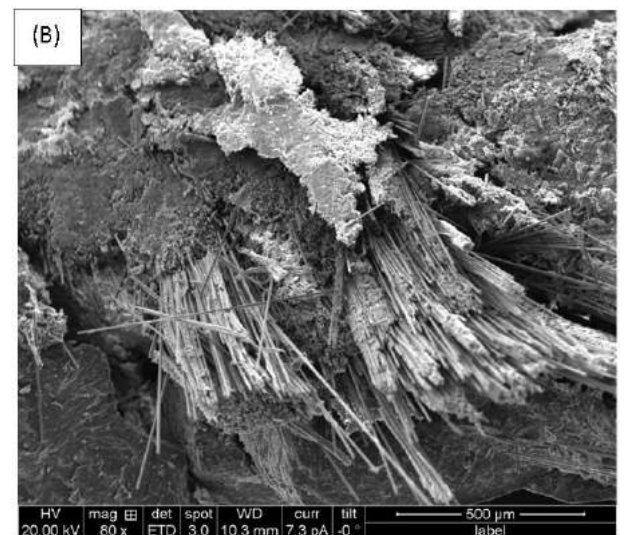
Figure 6: Scanning Electron Microscope Images of (Blend+ Clay + CF) Blended) for (a)4wt.% (b) 5%wt.% and (c) 6wt.% blended Nanocomposites as a Function of Clay Loading.

Bright feature clay of microstructures indicates a significant increase in cross-linking between clay and matrix. A large amount of resin matrix adheres to fibres surface, which indicates strong interfacial adhesion between fibres and matrix. This could be due to the higher affinity between fibres surface and polymers. The fracture model is changed from pure fibres broke to the combination failures of fibres broke, interface and delamination. From the above analysis, the mechanical properties of blend cast and its fibres reinforced blended nanocomposites are outstanding with 4 wt.% nanoclay content. **Fig.6 (b)** shows the SEM analysis of 5wt.% clay loading of polymer blended carbon reinforced nanocomposites as function of clay in which the strong adhesion between the fibre and matrix were observed. Due to increased viscosity of the modified matrix flowability has been come down as a result of that there may tendency of degrading of performance. **Fig.6 (c),** depicted high clay concentration resulting in agglomeration which led to high deformability and another reason was higher fractions of clay resulting micro voids which act as stress concentration factors and facilitate shear yielding in the system, and therefore, reduces tensile and flexural strength in fractured cross-sections through SEM images [25]. At 6wt.% clay with carbon fibres PBHNC was observed couple of pulled out from matrix and delamination occurs at the interface between fibres and matrix, which indicate the wet-out of fibres and the interfacial bonding is poor. In addition, a more brittle surface is observed in the pure blend/fibres nanocomposites, while the surface of the nanocomposites appears much rougher. Poor interlocking of fibre/matrix could be observed thereof.

IV. CONCLUSION

Development of polymer/polymer blended hybrid composites were evaluated successfully for the system-I (blend+ Clay) and system-II (blend+ CF + Clay). Flexural strengths and modulus were optimized at 4wt.% and 5wt.% clay, whereas for compression strengths and modulus were optimized at 5wt.% clay for two systems. Compression strengths and modulus were optimized at 5wt.% clay for two systems. SEM analysis were conducted for the duo systems and it was noticed that fiber matrix interactions were improved for system –I and system-II for 4 and 5wt.% clay and clay plus carbon fibre composites whereas voids and pull outs were noticed for the for 6wt.% loading nanocomposites for system-I and system-II. Overall performance was optimised for the system-I and system-II at 4wt.% and 5wt.% clay loadings.

V. ACKNOWLEDGEMENTS

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Intelligent Information Extractor through Artificial Data Analyzer Mechanism in Electrocardiogram Data

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ABSTRACT

Electrocardiography is a test that checks for problems with the heart. It gives details of the state of the heart and any disturbance in the heart sound can be diagnosed. It is very useful for the medical field. The XML ontology integrates ECG waveform data, data descriptions, and cardiac diagnosis rules. It is used for providing an ability to both represent ECG waveform as well as do automated diagnosis of 37 cardiac abnormalities. It does not tune-up the image of the ECG before image processing as the noise percentage misleads to the diagnosis report. The histogram process is performed to rectify the noise from the input image and the image is tuned up. The RGB image is converted to the grayscale using the image blending technique for the segmentation process. The tuned up image with enhancement in quality is performed in perfectly. In the proposed system, an image validation of histogram process is formulated and it is to change the noise obtained in the input ECG Image. The Validated ECG image has been measured with its amplitude and height to measure the abnormalities using XML ontology. It overcomes in terms of time and accuracy has been visualized graphically.

Keywords : ECG, Validate Image, Histogram process, Cardiac abnormality, XML Ontology

I. INTRODUCTION

Image process may be any form of signal method that the input is an image, sort of a photograph or video frame; the output of image process is to boot either an image or a bunch of characteristics or associated with the image. Most this techniques involve treating the image as a two-dimensional signal and applying current place signal-processing techniques for that. Image method usually refers to [9] digital image method, but optical and analog image method also are accomplishable the text is

regarding general techniques that apply to any of them. The acquisition of images is expressed as imaging. The projected system overcomes the matter of a wrong prediction of the syndrome by supportive the input image practice bar chart techniques that validates the part for added method. The result of the projected system liberates the syndrome diagnosis with a legitimate input image thereby characteristic the rhythm,

end point and axis positions of the curve. [12] Electrocardiogram is to show a human heartbeat created by diagnostic technique. Fig.1. The field of [12] cardiology was limited to the stethoscope and the autopsy suite. Cardiac anatomy includes a location of the heart, wall, chambers, valves, layout, and structure of coronary circulation. The heart is a one of the shapes. It is located in the chest, behind the sternum in the mediastinum cavity and it between the lungs, in front of the spine. It lies tilted in this area like an upside-down triangle. So, this electrical activity of the heart is to play a major role for a human being, utilized in the [4]-[13] medical field for diagnosing the acquired syndrome.

An ontology is generated on the basis of abnormalities diagnosis report of the ECG curve measured with the x and y-axis positions. [8] An XML schema is a type of XML document and it has a content of documents through the constraints imposed by XML itself. [8]-[13] An XML schema is designed from the generated ontological electrocardiographic data. The resultant of the existing

system is the diagnosis report of the input Electrocardiographic data [13]. The Resultant sorts out the possible abnormalities with the pulse rate estimated in the ECG graphical curve. [15] The starting stage of ECG is to discover unpredictable and after that the waves of mirroring system, depolarization and re-polarization of this ECG activity. [4] In the medical field, they have to set the standard duration, amplitude values of those peaks and derivatives.

II. OBJECTIVE

Electrocardiography is that the recording of the electrical activity of the guts, historically this can be within the kind of a transthoracic interpretation of the electrical activity of the guts over an amount of your time [10]. [1] The Existing methodology focuses on identification the thirty-seven viscous abnormalities by victimization [8] XML metaphysics and metaphysics schema to spot the illness non-inheritable.

Scope

In the planned method, the valid [12]-[15] electrocardiogram sample image has been measured with its waves to live the abnormalities victimization XML metaphysics.

1) Current System

- An ECG is to check the electrical activity of the heart.
- To find the chest pain and heart activity. It could be found by a heart attack.
- It is to find the cause of symptoms in heart disease. Symptoms include shortness of heartbeats that are rapid and irregular.
- Find out if the walls of the heart chambers are thick.
- To check the medicines are working and it causing side effects in their heart.
- To check the mechanical devices are implanted in the heart, such as pacemakers, etc. So it is to control the heartbeat.
- To check the health of heart when other diseases are present. It includes high blood pressure, high cholesterol, smoking habits, diabetes, and a family of early heart disease.

Disadvantages:

It has no validation of image, and it is used to concentrates on Pulse value in the [9] digital input image. And then it has false information because of that noise, so false positive disease is a prediction.
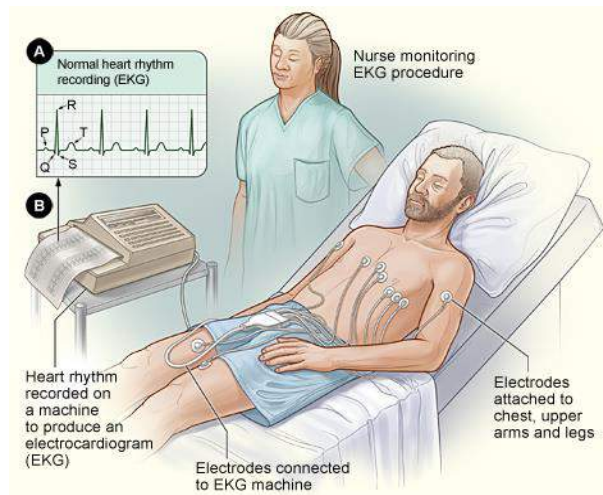
Figure 1. ECG Diagnosis Report

III. PROPOSED SYSTEM

The Projected system incorporates a way of automatic generation of diagnosis report with ECG image that will be a useful innovation to the medical field [4]-[13]. The manipulation of diagnosis reports with the ECG graphical and historical curve [14]. It acquires many variations in heartbeat such as slow, irregular, fast and normal [13]. A validation process is incorporated in the latest system to remove the noisy information from the input ECG image as it deceives the accuracy of the ECG report Fig.2. An associate ontological schema is to spot the abnormality predictions of curves and schema are exploited in an approach with the map of an ontological schema. [13] Existing system attains a problem of inappropriate diagnosis as the noised input ECG image. It acquires noisy information that leads to the prediction of a syndrome. This system overcomes those problems of prediction syndrome by validating the histogram image Fig.2. This technique is used to validate the pixels for further image segmentation [11]-[13]. The result of the projected method generates the syndrome diagnosis with a valid image [13]. It is used to identifying the rhythm, x and y-axis positions of the curve.

Advantage

The Proposed System is to validate the image using histogram check and it is used to display accurate disease prediction. And the process of segmentation is evolved to measure the curve variation.
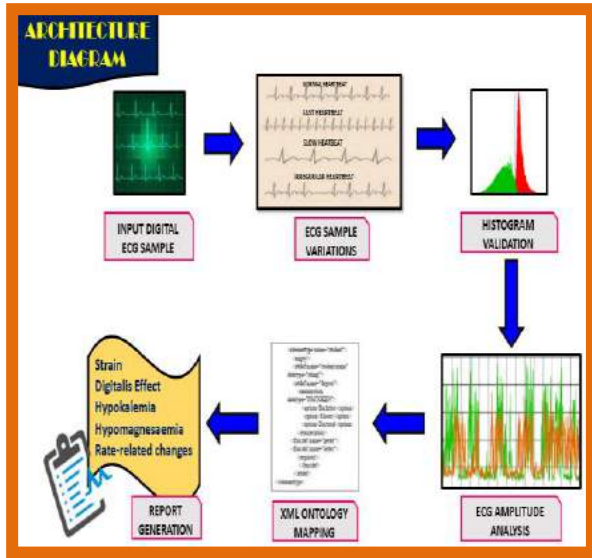

Figure 2. Architecture of ECG
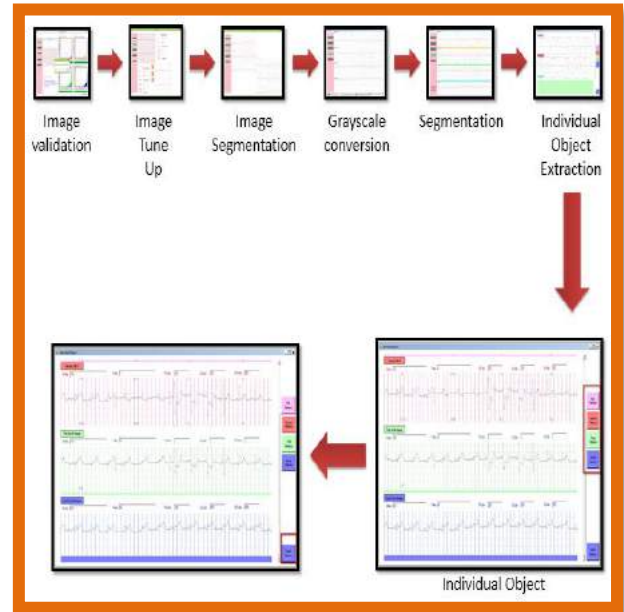
IV. IMPLEMENTATION

It is the stage of the project once the theoretical style is yield into the working system. [3] The Histogram check is to provide the ECG signal and a separate report generation [14]. The implementation has designed with some testing electrical activity.

Figure 3. Checking Process

It will also provide a series of ECG graph in a custom format. In the series of files is to attach with the patient's name, age & type of heart disease has been collected.

Figure 4. Digital Wave Form

This ECG data can be created and the users are querying specific abnormal cardiac conditions. Future work could focus on the design and advanced techniques for data entry, storing, searching, and presenting ECG information to the users. [3]-[13] Using Histogram check is to identify an accurate disease for the ECG diagnosis report. Finally, extract the image of a graphical waveform and it has data to identify the diseases.

Figure 5. Disease Identification

V. TYPES OF MODULES

It has six modules. They are:

1. Image acquisition

➤ It is used in digital ECG data information access the image acquisition and image processing called as a real-time image. [9] This is sometimes involves retrieving images from a supply that is mechanically capturing images.

➤ Performing image acquisition is usually the primary step within the workflow sequence as a result of while, not an image, no processing is possible.
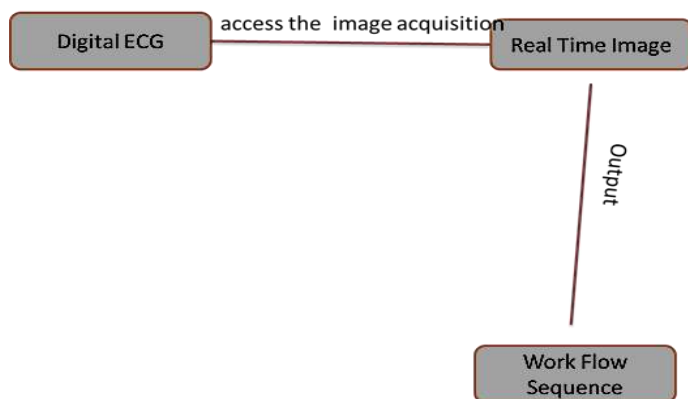
2. Histogram image validation

➤ We give input data for digital format objects. [3]-[9] The input data will be electrical activity format, validate the condition of a heart.

➤ Usually, time-domain graphical record signals area unit used.

➤ New computerized [10]-[14] ECG recorders utilize frequency data to find pathological condition.
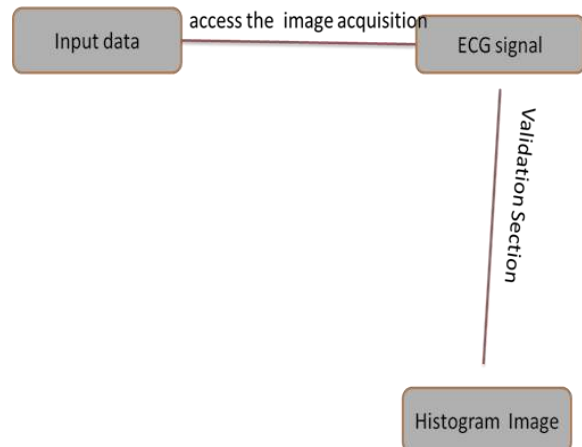
3. Image Segmentation

➤ The result of image segmentation is also a group of segments that jointly cover the entire image or a group of contours extracted from the image [11]. Each of the pixels during a region is similar with relevance some computed property.

➤ ECG Signal contains noise elements due to various sources that are suppressed throughout the process of an [12] electrocardiogram signal.

➤ Training signals were divided and labeled by a group of knowledgeable ECG graph analysts.

➤ We can discuss solely ways that don't use external references (ECG, CP or different channels).
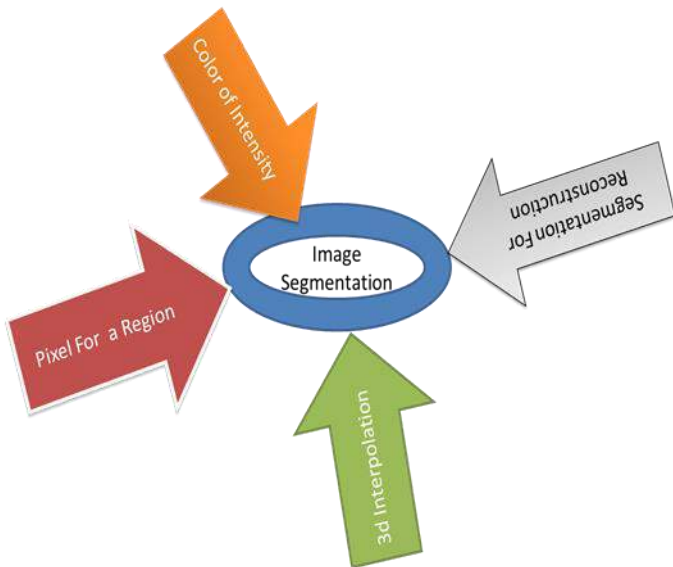
4. Ontology schema mapping

- The Ontology would like for ontology alignment arose out of the requirement to integrate heterogeneous information bases ones developed independently and so each having their own data vocabulary.
- It involves several actors providing their own ontology matching has taken an essential place for serving to heterogeneous resources to interoperate.[7] Ontology alignment tools find categories of information that are semantically equivalent as an example, Troops, Science and a few severally.
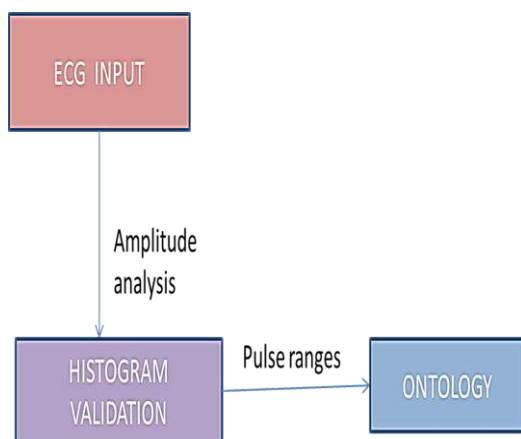
5. XML schema mapping:

- You can't put any restrictions on text content. [6]-[8]Then you've got a little control over mixed content (text and elements) and ordering of elements.
- XML Schema [6]-[8] documents are accustomed define and validate the content and structure of XML information.
- Schema elements are that the universal term for the building blocks that compose the abstract information model.
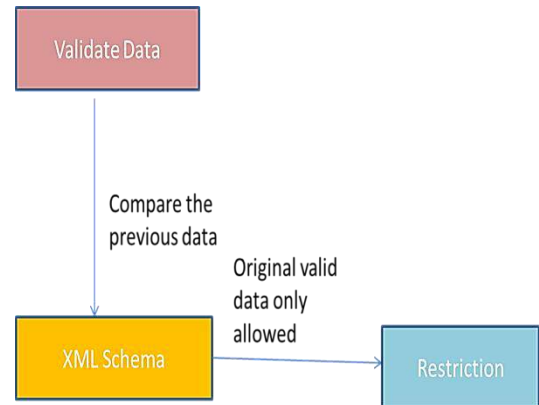
6. Cardiac abnormalities deletion

- ECG signal sequence of cardiac cycles or 'beats'. The Signal contains noise parts because of varied sources that are suppressed during processing of ECG signal.
- It is used in [2] Wavelet transform - provides good time decision at high frequencies and poor time decision at low frequencies.
- Resolution of the signal is modified by filtering operations. The Subsampling reducing rate or removing a number of the signal.
- DWT (Discrete Wavelet Transform) [2] will have same no. of coefficients as an original signal.
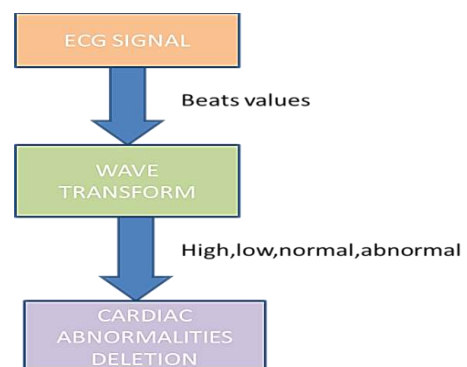
7. ECG diagnosis reports generation

➤ We implemented the Modern standard ECG – uses more electrode connection point's stored procedures.
➤ It permits users to alert the business logic while not truly tinkering with the appliance.
➤ The Final reports are comprehensive for the subsequent reasons in Better Performance, Average Performance, Worst Performance, and Responsibility.
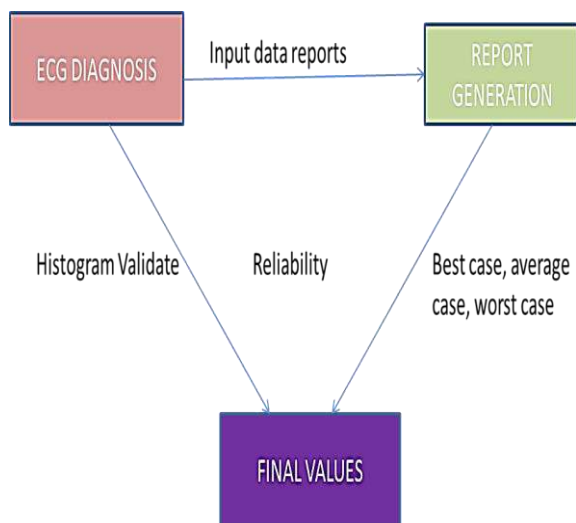
8. Performance Evaluation

➤ We performance the Amplitudes, time shifts and scale factors of a few [2] wavelets need to be stored. [15] The Output of integrator-large amplitude pulse for every QRS (waves), lower amplitudes for noise spikes.
➤ If filtered ECG and measuring system output exceed their thresholds, the peak is assessed as QRS peak. Monitored by the computing estimate of amplitude and threshold.
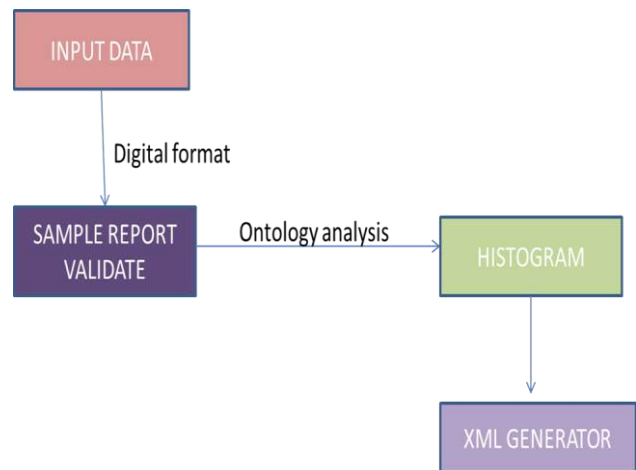
IV. CONCLUSION

The Projected system incorporates a way of automatic generation of identification report with graphical record image which will be a helpful innovation to the medical field [4]-[14]. The manipulation of identification report with the graphical record curve acquires several variations in the heartbeat like irregular, slow, quick and traditional. A validation method is incorporated within the projected system to get rid of the hissing info from the inputted image because it deceives the accuracy of the identification report. An ontological schema is intended to spot the internal organ predictions of curves. It overcomes the matter of false prediction of the syndrome by confirming the input image pattern bar chart techniques that validate the extra method. The result of the projected system achieves the syndrome identification with a legitimate input image thereby identifying the rhythm, termination and axis positions of the curve. [11] We have to develop only image segmentation using histogram check. This image is further validated using histogram technique. It includes noise rectification, which it is rectified so that we could predict the appropriate disease. [8] Finally, the image is compared with XML ontology to categories cardiac abnormality and the report is generated for the identified diseases.

V. FUTURE ENHANCEMENT

No matter graph or electrocardiogram fails or succeeds, the purpose is Heart Fatalities area unit rising and up and up severely. Our aim ought to be to avoid and cure the guts Failures, to not probe graph or electrocardiogram Failure/Success.

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Molecular Docking Studies of E-Bola Virus Protein VP30

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ABSTRACT

The Ebola virus (EBOV) genome encodes for several proteins that are necessary and sufficient for replication and transcription of the viral RNAs; NP, VP30, VP35, and L. VP30.VP30 binds to the RNA at the first gene start signal to initiate transcription. VP30 protein has playing important role in Ebola virus transcription and transcription reinitiation hence VP30 protein was targeted for the inhibition of Ebola virus. After target identification, Framycetin drug was taken from DrugBank database which is new lead and its derivatives were designed by bioinformatics virtual screening. Further, drug lead molecules were evaluated for their drug likeness using "Lipinski rule of five" and pharmacokinetic/ADMET properties. In molecular docking studies framycetin derivative shows the better binding energy with the target protein. This *in silico* approach can be appropriate to develop new drug lead molecules against Vp30 proteins Ebola virus infection.
Keywords: Ebola virus, VP30, framycetin, virtual screening, Molecular docking.

I. INTRODUCTION

Ebola viruses (EBOV) are non-segmented, negative RNA viruses, which together with Marburg virus constitute the family Filoviridae. Filoviruses cause severe and lethal hemorrhagic fevers in humans and nonhuman primates and, as such, are classified as biosafety level. Severe and often fatal hemorrhagic fever is the significant symptom of Ebola infection which happens in two stages; incubation period and late stage. Incubation period shows indications like joint pain, fever, weakness, sickness which can keep going for one week and late side effects incorporate sorrow, eye irritation, and hemorrhagic rash over the whole body [3]

A better understanding of the physical and functional interactions between Ebola virus proteins and cellular factors regulating the host innate immune response may reveal novel insights into the pathogenesis of Ebola virus and offer new strategies to inhibit Ebola virus replication[17]. The enveloped EBOV particle is composed of seven structural proteins, five of which form the helical nucleocapsid that represents the template for viral transcription and replication. The viral genome is encapsidated by the major nucleocapsid protein NP, and VP35, VP30, and VP24 interact with NP to form the mature nucleocapsid. In present study focused on VP30 protein as a potential drug target based on its function.
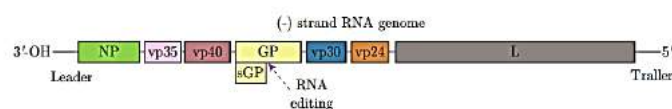

Figure 1 : Ebola Viral Genome Arrangement

Transcription is regulated by conserved transcription start and stop signal at the viral gene borders. The gene start signals are part of RNA secondary structures and it has been proposed that VP30 binds to the RNA at the first gene start signal to initiate transcription. In addition, VP30 was shown in Fig.1 which is important for transcription reinitiation of subsequent genes [6].

Phosphorylation of VP30 positively regulates and negatively regulates its transcriptional activity. In addition, enhancement of transcription by VP30 requires a putative RNA secondary structure located within

nucleotides (nt) 54 to 80 of the leader region. Deletion of the predicted RNA secondary structure permits VP30-independent transcription of viral messengers. These reported activities of VP30 suggest the possibility of a direct interaction of VP30 with EBOV RNA in its role in transcription. Recent publications with the mini genome system for EBOV suggest at least two possible mechanisms that VP30 may use in its transcriptional regulatory role. One possible mechanism could be that VP30 interacts with one or more of the other nucleocapsid proteins, polymerase, NP or VP35, and promotes increased stability of the transcriptional complex, VP30 may interact directly with viral RNA(s) to regulate transcription [14]. After entry into the host cell, the EBOV envelope fuses with host cell membranes to release the nucleocapsid into the cytoplasm where transcription and replication take place. Initial transcription of the newly entered encapsulated RNA genome is entirely accomplished by the nucleocapsid proteins that are associated with the intruding virus (primary transcription). Transcription is regulated by conserved transcription start and stop signals at the viral gene borders (Nadine Biedenkopfet al). VP30 represents an essential Ebola virus-specific transcription factor whose activity is regulated via its phosphorylation state. It has been hence conjectured that VP30 may help to beat this obstruction for transcriptional enactment, steady with its proposed part at a nearly phase of interpretation. VP30 due to its role in homooligomerization is considered as a potential target for antiviral treatment (Utkarsh Raj *et al).* Currently neither an approved vaccine nor antiviral therapy is available for humans.

According to latest reports, ZMapp, optimized combination of drug contains monoclonal antibodies made from a tobacco-plant strain can act as antiviral therapy against Ebola infection[1]. ZMapp is a cocktail combining the best components of two treatments namely MB-003 (Mapp) and ZMAb(Defyrus/PHAC) and is produced in a laboratory by exposing mice to fragments of the virus. Another drug BCX4430 (Developed byBioCryst), a new synthetic adenosine analogue, inhibits infection of different filoviruses in human cells[13]. Biochemical, reporter-based and primer-extension assays indicate that BCX4430 inhibits viral RNA polymerase function, acting as a non-obligate RNA chain terminator. Post-exposure intramuscular administration of BCX4430 protects against Ebola virus and Marburg virus disease in rodent models but it is not tested in humans yet.

In present study, we used *in silico* approach or discovering drug lead candidate against Ebola virus infection. The use of bioinformatics methods allows, using all aspects of drug discovery, forming core of structure based drug design and has advantage of delivering drug more quickly and at economic cost. Structure based drug designing approaches involves the 3-D structure of protein on which docking studies of various individual small molecules have been carried in order to calculate their docking score and binding energy by utilizing a series of scoring functions. The virtual screening & molecular docking of the drug candidates on target protein could find out the best lead like compounds with further optimization of the compounds to designing the lead (Rajamaniet al., 2007).

II. METHODS AND MATERIAL

1. Homology Modeling and Validation:

The sequence of VP30 protein was retrieved from the universal protein resource database (Uniprot) (UniprotKb ID: P35258). Secondary structure prediction was performed by using SOPMA (Geourjon and Deleage).The template for sequence alignment was identified through searching VP30 against PDB using the BLASTp[16].The 3D Crystal structure of the C-terminal domain of Ebola virus VP30 was downloaded from PDB (PDB ID: 3V7O) as the template structure. The homology model of VP30 was built by Swiss Model server. After modeling, the quality and validation of the model was evaluated by Ramachandran plot analysis using PDBsum server. The active site prediction of protein was predicted by using CASTp (Computed Atlas of Surface Topography of proteins) server [4].

2. Designing of Drug library :

Ligand molecule was downloaded from DrugBank database. Before docking ligand molecule was cleaned in 2D and 3D and saved it in mol2 chemical structure file format. After selecting the drug compound the drug library of compounds were generated using Marvin sketch software (version 5.8) and 2D structure of the all

compounds were subsequently converted in to 3D structures and saved in mol2 file format.

3. Virtual Screening by Lipinski's Rule of Five:

Molecular descriptors and drug likeliness properties of compounds were analyzed using the Molinspiration server with based on Lipinski's Rules . Molinspiration server supports for calculation of important molecular properties such as LogP, polar surface area, number of hydrogen bond donors and acceptors, as well as prediction of bioactivity score for the most important drug targets GPCR ligands, kinase inhibitors, ion channel modulators, enzymes and nuclear receptors[4].

4. Virtual Screening by ADMET Properties:

The pharmacokinetic properties such as Absorption, Distribution, Metabolism, Excretion and Toxicity of the compounds were predicted using admetSAR database. In admetSAR is a web based query tools incorporating a molecular build-in interface enable the database to be queried by SMILES and structural similarity search [4].

5. Molecular Docking Studies:

Based on the drug likeliness properties and pharmacokinetic properties 10 compounds were selected for docking studies. To validate drug- target association, the molecular docking was performed on active compound with screened compounds by Vlife MDS (Molecular Dynamics and Simulation) software (version 4.3) and we choose GA (Genetic Algorithm). All compounds and target protein were saved in mol2 file format before subjecting to software for docking [15].

III. RESULT AND DISCUSSION

1. Homology Modeling and Validation:

PDB id 3V7O (Crystal structure of the C terminus domain of Ebola virus) was selected as template with 37.50% sequence identity to query sequence. The quality and validation of the model was evaluated by Ramachandran plot analysis using PDBsum server. Ramachandran plot analysis showed that 2.7% in additional allowed region and 96.9% in favored region,

indicating that the models were of reliable and good quality tools which shown in Fig. 1. The predicted model was visualized in Jmol visulazation tools which shown in Fig. 2. The predicted protein was subjected to CASTp server for pocket prediction. 53 pockets were predicted and docked all pockets which found that most repeating interacting residues were present in pocket ID 53 on the volume and area of this pocket is large as compare to other predicted pockets.
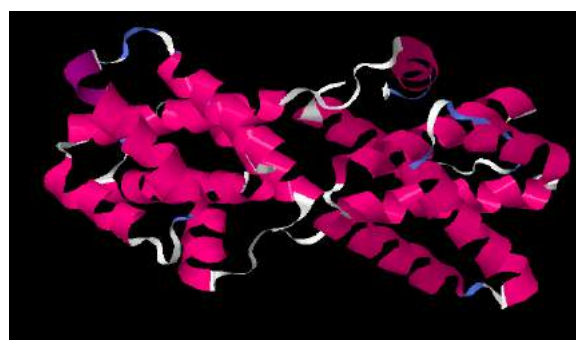

Figure 1: Procheck Analysis

Figure 2: Visualization of VP30 in Jmol

2. Designing of Drug library :

Framycetin compound was selected from DrugBank as inhibitor for VP30 protein. Drug library of selected framycetin derivatives compound was designed in Marvin sketch software (version 5.8).Total 31 derivative compounds were generated.

3. Virtual Screening by Lipinski's rule of five:

Drug likeliness properties of compounds were predicted by Molinspiration server. The CLogP (octanol /water partition coefficient) was calculated by the methodology developed by Molinspiration as a sum of fragment based

contributions and correlation factors. The molecular descriptors of five compounds given in Table 1 were tested to Lipinski's rule of five. In that top ten compounds which showed drug likeness properties were selected for further analysis.

The ADMET (Absorption, Distribution, Metabolism, Excretion and Toxicity) properties of the target compounds were calculated using admetSAR. Blood-Brain Barrier (BBB) penetration, HIA (Human Intestinal Absorption), and AMES toxicity were calculated. The predicted ADMET data were summarized in Table 2. The cytochromeP450 super family plays an important role in drug metabolism and clearance in the liver.

4. **Virtual Screening by ADMET properties:**

Sr. NO	SMILE	Log P	Mol. Wt	H boud accp	H bound donar	Rot bound
1	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2C#N	-6.0	623.66	18	19	9
2	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(C#N)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2O	-6.0	623.66	18	19	9
3	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CC#N)C(OC1OC(CN)C(O)C(O)C1N)C2O	-6.1	623.66	18	19	9
4	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(C#N)C(O)C1N)C2O	-6.03	623.66	18	19	9
5	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(C#N)C1N)C2O	-6.03	623.66	18	19	9
6	NC4C(C#N)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C1N)C2O	-6.03	623.66	18	19	9
7	NC4C(O)C(C#N)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C1N)C2O	-6.03	623.66	18	19	9
8	[H+].NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(=[N+]=O)\C1N)C2O	-6.49	623.66	20	19	9
9	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(CO)C1N)C2O	-6.09	628.68	19	19	9
10	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(CO)C(O)C1N)C2O	-6.09	628.68	19	19	9
Framy cetin	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2O	-6.11	614.65	19	19	9

Table 1: Virtual screening of Framycetin derivatives by Lipinski's rule.

Sr. NO	SMILE	BBB	Carcinogenic	LD-50	CYP 450	AMES toxicity
1	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2C#N	0.9708	Non carcinogenic	1.7003	0.6398	Non toxic
2	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(C#N)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2O	0.9708	Non carcinogenic	1.7003	0.6398	Non toxic
3	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CC#N)C(OC1OC(CN)C(O)C(O)C1N)C2O	0.6953	Non carcinogenic	1.8101	0.6311	Non toxic
4	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(C#N)C(O)C1N)C2O	0.9708	Non carcinogenic	1.7003	0.6390	Non toxic
5	NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(C#N)C1N)C2O	0.9708	Non carcinogenic	1.7003	0.6398	Non toxic
6	NC4C(C#N)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2O	0.9708	Non carcinogenic	1.7003	0.6398	Non toxic
7	NC4C(O)C(C#N)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2O	0.9708	Non carcinogenic	1.7003	0.6398	Non toxic
8	[H+].NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(=[N+]=O)\C1N)C2O	0.9920	Non carcinogenic	2.2020	0.5701	Non toxic

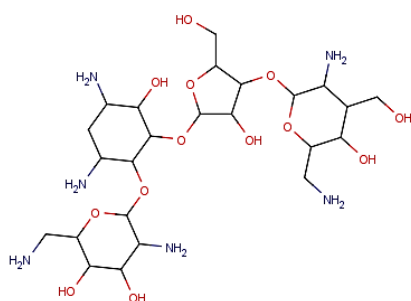| 9 | NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(CO)C1N)C2O | 0.968 | Non carcinogenic | 1.5675 | 0.6458 | Non toxic |
| 10 | NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(CO)C(O)C1N)C2O | 0.9632 | Non carcinogenic | 1.7059 | 0.6393 | Non toxic |
| Framy cetin | NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(O)C1N)C2O | 0.9659 | Non carcinogenic | 1.4850 | 0.6473 | Non toxic |

Table 2: Virtual screening by ADMET.

Molecule	Docking Score
Parent molecule	-2.4194
NC4C(O)C(O)C(CN)OC4OC3C(N)CC(N)C(O)C3OC2OC(CO)C(OC1OC(CN)C(O)C(CO)C1N)C2O	-2.4932

Table 3: Docking score.

5. Molecular Docking :

Molecular docking analysis were carried out using Biopredicta module of Vlife MDS 4.3.The receptor(VP30) was kept rigid, while ligands were set flexible to rotate and explore most probable binding poses. Software predicted cavities in the protein structure, first cavity was selected as binding pocket as it shows the similar residues as predicted in CASTp server pocket ID 53. The molecular docking complex which shows minimum binding energy was selected as shown in Table 3. The docking score or binding energy for the complex of VP30 and compound no 9((2R,3R,4S,5S,6S)-5-amino-2-(aminomethyl)-6-{[(1R,2R,3S,4R,6S)-4,6-diamino-2-{[(2R,3S,4S,5S)-4-{[(2R,3R,4S,5R,6R)-3-amino-6-(aminomethyl)-5-hydroxy-4-(hydroxymethyl)oxan-2-yl]oxy}-3-hydroxy-5-(hydroxymethyl)oxolan-2-yl]oxy}-3-hydroxycyclohexyl]oxy}oxane-3,4-diol) which shown in Fig. 3 was found out to be -1.3561 and the interacting residues Leu-151, Gyl-155, His-156, Ser-159, Gly-184 and Lys-187 were shown in Fig. 4.

Figure 3: Chemical structure of compound 9 (2D representation).
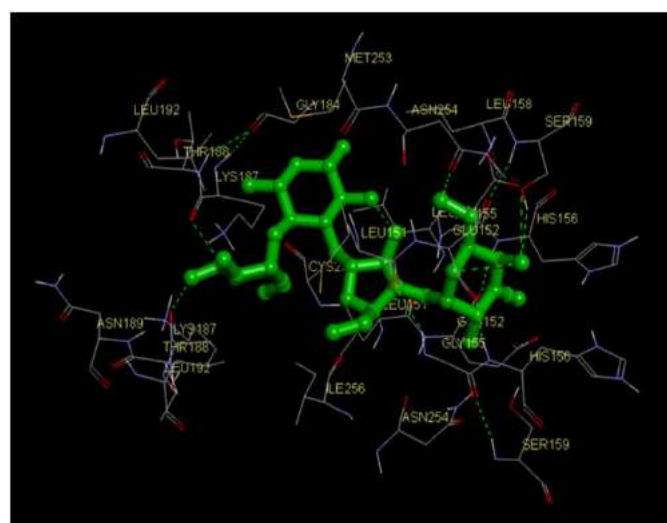

Figure 4: Molecular docking between the VP30 and compound 9 :(Binders are represented by green colored sticks and protein was represented by lines and colored according atom types.)

IV. CONCLUSION

The Ebola virus is most lethal disease. At present there is no potent drug available to treat Ebola virus. Molecular docking is one of the powerful technique for identifying biological significance and exploring new drugs by screening millions of compounds. The results of the current study clearly demonstrated that screened compounds of Framycetin are better inhibitors for viral protein (VP30)target as they interact with VP30 protein. The findings of this study are important as there is need for new drug to inhibit Ebola virus. The lead found out, could possibly inhibit the infection. However, the lead should undergo various preclinical analysis and optimization process before going into clinical trials.

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PI Controller Based IDBB Power Driver with High PF and Low THD for LED Lamps

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ABSTRACT

An IDBB converter circuit, which can act as a high power factor, low output current ripple, and good efficiency driver for power LED lamps. The input stage is based on the integration of buck boost converter which performs power factor correction (PFC) from a universal ac source, using the PWM operation mode as a control loop. The integrated double buck-boost (IDBB) converter features one controlled switch and two inductors that supply a solid-state lamp from the mains, providing high power factor and good efficiency. In this project, the IDBB converter is analyzed with and without Control algorithm (PI controller), and a design methodology is proposed using Matlab. It is demonstrated that, with a careful design of the converter, the filter capacitances can be made small enough so that film capacitors may be used. The results obtained using PI controller and fuzzy logic controller for the same circuit are compared and are presented which validates high input power factor and superior control over the output voltage.
Keywords: IDBB Converter, PI Controller, Thermal Harmonic Distortion (THD), Power LED, High Power Factor (HPF)

I. INTRODUCTION

WHITE POWER LEDs are becoming an attractive light source, owing to their high reliability, long life, high color rendering index, and small size. In addition, there are commercially available units that can reach light efficiencies as high as 100 mW. All these features make white LEDs a good option to override fluorescent and other discharge lamps in many applications, including street lighting, automotive lighting, decorative applications, and household appliances. However, power LEDs suffers from several drawbacks. First, due to their nearly constant-voltage behavior, they cannot be supplied from the dc or ac input voltage directly. Therefore, some kind of current-limiting device must be used, similarly to the ballast used to limit the current through a discharge lamp. On the other hand, the high efficiency of power LEDs is only maintained under strict operating conditions, which include low direct current and low junction temperature. All these mean that the development of power supplies that achieve correct driving of the LED-based lamp is an important topic of research.

Energy prices have skyrocketed in recent years owing to depleting renewable resources. In addition to seeking other energy sources, countries worldwide are also initiating energy-saving and carbon reduction programs. Due to the small size and high efficiency, semiconductor lighting has attracted researchers and manufacturers to develop new products using this technology. Nowadays the energy-inefficient incandescent lamps and mercury-based tubular and compact fluorescent lamps are replacing LED lamps. Although HB white LEDs are not the most efficient lighting systems in terms of lumens per watt for streetlight applications (indeed, they achieve a lower efficiency than low-pressure sodium vapor lamps), they are quite interesting compared to traditional solutions due to their longer operating life and their more pleasant light spectrum (sodium lights emit only in yellow color, thus providing a very poor Color Rendering Index, CRI). High Brightness-LEDs do not need neither warm up nor restart period, which do imply the use of specific circuitry. Due to the high efficiency of the LEDs with maximum illumination, the utilization

is 85%-90% of the input power into light energy, whereas the fluorescent lamps will produce only 77%. On the other hand global warming and increasing power demand etc. may be fulfilled by LEDs by implementing enhanced control technique (light dimming and preheating of filaments if possible). The recombination of electrons and holes can cause either photons (light) or phonons (heat). So the junction temperature of the LEDs increasing leads to the degradation of the luminous flux of LEDs .The high efficacy of power LEDs is only maintained under strict operating conditions, which include low direct current and low junction temperature (Fig 1).

All these mean that the development of power supplies that achieve correct driving of the LED-based lamp is an important topic of research. White power LEDs are becoming an attractive light source, owing to their high reliability, long life, high color rendering index, and small size. In addition, there are commercially available units that can reach light efficacies as high as 100 lm/W. All these features make white LEDs a good candidate to override fluorescent and other discharge lamps. The main drawback of these LEDs is they need constant voltage as input and they need current limiter before the input of the LED. Therefore, some kind of current-limiting device must be used, similarly to the ballast used to limit the current through a discharge lamp. On the other hand, the high efficacy of power LEDs is only maintained under strict operating conditions, which include low direct current and low junction temperature.

This drive is currently implemented with power electronic stages based on switch mode power supplies (SMPS). However, an electrolytic capacitor is required in these applications. Unfortunately, the operating life of such capacitors is by far shorter than the life of the HB LEDs, and usually are the shortest of all the devices in the power supply. Thus, removing the electrolytic capacitor would imply a remarkable increase in the operating life and reliability of the system. PFC converters can be classified into two types: two-stage and single-stage. Two-stage PFC converters consist of a PFC stage and a dc/dc stage. Single-stage PFC converters integrate the PFC stage and the dc/dc stage, leading to simple topology and low cost. They are suitable for low-power applications. The simplest active

PFC circuits are implemented with a single-stage that makes the power factor correction. The most common single-stage topology used is the fly back converter working in Discontinuous Conduction Mode (DCM), being called DCM fly back PFC converter. The main drawbacks of these pre-regulators are, by one hand, the high peak current stresses caused by the DCM and serious EMI problem and, by the other, the poor dynamics that these converters perform due to the low-pass filter (10 Hz-20 Hz) needed to reduce the input line current total harmonic distortion (THD). Therefore, if dimming operation is required, which must be done at frequencies above 200 Hz, these single stage solutions are not feasible. Attending to the reasons exposed above, a two-stage is needed so the Power Factor Correction can be done properly and a fast enough output dynamics is obtained. The numerous types of switching converter include boost, buck, buck-boost, and Cuk converters.
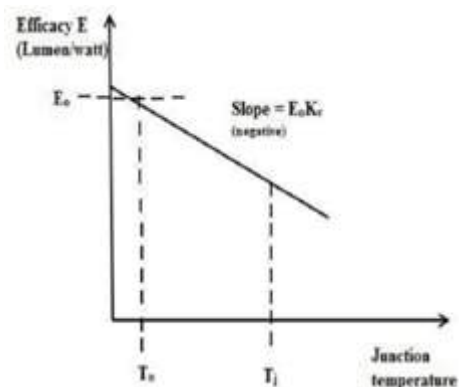

Figure 1. Efficiency versus Junction temperature of LED

II. METHODS AND MATERIAL

A. IDBB Converter

The converter behaves as two buck–boost converters in cascade. The input buck–boost converter is made up by Li, D1, CB, and M1 and the output buck–boost converter comprises LO, D2, D3, CO, and M1.The reversing polarity produced by the first converter in the capacitor CB is corrected by the second converter, given a positive output voltage with respect to ground. This simplifies the measurement of the load current for closed-loop operation, thus reducing sensing circuitry and cost. By operating the input inductor Li in discontinuous conduction mode (DCM), the average

current through the line will be proportional to the line voltage, therefore providing a near unity PF. On the other hand, the output inductance LO can be operated either in continuous conduction mode (CCM) or DCM. The operation in DCM has the advantage of providing a bus voltage across CB independent of the duty cycle and output power. However, it presents the disadvantage of requiring a higher value of the output capacitance to achieve low current ripple through the load.
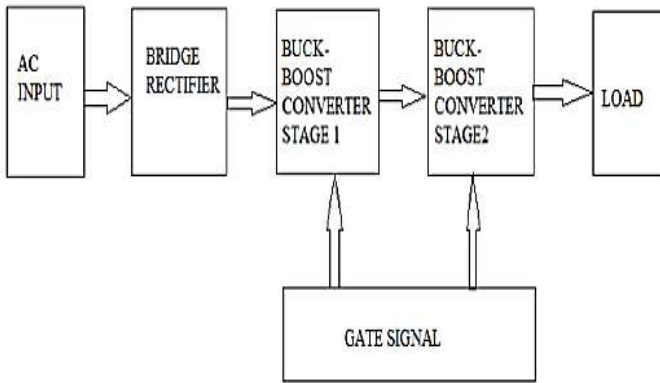

Figure 2: Block Diagram of IDBB Converter
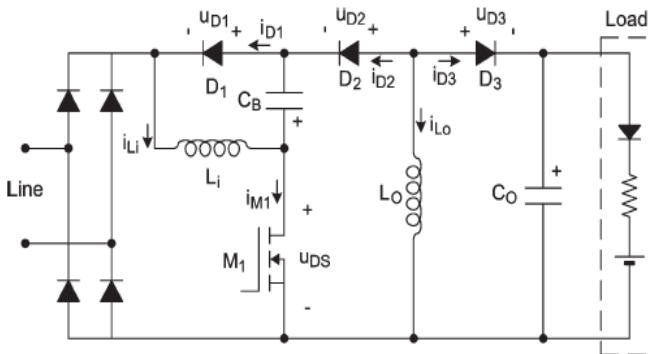
Figure 3: Schematic of IDBB Converter

B. Theoretical Analysis Offline IDBB Converter

In this section, the IDBB converter is analyzed when operated from the main voltage, achieving a near-unity input PF and a low-ripple current through the power-LED load. It is assumed that the line voltage is a sinusoidal waveform given as

$$vg(t) = Vg \sin \omega Lt.$$

i. Line Current and Input Power

$$P_g = \frac{1}{2}V_g \langle i_g \rangle_{\text{peak}} = \frac{D^2 V_g^2}{4L_i f_S}$$

ii. Output and Bus Voltages

$$V_B = \frac{1-D}{D}V_O = \frac{(1-D)V_g}{2\sqrt{K}}.$$

iii. Reactive Components

$$L_O = \frac{DV_B}{0.5\Delta I_{Lo\_\text{HF}} f_S}$$

$$C_O = \frac{DI_O}{\Delta V_{O\_\text{HF}} f_S}$$

C. Power Factor Requirements For Offline LED Drivers

- IEC (EU) requirements dictate THD performance for Lighting (over 25 W), other international standards apply depending on the region.
- US DOE ENERGY STAR includes mandatory PFC for Solid State Lighting regardless of the power level. This is a voluntary standard and applies to a specific set of products such as down lights, under cabinet lights and desk lamps for example.

1) >0.7 for residential applications
2) >0.9 for commercial applications

- While not absolutely mandated in the for lighting in all countries, it may be required based on the application:
- Utilities drive major commercial uses to have high PF at the facility level
- Moreover when utilities owns/service the streetlight it is in their interest to have good power factor, typically > 0.95+

III. RESULT AND DISCUSSION

For the design of circuit component values, certain parameters are assumed approximately. Simulation results of IDBB converter using PI controller gives waveforms very close to standard waveforms. The input power factor of the converter can be viewed on the power factor display block. The control block as shown in figure generates the gate signal for controlling the switch.

The rated current of the LED lamp which is 350 mA is given as current reference. The output current is

subtracted from the reference current value to produce the error signal. This error signal is the input to the PI controller.

The controller output is so as to maintain the output current value close to reference value. The output of PI controller is fed to the saturation block. The saturation block is used to limit the controller output to a limited range; the range being decided by the upper and lower limits of ramp signal, a pulse is generated. In simulation the output values for ramp signal are chosen as 0 and 1. Therefore the saturation upper and lower limits are taken as 0.9 & 0.1 respectively. The ramp signal and controller output signal are compared in the relational operator block. Whenever the Controller output is greater than the ramp signal, a pulse is generated.

A. Algorithm For Input Voltage to the IDBB Converter

Step 1: start
Step 2: Enter the voltage values ranging from 190 to 250 V.
Step 3: Evaluate Source Voltage Vs=Vsi
Step 4: Measured lamp current, PF, THD, Efficiency as a function of the input voltage at closed loop operation.
Step 5: The above values (current, PF, THD, Efficiency) are noted for Buck Boost converter 1.
Step 6: The Same procedure is implemented for Buck Boost converter 2.
Step 7: Stop
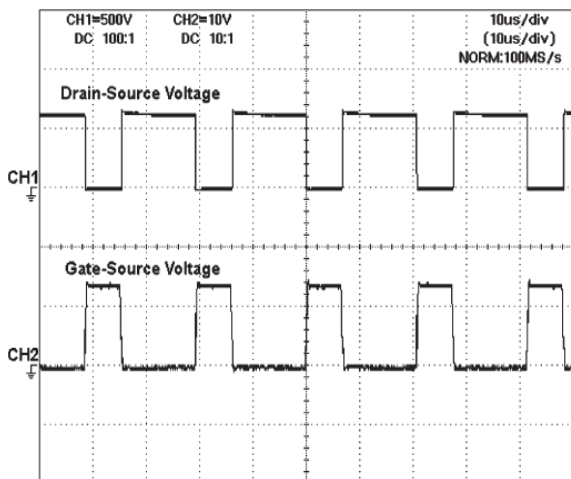
Figure 4: Waveforms in MOSFET M1 at 230-Vrms line voltage.
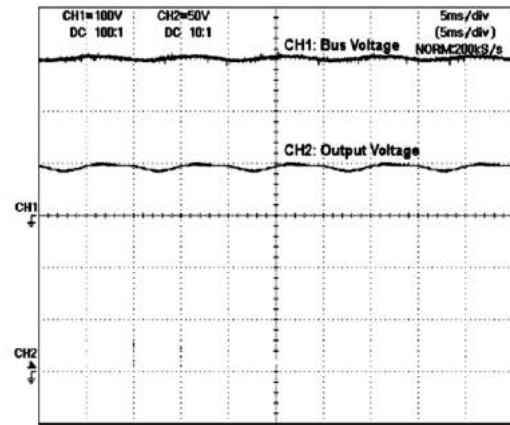
Figure 5: Bus and output voltages at nominal power and 230-Vrms line voltage
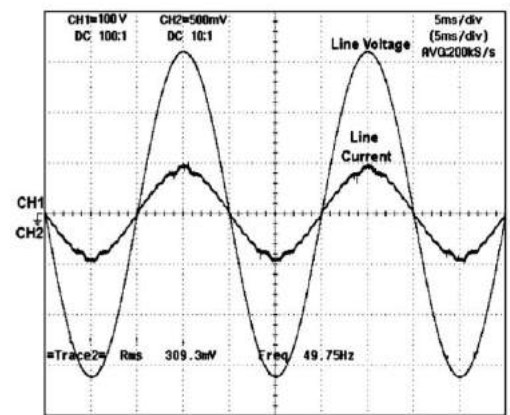

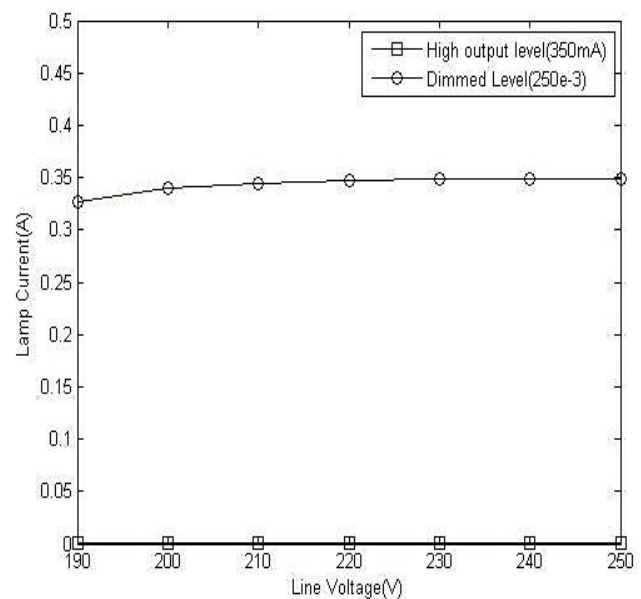**Figure 6:** Line voltage and current at nominal power and 230-Vrms line voltage.

Figure 7 : Measured converter efficiency as a function of the input voltage.
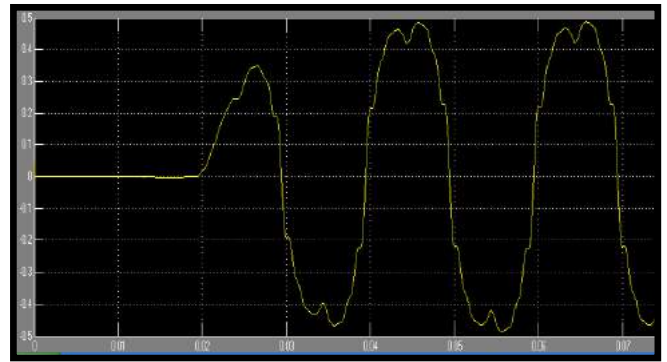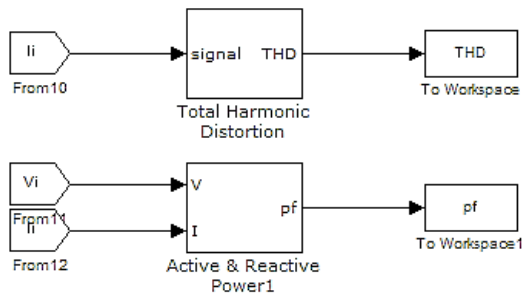
B. Simulation OF IDBB Converter

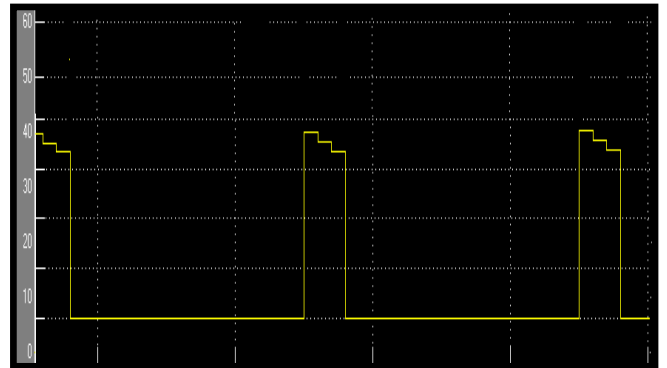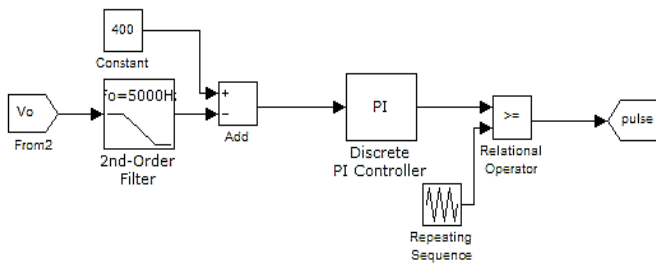**Figure 9:** Input Voltage and Lamp Current Waveforms

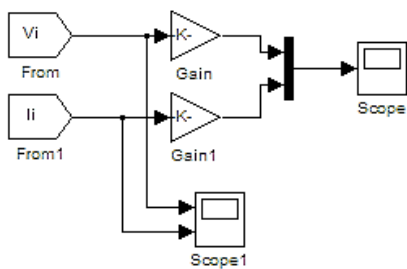**Figure 10:** Input Pulses to MOSFET Switch

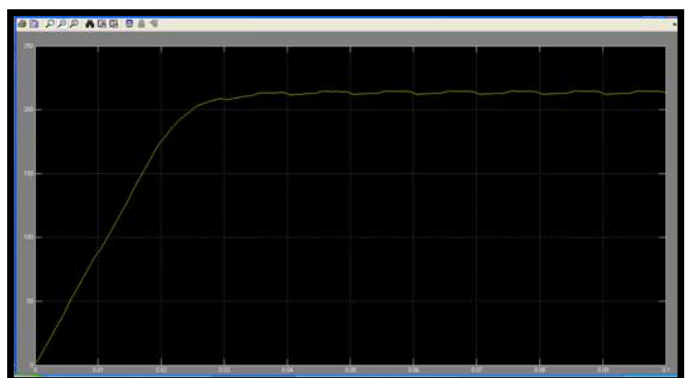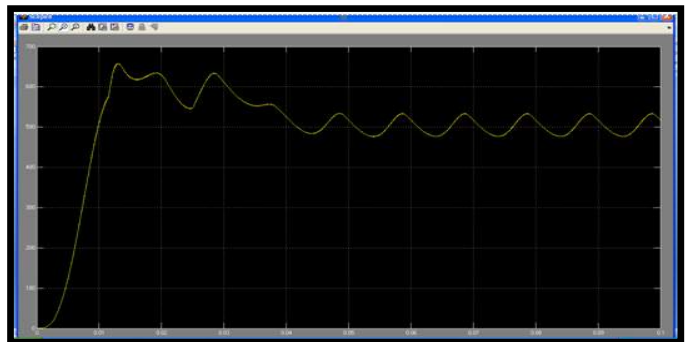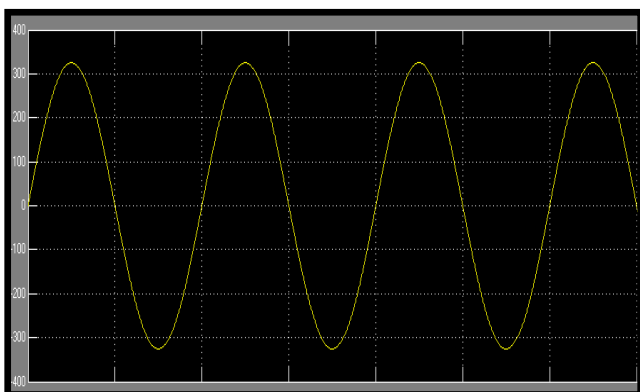**Figure 8 :** Simulink Model of IDBB Converter

Figure 11: Output Voltage With and Without PI Controller

IV. CONCLUSION & FUTURE SCOPE

An IDBB converter for power LED lamps was proposed which ensures high input power factor and low output ripple. The converter with PI control method was modeled in SIMULINK and waveforms were studied. The topology features two buck–boost converters in cascade but using only one controlled switch. By operating the input converter in DCM, a high input PF can be obtained. On the other hand, the operation of the second stage in CCM assures a low-ripple current through the LED load without using a very high output capacitance. In this way, the converter can be implemented using only film capacitors, avoiding the use of electrolytic capacitors and increasing the converter mean time between failures.

It can be used in led's as the boost converter which boosts the energy and the led's glow brightly. As now a days led's are being used everywhere, this concept can be used for further better results. Even if any amount of rated voltage is given the buck boost converter can handle it and send the required voltage to led's. It can be used even for the bunch of led's for maximum efficiency. The overall efficiency can be increased by using Fuzzy controller. Galvanic isolation can be provided in the circuit using an inductor in the output circuit. Automatic dimming controls can be implemented for better efficiency when used for street lighting applications.

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Banana Fruit Stem Fiber Reinforced with Polyester Composites on Mechanical Properties

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ABSTRACT

This research article presents polymer composites reinforced with Banana stem fruit fiber (BFF) to assess the mechanical properties. The fibers used in the research are treated with NaOH solution gain the advantage over the neat polyester. Fiber was loaded with 2,3,4,5, and 6 wt.% for both the composites. Composites are prepared with the help of hand layup technique and the glass moulds are prepared to provide castings for composites. Banana fiber was treated with NaOH (10%) solution for about 45 minutes. Tensile strength, modulus and flexural strength and modulus were estimated for both treated and untreated composites. It was noticed that treated composites are good candidates for effective improvement of the performance. In SEM analysis reveals the improved/ decreased performance of treated and untreated composites.

Keywords: Banana fruit fiber (BFF), Polyester, Composite, Mechanical Properties, SEM

I. INTRODUCTION

The matrix forms a significant volume fraction of a polymer composite and it has a number of critical functions; it binds the reinforcements together, maintains the shape of a component and transfers the applied load to the reinforcing fibres. it protects the reinforcing fibres from degradation, due to abrasion or environmental attack. It contributes significantly to the mechanical properties of structural polymer composites, acting to resist delamination between plies of reinforcements and to inhibit fibre buckling during compression. Thermoplastics are used in certain applications but constitute a relatively small sector of the structural composites market. Matrices used for structural composites are mainly thermosetting plastics, such as polyester resins, epoxy resins, phenolic resins and vinyl-ester resins. Polyester resins are the most widely used resin systems, particularly in the marine industry. By far the majority of dinghies, yachts and work-boats built in composites make use of this resin system. Thermosetting plastic systems generally consist of liquid mixtures of relatively low molar mass reactants, such as monomers and/or prepolymers, which

polymerise upon heating to form highly-crosslinked, network polymers. Thanks to the natural fibers as they are slowly showcasing their lime light when it's come to mechanical properties, and environmental benefits. These have proved to be suitable candidates as a reinforcement material for polymer composite materials, especially thermoset based plastics. A wide variety of such fibers (flax, jute, hemp, sisal, etc.) are already being applied in the automotive industry, offering such advantages as a high rigidity accompanied by a lighter weight and easier reprocessing. The main limitation of the fibers is their hydrophilic nature, low thermal stability, and poor dispersion in polymer melts [1-5]. It is clear that composite technologies allow the producer to add much more value to his product than the processing and trading of raw material. The development of new and more profitable markets will improve the position of the (mainly poor) people working in the coir industry and increase their welfare also. Other natural fibers such as flax and sisal have already shown that they can be used successfully in composite components in order to realize reduction of weight and cost [6-10]. The resulting mechanical properties of composites generally depend on the fiber's

nature, size and distribution, aspect ratio, volume fraction, and the intrinsic adhesion between the surfaces of fiber and polymer. High aspect ratio (fibre type) fibers generally increase the yield strength because the fiber is capable of attaining high local stress transferred from the polymer matrix, which does not happen with lower aspect ratio fibers. It is known fact that polymers are compatible with any type of natural fibers and these have been proved that they can be replaced with synthetic fibers as well. Using glass fibers, aramid fibers strength may be increased significantly but they will damage in environment and also processing of these fibers is cumbersome. Past 15 years continuous research has been going in all over the globe to replace them with synthetic fiber. These problems gave birth to the natural fibers reinforced composites [11-20]. Thus in the present study we are using banana stem fruit fiber are reinforcing agent and the polyester is the matrix we have taken to fabricate composite and also different fiber concentration such as 2,3,4,5, and 6 wt.% ration of natural fibers have been considered for this research to evaluate mechanical and scanning electron microscope.

II. METHODS AND MATERIAL

Polyester Ecmalon 9911,Ecmas Hyderabad, with 2% cobalt accelerator, catalyst 50% methyl ethyl ketone peroxide (MEKP) in 10% DMA solution, ratio of the resin/accelerator/catalyst:100/2/2. The resin has a density of 1335 kg/m^3, Young's modulus of 450 MPa, tensile strength of 15.3MPa and elongation at break of 3.3%. Tensile strength, three point bending tests were carried out on par with ASTM D 53455. Tensile and flexural tests were performed on Instron universal testing machine (3369). All the tests were accomplished at a room temperature of 20 ℃. At least five samples were tested for each composition and results were averaged. Scanning electron microscopy (SEM) studies of the fractured surface of the tensile specimen were carried out on a Jeol (6380LA, Japan). The specimen was sputter-coated with gold to increase surface conductivity.

Composite Preparation

Polyester resin (matrix) was taken in a by weight based on the mould volume and then mixed with matrix/ promoter/accelerator as 100:2:2 stoichiometric ratios.

Meanwhile glass moulds are prepared to assist the casting on par with the ASTM standards and then mould ought to coat with polyvinylalcohol (PVA) to remove the casting after post curing without any damage. Then put the 20% of total solution into the mould all over the mould and this will act like wetting agent while fiber is placed upon it. Fiber is stacked in all directions randomly and then the remaining polyester solution has to pour all over the mould as a second layer. Using brush and roller air was removed and then a thin OHP sheet is spread all over the top surface of the mould then weight of 50kg load is placed above the OHP sheet [7, 8]. This weight facilitates the uniform distribution of matrix all over the mould, and mirror surface finish when compared with the bottom surface. After 24 hours post cured samples were cut according to the ASTM standards as mentioned thereof.

Table 1: Illustration of mechanical strength measurements as a function of fiber loading untreated composites.

Fiber Loading (wt.%) (Untreated)	Tensile strength(MPa)	Tensile modulus (MPa)	Flexural strength (MPa)	Flexural modulus (MPa)
PE + 2wt.%BFF (A)	35.04	4256.02	25.04	2589.06
PE + 3wt.%BFF (B)	38.11	4485.45	27.88	2789.52
PE + 4wt.%BFF (C)	42.53	4702.63	29.12	2935.01
PE + 5wt.%BFF (D)	47.96	4901.20	30.19	3052.66
PE + 6wt.%BFF (E)	40.23	5635.05	32.07	3587.53

III. RESULT AND DISCUSSION

Table 1 and Table 2 shows that the mechanical properties such ass tensile strength, tensile modulus, flexural strength and flexural modulus measurements as a function fiber loading. Tensile strength performance for untreated and treated composites is shown in the Figure 1. It was noticed from the graph is strength was increased gradually from A to D specimens but decreases after that at 5wt.% BFF loading strength was optimized and also 36.87% strength is increased when compared with the performance of 2wt.% BFF loading.

Table 2: Illustration of mechanical strength measurements as a function of fiber loading of treated composites.

Fiber Loading (wt.%) (Treated)	Tensile strength(MPa)	Tensile modulus (MPa)	Flexural strength (MPa)	Flexural modulus (MPa)
PE + 2wt.%BFF (A)	37.63	4890.25	29.05	2935.42
PE + 3wt.%BFF (B)	39.42	5236.42	33.05	3124.00
PE + 4wt.%BFF (C)	45.36	5428.63	35.47	3302.88
PE + 5wt.%BFF (D)	50.67	5698.41	37.63	3634.74
PE + 6wt.%BFF (E)	45.03	6025.41	38.96	4865.26

Tensile strength for treated composites were increased gradually from A to D whereas after that strength was suddenly decreases.
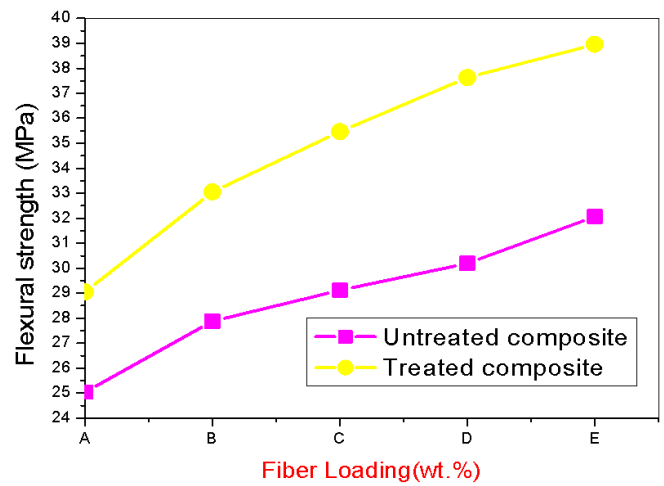

Figure 1: Measurements of tensile strength results PE reinforced with BFF composites.

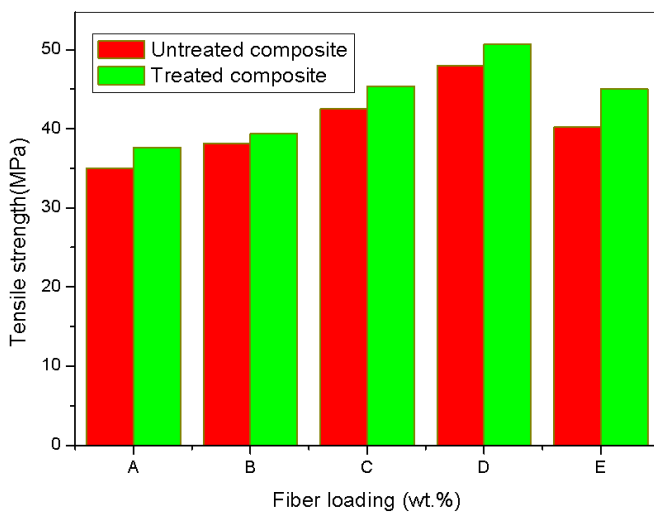**Figure 2:** Measurements of tensile modulus results PE reinforced with DFF composites.

Figure 3: Measurements of flexural strength results PE reinforced with BFF composites.

Tensile strength was increased up to 34.65% when compared with the specimen A magnitude. Over all 5wt.% treated composites are having5.65% greater strength when compared with the same composite from the untreated composites [10]. Tensile modulus performance for untreated and treated composites is shown in the Figure 2. It was noticed from the graph is stiffness was increased gradually from A to E specimens and also 32.40% strength is increased when compared with the performance of 2wt.% BFF loading.
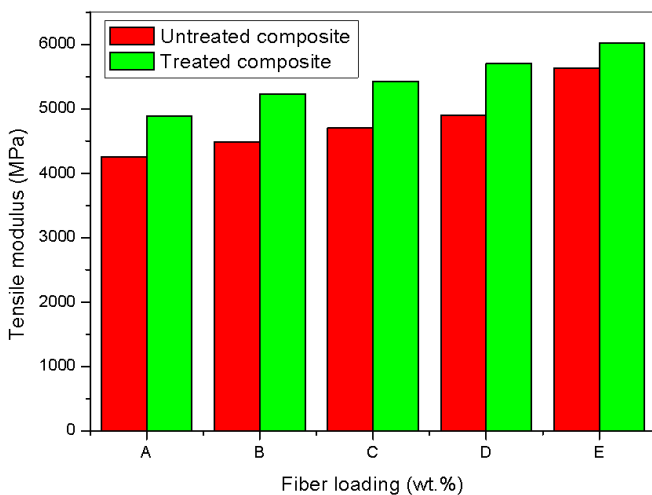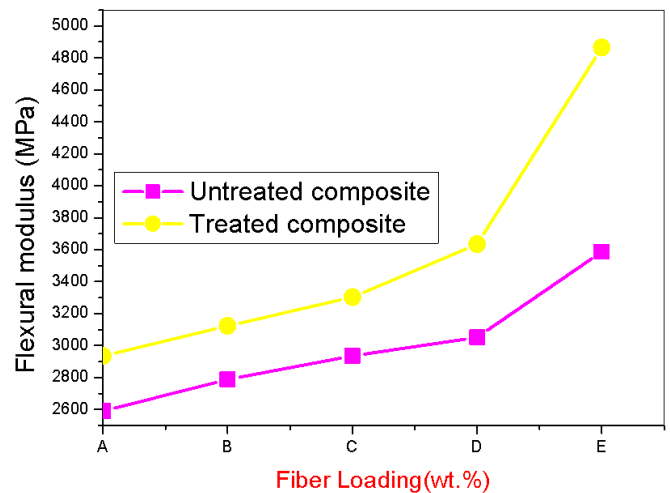

Figure 4: Measurements of flexural modulus results PE reinforced with DFF composites.

Tensile modulus for treated composites were increased gradually from A to E. Tensile modulus was increased up to 23.21% when compared with the specimen A magnitude [14]. Over all 5wt.% treated composites are having 6.92% greater stiffness when compared with the same composite from the untreated composites. Flexural

strength performance for untreated and treated composites is shown in the Figure 3.
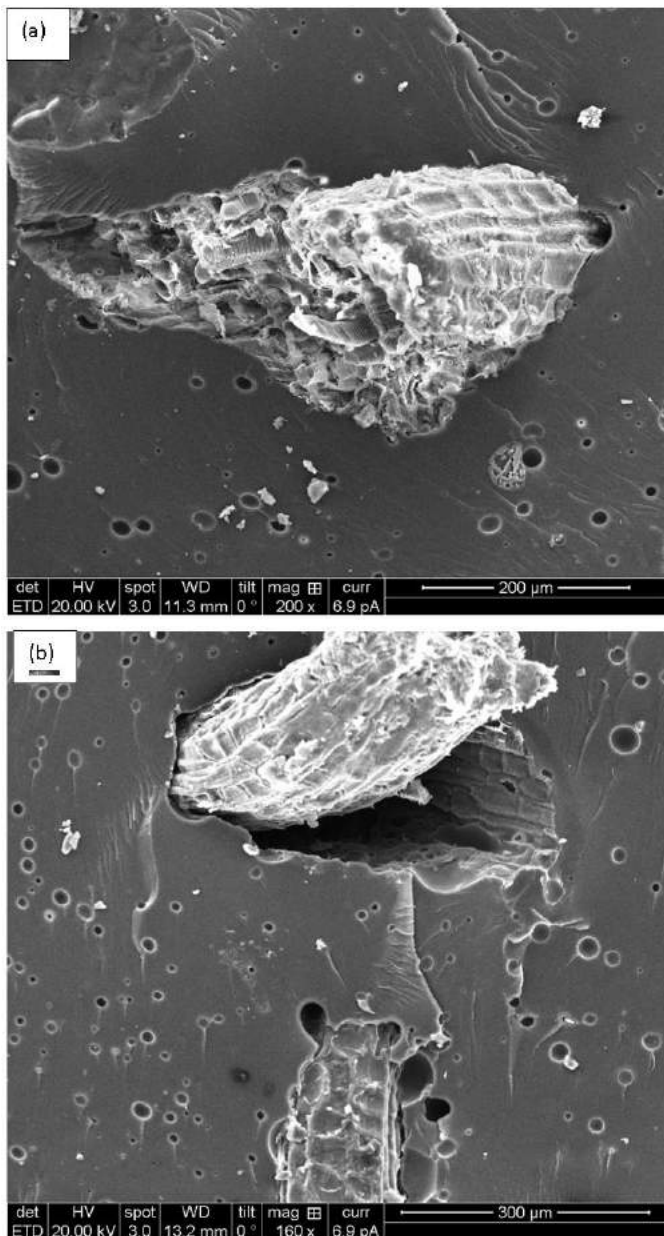

Figure 5: Tensile strength fracture surfaces of Specimen E SEM images (a) 200X and (b) 160X magnifications
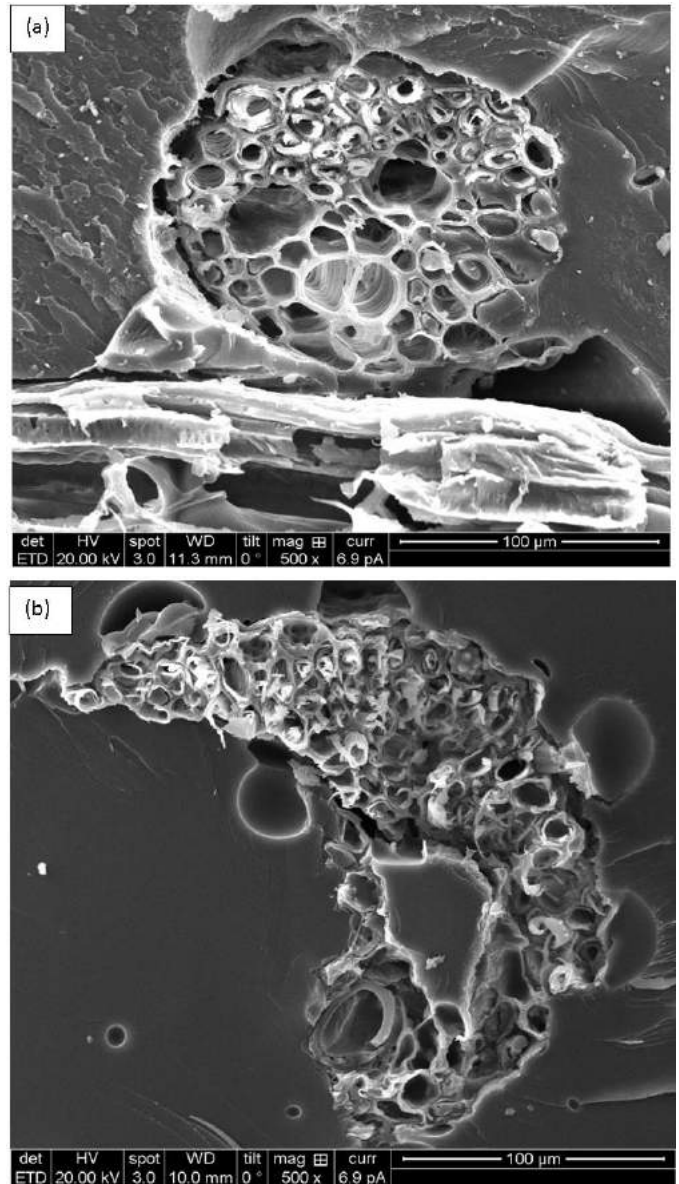

Figure 6: Tensile strength fracture surfaces of Specimen D SEM images (a) 500X and (b) 500X magnifications.

It was noticed from the graph is strength was increased gradually from A to E and also 28.07% strength is increased when compared with the performance of 2wt.% BFF loading. Flexural strength for treated composites were increased gradually from A to E. Flexural strength was increased up to 34.11% when compared with the specimen A magnitude. Over all 5wt.% treated composites are having 21.48% greater strength when compared with the same composite from the untreated composites. Flexural modulus performance for untreated and treated composites is shown in the Figure 4. It was noticed from the graph is that the modulus was increased gradually from A to E and also 38.56% strength is

increased when compared with the performance of 2wt.% BFF loading. Flexural modulus for treated composites were increased gradually from A to E. Flexural modulus was increased up to 65.74% when compared with the specimen A magnitude. Over all 5wt.% treated composites are having 35.61% greater strength when compared with the same composite from the untreated composites. Tensile strength fracture surfaces were analysed with the help of scanning electron microscope in order to assess the reasons of the composites. Figure 5 (a) & (b) shows the SEM images of the untreated composites specimen E. It was observed from the microgram that image is full of voids all over the images 5(a) and also fiber pull outs were also identified in the image 5(b). Voids may be due to poor flowability of the polyester consequently made polyester air entrapment in the some vulnerable points. Fiber and matrix interface is also not up to the mark [12]. These are all the significant reasons for decreased performance. Figure 6 (a) & (b) shows the SEM images of the treated composites of specimen D. It was observed from the microgram that image is out of voids some extent 6(a) and also fiber pull outs were also not identified in the image 6(b). Deprived of voids may be due to flowability of the polyester consequently made polyester no air entrapment in the some vulnerable points [5]. Fiber and matrix interface is also significantly good. These are all the significant reasons for increased performance for the treated composites.

IV. CONCLUSION

This research article presents polyester matrix composites reinforced with treated/ untreated banana fibers. Characterization includes tensile strength, tensile modulus, flexural strength, flexural modulus, and scanning electron microscope analysis measurements were evaluated. For tensile strength treated composites participated comparatively well when compared with untreated composites. Over all 5.65% tensile strength was increased for treated specimen D when compared with untreated specimen D. For tensile modulus treated composites participated comparatively well when compared with untreated composites. Over all 6.92% tensile modulus was increased for treated specimen E when compared with untreated specimen E. For flexural strength treated composites participated comparatively well when compared with untreated composites. Over all

21.48% flexural strength was increased for treated specimen E when compared with untreated specimen E. For flexural modulus treated composites participated comparatively well when compared with untreated composites. Over all 35.61% flexural modulus was increased for treated specimen E when compared with untreated specimen E.

V. ACKNOWLEDGEMENTS

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Preparation and Evaluation of Polyester Hybrid Composites Reinforced with Carbon Fibre/ Wollastonite Fibers

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ABSTRACT

In the present study the authors focused on the performance of injection molded short wollastonite fiber and chopped carbon fiber reinforced hybrid polyester composites. The results showed that hybridization of carbon fiber and wollastonite was in congruence to polyester and fibre composite system. Effect of fibre length, fibre orientation in matrix and analysis and fracture surface was undertaken. The mechanical properties of injection molded, chopped carbon fibre/wollastonite/polyester hybrid composites have been investigated by considering the effect of hybridization by these two fillers. It was observed that the tensile, flexural, and impact properties of the filled polyester were higher than those of unfilled polyester. The effect of filler on polyester matrix subjected to the tensile strength and modulus was studied with the help of rule of mixture. The actual results are marginally low compared to the values obtained by the rule of hybrid mixtures.

Keywords: Hybrid fibers, wollastonite fiber, carbon fiber, mechanical properties

I. INTRODUCTION

The interfacial interactions between fillers and polymer matrix play a crucial role in determining the quality and properties of the composites. The poor bonding linkage between the fillers and polymer matrix such as composites made by simple mixing will introduce artificial defects, which consequently result in deleterious effect on the mechanical properties of the composites. Introducing good linkages between the fillers and the polymer matrix is still a challenge for specific composite fabrication. They can be divided into two broad classes, amorphous and crystalline, depending on the type of their characteristic transition temperature. Amorphous thermoplastics are characterized by their glass-transition temperature, Tg, a temperature above which the modulus decreases rapidly and the polymer exhibits liquid-like properties; amorphous thermoplastics are normally processed at temperatures well above their Tg. Glass transition temperatures may be as low as 65 °C for polyvinyl chloride (PVC) and up to as high as 295 °C for polyamideimide (PAI). Crystalline thermoplastics, or more correctly, semicrystalline thermoplastics can have different degrees of crystallinity ranging from 20 to 90%; they are normally processed above the melting temperature, Tm, of the crystalline phase and the Tg of the coexisting amorphous phase. Melting temperatures can be as high as 365 °C for polyetherketone (PEK), as low as 110 °C for low density polyethylene (LDPE), and even lower for ethylene–vinyl acetate (EVA) copolymers. Upon cooling, crystallization must occur quickly, preferably within a few seconds. Additional crystallization often takes place after cooling and during the first few hours following melt processing. Over 70% of the total production of thermoplastics is accounted for by the large volume, low cost commodity resins[1-10]: polyethylenes (PE) of different densities, isotactic polypropylene (PP), polystyrene (PS), and polyvinyl chloride (PVC). Next in performance and cost are acrylics, acrylonitrile–butadiene–styrene (ABS) terpolymers, and high-impact polystyrene (HIPS). Engineering plastics, such as acetals, polyamides, polycarbonate, polyesters, polyphenylene oxide, and blends thereof are increasingly being used in high performance applications. A complex microstructure may result in different fiber orientations at different points of molded specimens. Microstructure

characteristics can only explain the in reference for mechanical properties of short fiber composites. The hybridization with small amounts of mineral fibers makes these carbon fiber composites more suitable for technical applications. In a hybrid system various mechanical properties like stiffness strength and fracture toughness depend on the characteristics of constituent fibers like fiber length and fiber volume fraction. When fiber length is smaller than critical fiber length fiber pull out takes place but if fiber length is more than critical fiber length breaking of fiber occurs thus fracture mechanisms can be identified with the knowledge of critical fiber length. Carbon fiber or carbon fibre (alternatively CF, graphite fiber or graphite fibre) is a material consisting of fibers about 5–10 micrometres in diameter and composed mostly of carbon atoms. To produce carbon fiber, the carbon atoms are bonded together in crystals that are more or less aligned parallel to the long axis of the fiber as the crystal alignment gives the fiber high strength-to-volume ratio (making it strong for its size). Several thousand carbon fibers are bundled together to form a tow, which may be used by itself or woven into a fabric. The properties of carbon fibers, such as high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion, make them very popular in aerospace, civil engineering, military, and motorsports, along with other competition sports. However, they are relatively expensive when compared to similar fibers, such as glass fibers or plastic fibers. Carbon fibers are usually combined with other materials to form a composite. When combined with a plastic resin and wound or molded it forms carbon-fiber-reinforced polymer (often referred to as carbon fiber) which has a very high strength-to-weight ratio, and is extremely rigid although somewhat brittle. However, carbon fibers are also composited with other materials, such as with graphite to form carbon-carbon composites, which have a very high heat tolerance. Most polyester resins are viscous, pale colored liquids consisting of a solution of polyester in a monomer which is usually styrene. The addition of styrene in amounts of up to 50% helps to make the resin easier to handle by reducing its viscosity. The styrene also performs the vital function of enabling the resin to cure from a liquid to a solid by 'cross-linking' the molecular chains of the polyester, without the evolution of any by-products. These resins can therefore be molded without the use of pressure and are called 'contact' or 'low pressure' resins. Polyester resins have a limited storage life as they will set or 'gel' on their own over a long period of time. Often small quantities of inhibitor are added during the resin manufacture to slow this gelling action. Vinylester resins are similar in their molecular structure to polyesters, but differ primarily in the location of their reactive sites, these being positioned only at the ends of the molecular chains. As the whole length of the molecular chain is available to absorb shock loadings this makes vinylester resins tougher and more resilient than polyesters. The vinylester molecule also features fewer ester groups. These ester groups are susceptible to water degradation by hydrolysis which means that vinylester exhibit better resistance to water and many other chemicals than their polyester counterparts, and are frequently found in applications such as pipelines and chemical storage tanks. Use of wollastonite in high fraction will reduce the cost of composite and improve tensile strength, impact properties and dimensional stability and yield. High aspect ratio resulting on these wollastonite composites to resist machining and thus has greater surface area, better stress propagation. Reinforcement with wollastonite increases the starting crystallization temperature and induces a shorter processing time in injection molding and thus the effect of crystallinity of the composite for this reason the reinforcement of rotational molded articles with wollastonite is of the interest for research. These materials exhibits increase in flexural modulus, HDT, superior dimensional stability, reduced cost and ease processability. A certain mechanical properties such as strength or modulus of a hybrid system consisting of two single systems can be predicted by the rule of hybrid mixtures as explained earlier. The present work aims to develop chopped carbon fiber and particulate type wollastonite fiber reinforced polyester composites. The composites were prepared by extrusion compounding and using injection moulding techniques [11-20]. In the present research the effects of hybridization by chopped carbon fiber and wollastonite on the tensile and flexural properties of the hybrid PE/CF/WF composites were studied. Since the mechanical properties of carbon fibers and wollastonite differ greatly, the hybrid effect would likely to exist for their hybrid reinforced composites. The hybrid effects have been calculated using the rule of hybrid mixtures for the tensile strength, modulus, flexural strength and modulus.

II. METHODS AND MATERIAL

Polyester (Ecmalon 9911,Ecmas Hyderabad, with 2% cobalt accelerator, catalyst 50% methyl ethyl ketone peroxide (MEKP) in 10% DMA solution, ratio of the resin/accelerator/catalyst:100/2/2. The resin has a density of 1335 kg/m^3, Young's modulus of 450 MPa, tensile strength of 15.3MPa and elongation at break of 3.3%. The grade of wollastonite fiber (WF) used for preparing different compositions was Fillex-11AB3 (surface treated), supplied by Wolkmen India Limited [12, 13]. Tensile strength, three point bending tests were carried out on par with ASTM D 53455. Tensile and flexural tests were performed on Instron universal testing machine (3369). Impact strength of samples was measured on the model number of machine Zwick according to ASTM D 53433. All the tests were accomplished at a room temperature of 20 °C. At least five samples were tested for each composition and results were averaged. Impact properties were measured in accordance with ASTM D256. The notched Izod test is best applied in determining the impact resistance for many parts with many sharp corners, such as ribs, intersecting walls and other stress concentrator components [15]. The izod strength of notched/un-notched specimens were conducted the impact energy used to break a notched/unnotched specimen is divided by the thickness of the specimen at the notch. It is expressed in kilojoules per meter (kJ/m). Scanning electron microscopy (SEM) studies of the fractured surface of the tensile specimen were carried out on a Jeol (6380LA, Japan). The specimen was sputter-coated with gold to increase surface conductivity. The length of 400–500 carbon and wollastonite fibers from each sample were measured separately and recorded with software [20].

Preparation of the Hybrid Composites

Firstly predetermined amount of polyester resin (matrix) was taken in a by weight based on the mould volume and then mixed with matrix/ promoter/accelerator as 100:2:2 stoichiometric ratios. This solution mixed thoroughly with the help of injection moulding machine.

Table 1 : Illustrations of specimen composites prepared by rule of hybrid mixtures

S.No.	PE (% by wt.)	CF (% by wt.)	WF (% by wt.)
A	100	0	0
B	60	40	0
C	60	30	10
D	60	20	20
E	60	10	30
F	60	0	40

Once it is conform that it is going to form gel then it is going to pour into the a 1/3ed layer of this modified solution on the mould, then carbon and wollastonite fibers are stacked in the randomly oriented direction and make sure that fiber spreads in all directions and then the remaining polyester solution has to poured all over the mould. Using roller a thin OHP sheet is spread all over the top surface of the mould then weight of 50kg load is placed above the OHP sheet [7, 8]. This weight facilitates the uniform distribution of matrix all over the mould, and mirror surface finish when compared with the bottom surface. Carbon and wollastonite fiber are stacked based on the **Table 1** demands. Injection pressure, temperature and back pressures are maintained as mentioned in the **Table 2**.

III. RESULT AND DISCUSSION

The results obtained from mechanical tests are shown in **Table 3**. The results are also obtained graphically in **Figure 1**. It has been found from data that with the incorporation of 40% carbon fiber (specimen B), the tensile strength, tensile modulus, values increased sharply when compared to unfilled material indicating the stiffening effect of carbon fiber.

Table 2 Assumptions made in the injection moulding machine parameter for PE/CF/W composites.

Injection Pressure (%)	Holding pressure (%)	Back pressure	Injection speed	Pressure (N/mm^2)	Injection Temp.(ºC)
64	63	4	80	165-210	70

On the other hand with the incorporation of wollastonite fiber from 10% to 30% by wt, the above values are found to decrease gradually with respect to (specimen B), indicating lower stiffening effect of wollastonite fiber in comparison to carbon fiber.

Sample No.	Tensile strength (MPa)	Tensile modulus (MPa)	Elongation at maximum force (%)	Flexural strength (MPa)	Flexural modulus (MPa)	Impact strength (J/m)
A	40.10	414.52	11.52	43.21	1571.66	28.75
B	43.25	645.63	7.42	57.87	3708.42	34.24
C	41.04	563.20	8.85	56.41	3625.02	26.70
D	39.23	538.96	7.85	55.74	3404.86	26.89
E	38.75	594.52	8.05	54.11	3307.56	27.56
F	37.8	963.48	9.24	53.88	3746.05	28.96

Table 3 Mechanical properties of PE/CF/W composites

When compared (specimen A) with (specimen F), it has been observed that there is a little change in tensile strength value between (specimen A) and (specimen F), but the values of tensile modulus of (specimen F) have been found to be higher than that of (specimen F). It has also been found that for the composites (B to F) yield lower values of tensile modulus. On the basis of the above results the authors are of the opinion that the addition of wollastonite content by reducing carbon fiber partially the degree of amorphous nature of polyester decreases.

Length classes(μm)	VfCF=40%Vf(WF)0%	Vf(CF)=30%Vf(WF)=10%		Vf(CF)=20%Vf(WF)=20%		Vf(CF)=10%Vf(WF)=30%		Vf(CF)=0%Vf(WF)=40%
	CF	CF	WF	CF	WF	CF	WF	WF
0-2	0	0	0	0	0	0	0	0
2-4	0	0	0	0	0	0	0	0
4-6	0	0	0.05	0	0.05	0	0	0
6-10	0	0	0.19	0	0.06	0	0.13	0.15
10-20	0.11	0.04	0.42	0.09	0.19	0.09	0.25	0.26
20-40	0.14	0.15	0.41	0.06	0.25	0.05	0.33	0.23
40-60	0.21	0.12	0.05	0.14	0.27	0.16	0.27	0.19
60-80	0.23	0.39	0	0.16	0.09	0.19	0.09	0.12
80-100	0.18	0.05	0	0.15	0.2	0.15	0.1	0.12
100-120	0.16	0.17	0	0.23	0	0.23	0	0.06
120-140	0.05	0.06	0	0.06	0	0.05	0	0.05
140-160	0.07	0.04	0	0.15	0	0.16	0	0
160-180	0.03	0.02	0	0.04	0	0.05	0	0
180-200	0.03	0.08	0	0.04	0	0.07	0	0
200-260	0.05	0.05	0	0.03	0	0.04	0	0
>260	0	0	0	0	0	0	0	0
Mean fiber length(μm)	78.5	110.2	25.36	98.5	40.5	103.8	42.5	48.62

Table 4 Relative frequencies of fiber concentrations.

Tensile stress strain curves of hybrid composites exhibit brittle fracture and show linear deformation under high stress. Measurements of flexural strength and modulus are graphically shown in the **Figure 2**. Flexural strength was increased up to specimen B where after that strength was decreased. On other hand flexural modulus was gradually increases right from the specimen A to specimen F and it was noticed that Specimen F got maximum strength. This non-linear deformation behavior may be related to (1) interfacial microfailure at the fiber ends would have occur in the composites, (2) the microfailure propagates along the fiber lengths, (3) plastic deformation bands in the matrix were observed, and (4) crack opening occurs in the band and the crack grows slowly through the band was observed by Ashok Kumar et al [5].
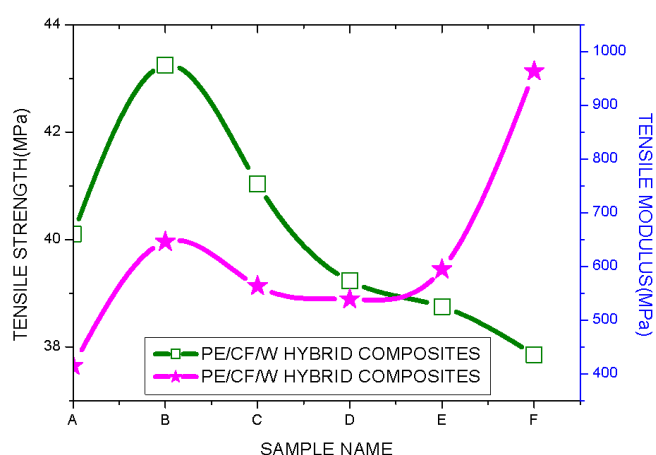

Figure 1: Measurements of tensile strength and tensile modulus of failure strain of the sample.

Finally the catastrophic crack propagation takes place through the matrix pulling out the fibers from the matrix.

The curves shift from right side to left side as the relative wollastonite fiber volume fraction increases. This is due to the fact that the modulus of wollastonite fibers is higher than the matrix but when compared to the glass fibre composite the modulus shows a slight change with the increase in relative wollastonite volume fraction [17]. Moreover, the failure strain of the hybrid composites increases with increasing in relative wollastonite fibre volume fraction as shown in **Figure 2**. This may be partially attributed to the less brittle nature of wollastonite fiber compared to carbon fiber. Furthermore as the wollastonite fiber volume increases there is no significant increase in the strength of the composites. Impact strength was increased for specimen B maximum when compared with the other specimens was shown in the **Figure 3**.

Figure 3 : Measurements of impact strength of failure strain of the sample.
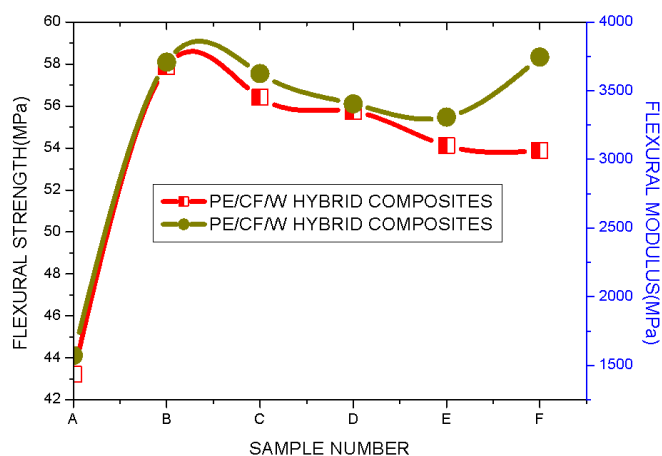
Figure 2 : Measurements of flexural strength and flexural modulus of failure strain of the sample.

The effect of relative wollastonite fiber volume fraction on the mean wollastonite and carbon fiber lengths is presented in **Table 4** & **Figure 4** where the total glass and wollastonite fiber fraction is fixed at 40%. It is of interest to note while observing the trends in mean fiber lengths of both the fibers that with the increase of relative wollastonite fibre volume fraction decreases the mean fibre length relative than the wollastonite fibre due to wollastonite interaction. The carbon fiber and wollastonite fiber length distributions are presented in **Figure 5** which show that fibre length distributions of both carbon and wollastonite fibers shift towards left side as the relative wollastonite fiber volume fraction increases. This figure depicts the cumulative distribution of the fillers in matrix that leads to further study of the fibre distribution.
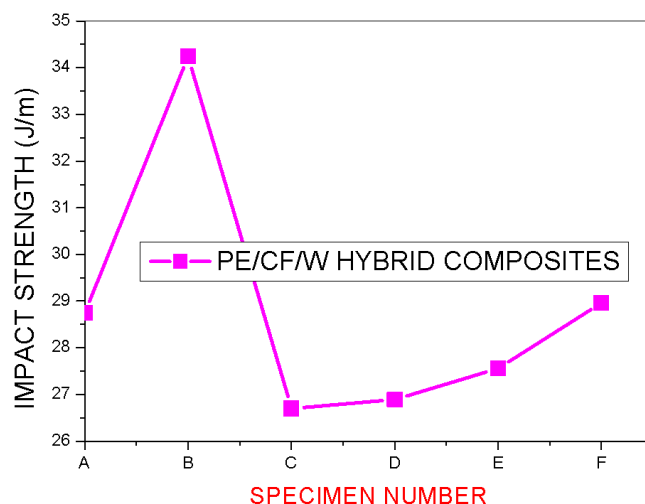
Figure 6 represents the SEM micrographs of fracture surfaces of hybrid composites (specimen D) and (specimen F). The brittle fracture can be easily seen in the composites. It is observed that the short carbon fibre and wollastonite were intimately mixed in the matrix and are distinguishable. Both the figures show that most of the carbon fibers are pulled out. Further it is observed fibers are preferentially aligned in flow direction for these injection molded specimens.

The orientation of fibers is observed morphologically on the specimen sections as shown in **Figure 6** which is the micrographs selected arbitrarily but is a typical one. For both single fibre reinforced and hybrid composites, the fibers are preferentially aligned along the flow direction. This has also been observed in earlier short fiber studies [18].
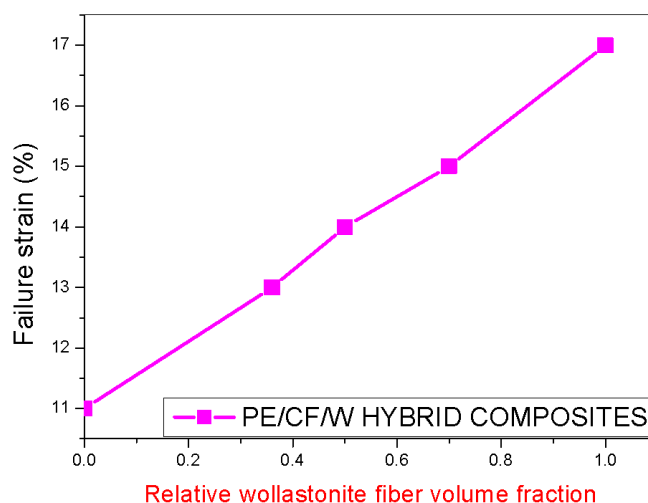

Figure 4 : Measurements of relative fiber volume fractions of failure strain of the sample.

Fiber length measurements were performed by following manually fiber image traces from morphological pictures using Zeiss computerized microscope. Figures below show the results of the RoHM prediction and the strength of hybrid PE/CF/WF composites. **Figure 7** (a) and (b) shows the results of the tensile strength of the hybrid composite. It was observed that, ultimate strength was significantly improved by the incorporation of carbon and mineral fibers. Since the fibers were preferentially aligned in flow direction for these injection molded specimens (see SEM images), in broader view the fiber orientation can be assumed roughly unchanged with the fiber volume fraction. When the relative wollastonite fiber volume fraction increased, there is a slight variation in the mean carbon and wollastonite fiber lengths. When the changes in fiber length were considered to affect, the strength of hybrid composites which was predicted using RoHM as described earlier [12].
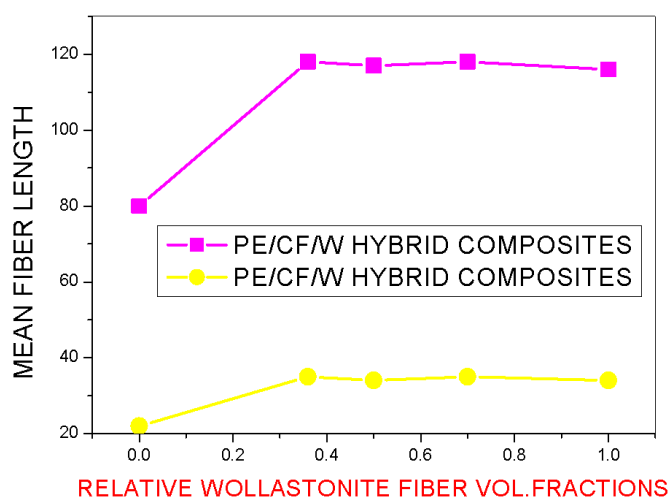

Figure5: Relative wollastonite fiber volume fractions of Vf(WF)/Vf(total).

The predicted values of the tensile strength and modulus measurements for hybrid composite are presented in **Figure 8 (a) and (b).** It can be seen that the experimental values of the ultimate strength of the hybrid composite lie slightly above the predicted values. Thus strength studies exhibits a positive deviation from predicted volumes using and which is evident of fibre addition. Since the wollastonite fiber is slightly less stiff compared to that of carbon fiber and the mean aspect ratios of wollastonite fiber composites were lesser than those of carbon fibers.
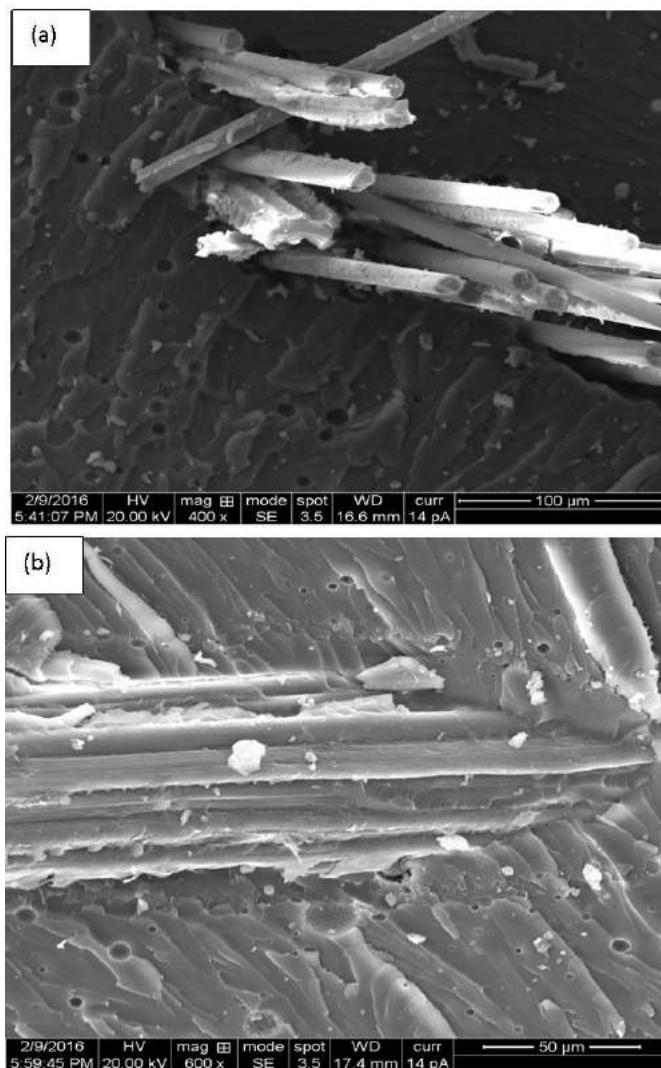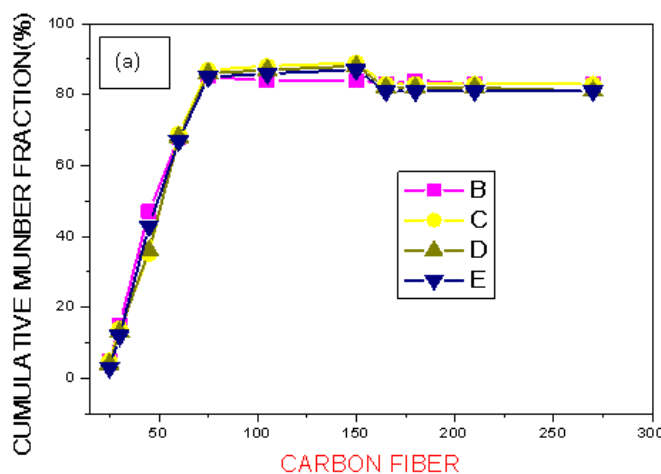

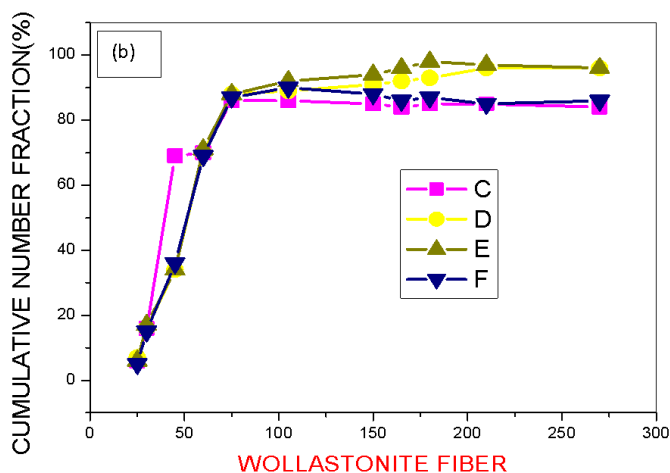**Figure 6:** Scanning electron microscope images of specimens of (a) D and (b) F

Figure 7: (a) Carbon fiber (b) Wollastonite fiber length distributions of PE/CF/WF hybrid composites.

In the presence of Thus according to the stress transfer theory [16] interfacial debonding would have taken place first at wollastonite fiber ends. Leading to microcrack creation we can say that wollastonite fibers are the source for the micro cracks. As the applied tensile strain or load is increased these cracks propagate along the fibre length and also across neighboring matrix. Carbon fibers these cracks would be bridged by these mineral fibers, allowing the wollastonite fibers to have a slightly larger contribution to the tensile strength of hybrid composites than that of single wollastonite reinforced composites.
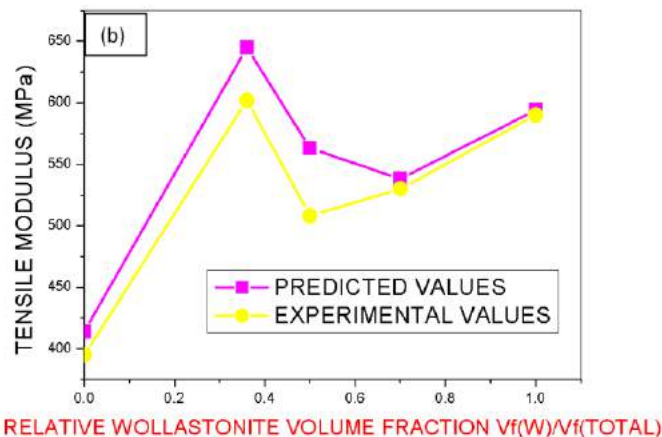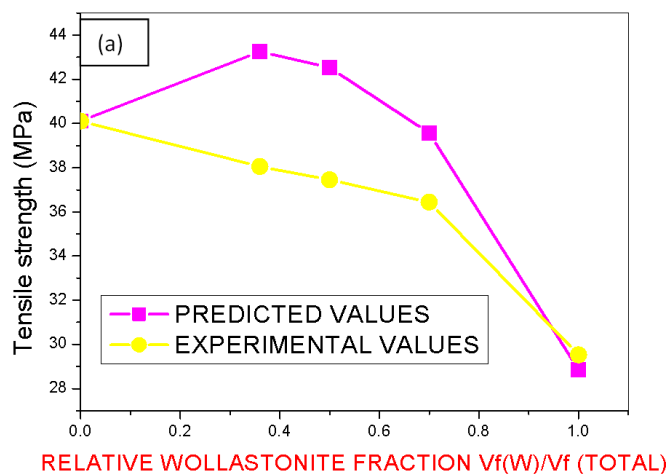

Figure 8: Comparison of experimental values with predicted values (a) tensile strength and (b) modulus of PE/WF/CF hybrid composites.

As a result, a slight encouraging strength of hybrid composites is observed with the addition of these fibers. **Fig. 8(b)** shows the case of tensile modulus. Since carbon fibers are stiffer than wollastonite, modulus was observed to increase with the 100% relative volume of carbon fiber and as wollastonite replaces carbon fiber partially composite modulus decreases with increasing relative wollastonite volume fraction. It can be observed from the figure that modulus of hybrid composites is greatly improved by the addition of both carbon fibers and wollastonite fibers. The modulus decreases slightly with the increase in relative wollastonite volume fraction. The predicted values according to mixture rule lie above the experimental values, indicates that the modulus exhibits a negative deviation from the mixture rule.

IV. CONCLUSION

The mechanical properties of injection molded hybrid polyester composites reinforced with short carbon fibers and wollastonite fibers have been investigated. The results have shown that the tensile strength, tensile modulus, flexural strength, flexural modulus and impact strength of hybrid composites are closed agreement with composites. The elongation at ultimate load and failure strain of the hybrid composites increases slightly with increase in relative wollastonite fibre volume fraction. The effects of fibre reinforced have been studied on the tensile properties of the hybrid composites. A positive effect has been observed in the ultimate strength while negative effect was noted for the tensile modulus.

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Aging Characteristics of Binary Concrete Filled With Fly Ash/Plasticizers on Compressive Strength

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ABSTRACT

In the present research presents the performance of binary concrete when filled with fly ash and plasticizers were discussed based on the soaking water in predetermined no of days such as 3, 7 and 28 days respectively. Compressive strength was evaluated for both fly ash filled concrete and super plasticizers. Hand layup technique was used to prepare the composites. Super plasticizers were proved that when the concrete filled with them with less weight ratio 1.5wt.% itself they showed good results when compared with fly ash filled binary concrete.

Keywords: Concrete, Fly Ash, Super Plasticizers, Compressive Strength

I. INTRODUCTION

It has been above 70 years to research and use fly ash. With its application, the action mechanism of fly ash had been recognized. During the initial stage, only its pozzolanic activity is paid attention. Many researchers devoted themselves to the research of the potential activity of fly ash and the hydration process of fly ash cement. With the deepening of the cognition for fly ash properties, some people found that the particles of fly ash have the morphology that is different to other pozzolanic materials. It is the unique particle morphology to make it have the ability reducing water, which other pozzolanic materials do not have. It influences not only the rheological property of fresh mortar but also the initial structure of hardened cement stone. Jan de Zeeuw and Abersch in the end of 1970s put forward that the role of fly ash, which its particle size is less than 30 , may be similar to that of the micro-particle of un hydrated cement in cement stone. Danshen et al., were summarized (1981) the previous research results and put forward the hypothesis of "fly ash effects." They considered that fly ash has three effects in concrete, i.e., morphological, activated and micro aggregate effects. The three effects are relative each other. This shows that the morphological effect is the important aspect of fly ash effects. The morphological effect means that in concrete, mineral-powdered materials produce the effect due to the morphology, structure and surface property of the particle and the particle size distribution. From the influence of fly ash on the properties of cement-based materials, the morphology effect includes three aspects: filling, lubricating and well distributing. These roles depend on the shape, size distribution, etc., of fly ash and influence many properties of concrete. Dayal and Sinha (1999) have reported the specific gravity of Indian coal ashes to range between 1.94 and 2.34 with a mean value of 2.16 and standard deviation of 0.21. The specific gravity of fly ash decreases as the particle size increases. The specific gravity increases when the fly ash particles were crushed. Typical values of the specific surface of Indian fly ashes (3267 to 6842 cm2/g) were comparable with that of the foreign ashes (2007 to 6073 cm2/g).Diamond 1986 studied the fly ash contained spherical particles of wide size range about 1m to more m with smooth surface. Some of the particles were covered with surface irregularities or deposits. The interior structure of a particle revealed the presence of iron rich magnetic grain on a sphere and in the adjacent

sphere needle shaped particles of mullite crystals were present. Garg (1995) studied the morphology of Indian fly ashes. The fly ashes contained angular as well as rounded black particles, spheroid glass, and minute silica grains. Sharma (1993) has classified Indian fly ashes based on the shape of particles as one of the parameters. According to him group-fly ashes contained mainly spherical particles with the size range between 2-25m. The surfaces of glassy spheres in this group are predominantly smooth without any deposit, only some adherence was observed. Poon, C.S.,et al.(2002) Low calcium fly ash (ASTM Class F) has been widely used as a replacement of cement in normal and high strength concrete. In normal strength concrete, the replacement level can be more than 50%, while in high strength concrete, the replacement level is usually limited to 15± 25%. According to ASTM C 618-89, fly ash, or pulverized fuel ash (PFA) in the U. K., is a "finely divided residue that results from the combustion of ground or powdered coal." It is primarily the inorganic portion of the source coal in a particulate form. The amount of literature concerning fly ash is considerable, including an ASTM standard (C 311-89) for sampling and testing fly ash for use as an admixture in Portland cement concrete. A number of standards exist which specify the desired properties of the fly ash. In the United States, ASTM C-618 is the standard. The hydraulic behavior of a fly ash is influenced by (1) its carbon content, which should be as low as possible; (2) its silica content, which should be finely divided and as high as possible; and (3) its fineness, which should be as high as possible Orchard 1973b. Fly ash is normally produced by burning coals which have been crushed and ground to a fineness of 70 to 80% passing a 75µm sieve. Different types of coal produce different quantities of ash. Depending on the concentration of mineral matter in that type of coal the ash content of the coal used in the western countries is generally less than 20% as the coal is processed prior to delivery at the power point, while in India the ash content of coal used is as high as 50% as the coal contains a higher percentage of rock and soil. Two kinds of fly ash are produced from the combustion of coal are Class C - High, more than 10%, calcium content produced from sub-bituminous coal and Class F - Low, less than 10%, calcium content produced from bituminous coal. The addition of fly ash to concrete has a considerable effect on the properties of fresh concrete. There is agreement that low calcium ashes show some

retarding influence on the mix. This may be due to the fact that the cement is becoming more "diluted." The effects of fly ash on fresh concrete are well known. Workability and pump ability of concrete is improved with the addition of ash because of the increase in paste content, increase in the amount of fines, and the spherical shape of the fly ash particles. Note that this improvement in workability may not be true for coarse, high carbon fly ashes. The use of fly ash may retard the time of setting of concrete. This is especially true of Class F ashes. C lass C ash may or may not extend setting time and there are results that show reduction of setting time. Fly ash, in contrast to other pozzolans, reduces the water requirement of a concrete mix. It has been suggested that the major influencing factor in the plasticizing effect of fly ash is the addition of very fine, spherical particles. In fact, it has been shown that as the particle size increases, the plasticizing effect decreases. This indicates that some fly ashes do not improve workability. The rheology of fly ash cement pastes has been shown to behave as a Bingham model. Finally, the inclusion of some fly ashes in a mix reduce bleeding and segregation while improving finishibility. This again can be attributed --to the increased amount of fines in the mix and lower water requirement. It is reported that the use of some fly ashes causes an increase in the amount of air entraining admixture required in concrete. It is proposed that carbon in the fly ash absorbs the AEA therefore requiring more to be used as an active role in the mix. In general class C fly ashes require less AEA than class F ashes. Also, there may be an increased rate of air content loss with manipulation if this ash is used. Plasticizers or water reducers, and super plasticizer or high range water reducers, are chemical admixtures that can be added to concrete mixtures to improve workability. In order to produce stronger concrete, less water is added (without "starving" the mix), which makes the concrete mixture less workable and difficult to mix, necessitating the use of plasticizers, water reducers, super plasticizers or dispersants. Plasticizers are also often used when pozzolanic ash is added to concrete to improve strength. This method of mix proportioning is especially popular when producing high-strength concrete and fiber-reinforced concrete. Adding 1-2% plasticizer per unit weight of cement is usually sufficient. Adding an excessive amount of plasticizer will result in excessive segregation of concrete and is not advisable. Depending on the

particular chemical used, use of too much plasticizer may result in a retarding effect. Super plasticizers have generally been manufactured from suffocated naphthalene condensate or sulfonatedmelamine formaldehyde, although newer products based on polycarboxylic others [1-14]. The main objectives of using fly ash in high strength concrete are to reduce heat generation and to obtain better durability properties. However, in concrete mixes prepared at a low water-to-binder (w/b) ratio, 20% fly ash content may not be sufficient to suppress the excessive heat of hydration. Manz and others (1982) have suggested that high-calcium fly ashes (Class C ashes) are best distinguished from the low-calcium (Class F) ashes by the incrementing properties. Thus, a general term 'mineral admixtures' has been suggested to describe all classes of slags, ashes, pozzolans and other cement supplements, with a further distinct on being drawn the basis of their self-cementing capabilities. The above form of classification has been proposed as being preferable to the current division of fly ashes. Ramezanianpour, (1994) Haw ever the terminology, 'high-calcium' and 'low calcium have been used in this study, in general, and Class C and Class F, while referring reporting the type of fly ashes actual used by various researchers, in their investigations. Tcnoutasse and Marion (1986) investigated the selective dissolution of different Began low-calcium fly ashes with water, hydrochloric acid solutions by chemical and microscopically techniques. 'The behavior of fly ashes was also studied in lime-saturated solution. The hydration mechanism was investigated as a function of time, for OPC and OPC' containing 10% to 80% of fly ashes. Cannon (1968) research carried out on the methods of proportioning fly ash concrete mixtures to obtain equal strength to those of conventional control mixtures. Cannon employed Abrams' law and a factor that accounted for the relative costs of fly ash and concrete. Rosen (1976), Gosh (1976) and Popovers (1982) extended the above concept to develop mixture proportions for fly ash concrete.Ghoul (1976) approach, are the standard guidelines available for proportioning pozzolana cements. U.K., Munday and others (1983) proposed a procedure for obtaining any desire strength at 28 days, which requires the collection of data, for a fly ash source. Brown (1982) found that both slump and vee-bee time improved increased substitutions and the changes were found to depend on the level of ash substitution on the water content. He also observed an increase in workability up to 8%replacement of sand or aggregate by ash. Further increase in the percentage replacement caused a rapid decrease in workability. The main objective of thesis is to investigate the strengthen characteristics of the concrete using different proportions of fly ash and super plasticizers. Here fly ash is a product of pulverized coal, considered as a waste by product finding difficulty to be disposed off. Using different proportions of fly ash the maximum strength can be reached in certain proportion of fly ash value. Similarly, super plasticizers are also using different proportions the maximum strength can be reached certain proportion of super plasticizers. The scope of the study is to know the properties of the fly ash and super plasticizers in different proportions. It can be used for find the strength values and find out the maximum strength of the concrete.

II. METHODS AND MATERIAL

Materials used in Binary Concrete concrete are Cement, Fine aggregate, Coarse aggregate; Water, Fly ash, and Super plasticizer were used. Zuari 43 grade ordinary Portland cement is used for casting the elements. The following test are conducted such as Fineness test, Standard consistency test, Initial setting time test, Final setting time test, Specific gravity test, Compressive strength test were conducted. In this study we can find out the various tests like compressive strength, split tensile strength and flexural strength are done. The strength properties are done M40 grade concrete mix design. The advantage of binary concrete can be enhanced by substituting some of the cement with other materials, such as fly ash. Fly ash is one of the by-products coal combustion in power generation plants. Large amount of fly ash are discarded each year, increasing costs for disposal. On the other hand, fly ash has been shown to improve the overall performance of concrete, when substituted for a portion of the cement. In same manner super plasticizers is also added different proportions the maximum strength can be reached certain proportion of super plasticizers. Then the maximum strength can be given at a certain proportion of adding fly ash and super plasticizers at various tests. These tests based on we can identified strength of concrete in addition of fly ash and super plasticizers.

Results of the cement are tabulated in the **Table 1** as mentioned below.

Table 1 Test Results on Cement

S.NO	TEST NAME	RESULT		
1	sieve test	8 %		
2	standard consistency	29 %		
3	Initial setting time	52 min		
4	Final setting time	480 min		
5	Specific gravity test	3.15		
		3 days	7 days	28 days
6	Compressive strength	N/mm^2	N/mm^2	N/mm^2
		22.12	30.12	44.23

In this investigation fine aggregate is naturally available sand and it is free from dirt, dust and any organic matter. The fine aggregate used for the project was obtained from Penna river .The following tests were conducted on the sand such as Sieve analysis, Bulking of sand by volume method, Specific gravity test. **Table 2** indicates the results of the fine aggregates as mentioned below.

Table 2 Test result on fine aggregate

S.NO	TEST NAME	RESULT
1	Sieve analysis	Zone III
2	Bulking of sand by volume method	12.5%
3	Specific gravity test	2.51
4	Relative density	45% (medium dense)

In this investigation hard broken granite aggregate is used. The size course aggregate is various from12 mm to 20 mm. The source the aggregates is Srikalahasti. The following tests like sp. gravity test, fineness modulus test, water absorption test, aggregate impact test, and aggregate crushing strength tests were conducted. The final results thereof as mentioned below in the **Table 3.**

Table 3 Results of the course aggregates of the filler.

S.NO	TEST NAME	RESULT
1	Fineness modulus	7.5
2	Specific gravity	2.33
3	Water absorption	2.1%
4	Crushing strength	22.43%
5	Impact test	28.12%

The following tests of fly ask such as Moisture content, Loss on ignition, Silicon oxide content, Alumina oxide content, Calcium oxide content, Chloride content, Free calcium oxide content, Total alkali oxides content, Particle density determination (by Pycnometer bottle and Le-Chatlier Flask methods), Fineness determination (by dry sieving, wet sieving, Blaine air permeability and laser methods) were conducted. The following tests for fly ash cement pastes, mortars, or concretes are outlined and they are namely Soundness (expansion test), water requirement (expressed as water content of test specimen divided by water content of control specimen to achieve equal specified consistencies), Preparation and curing of specimens, determination of compressive strength (28 days).

III. RESULT AND DISCUSSION

The following tests are conducted on binary concrete in this study for different proportions of fly ash and super plasticizer. This test was developed by Chapman at the U.S in1913, this is the simplest test and that most commonly used in on site testing and it has been referred in B.S 1881. This is used to measure the compressive strength of concrete, and it can be used in laboratory. The apparatus for conducting the compressive strength test essentially consists of 40t U.T.M., weighing balance, scale, cube moulds of 15cms sides, vibrator, pan for mixing cement & sand, measuring jar, trowel, and non-porous plate. Place the green concrete in moulds in equal three layers and with vibrator. Keep the specimens in the moulds at 90% relative humidity. After curing period is completed, moisture around the specimen is wiped-out and weighs the specimen. The non-casting faces are placed in the jaws [10]. Apply the uniaxial load at a rate of 140 kg/cm^2/min up to the specimen is crushed. The ultimate load is note down. **Figure 1** shows the variation of compressive strength as a function of fly ash after 3

days indicates that the compressive strength is gradually decreases when the fly ash increases on other hand. It was also observed that the when the fly ash was 0wt.% maximum compressive strength was observed.
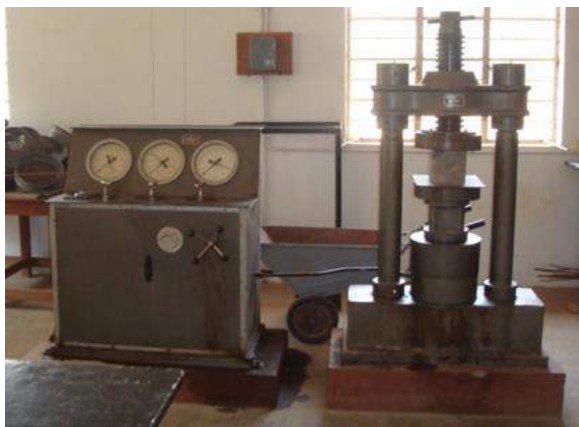

Figure 1. Compression testing machine.

Table 4 Test result on compressive strength

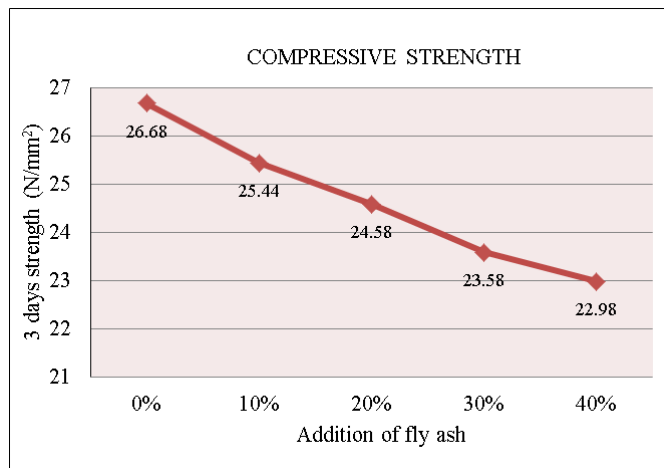| Addition of fly ash	Compressive strength(N/mm^2)		
	3 days	7 days	28 days
0%	26.68	29.77	45.77
10%	25.44	32.22	50.44
20%	24.58	34.60	52.33
30%	23.58	35.56	55.56
40%	22.98	28.25	44.23
Super plasticizers			
0%	26.68	29.77	45.77
0.50%	29.11	32.85	54.12
1%	30.01	35.98	54.85
1.50%	30.98	36.01	55.12
2%	25.12	28.12	44.85
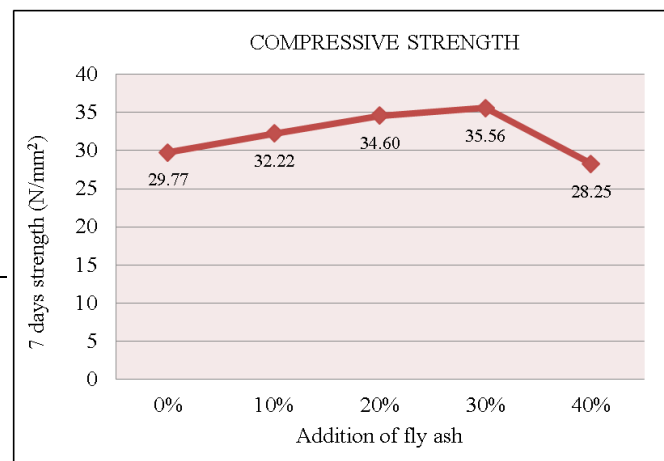
Figure 2 : Variation of compressive strength as a function of fly ash for 3 days.

Figure 2 shows the variation of compressive strength as a function of fly ash after 7days indicates that the compressive strength is gradually increases when the fly ash increases on other hand. It was also observed that the when the fly ash was 30wt.% maximum compressive strength was observe as 35.56 N/mm2 and after that compressive strength is decreased [1]. **Figure 3** shows the variation of compressive strength as a function of fly ash after 7days indicates that the compressive strength is gradually increases when the fly ash increases on other hand. It was also observed that the when the fly ash was 30wt.% maximum compressive strength was observe as

55.56 N/mm2 and after that compressive strength is decreased. When soaking days are increased as a results of that strength is gradually increases.
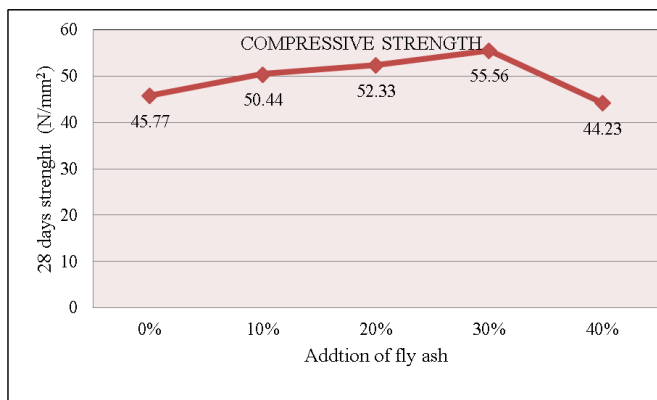

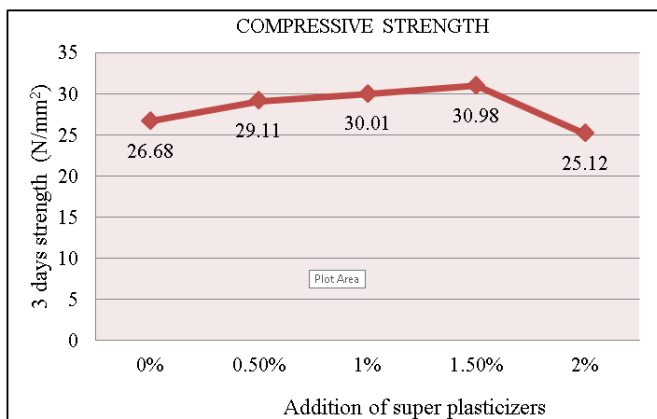**Figure 3** Variation of compressive strength as a function of fly ash for 28 days.

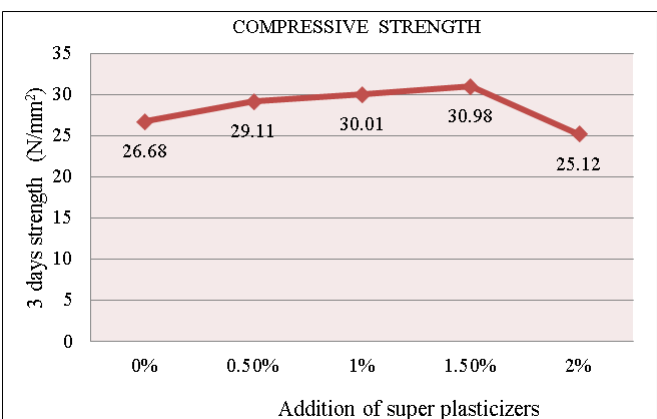**Figure 4** Variation of compressive strength as a function of super plasticizers after soaking 3 days in water.

Figure 5 Variation of compressive strength as a function of super plasticizers after soaking 7 days in water.

Figure 4 shows the variation of compressive strength as a function of fly ash after 3days indicates that the compressive strength is gradually increases when the plasticizers increase on other hand. It was also observed that the when the fly ash was 1.5wt.% maximum compressive strength was observe as $30.98 N/mm^2$ and after that compressive strength is decreased. When soaking days are increased as a result of that strength is gradually increases. **Figure 5** shows the variation of compressive strength as a function of fly ash after 7days indicates that the compressive strength is gradually increases when the plasticizers increase on other hand. It was also observed that the when the fly ash was 1.5wt.% maximum compressive strength was observe as $36.01 N/mm^2$ and after that compressive strength is decreased. When soaking days are increased as a result of that strength is gradually increases. **Figure 6** shows the variation of compressive strength as a function of fly ash after 28days indicates that the compressive strength is gradually increases when the plasticizers increase on other hand. It was also observed that the when the fly ash was 1.5wt.% maximum compressive strength was observe as $55.12 N/mm^2$ and after that compressive strength is decreased. When soaking days are increased as a result of that strength is gradually increases.
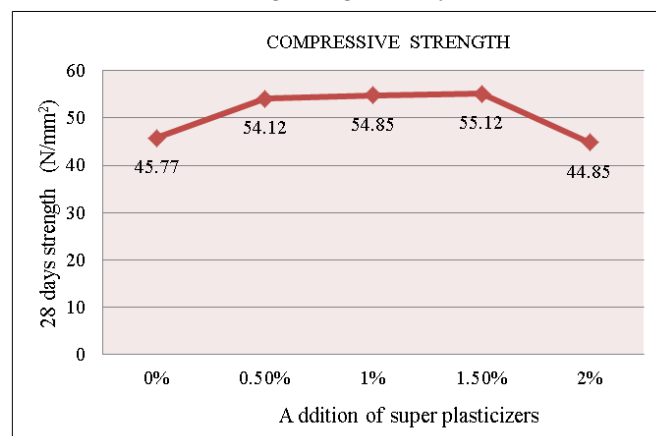

Figure 6 Variation of compressive strength as a function of super plasticizers after soaking 28 days in water.

IV. CONCLUSION

For 43 grade cement with M40 mix, by adding up to 30% of fly ash to the cement, the strength is increased and by adding 40% of fly ash the strength is decreasing. Fly ash is added at different proportions namely 0%, 10%, 20%, 30% and 40%. The test results show that on addition of 30% of fly ash to cement it has gained maximum strength at 28 days period but the rate of strength gain compared to ordinary Portland cement concrete OPCC is

at slower rate at initial days. The compressive strength increased by 22.44% when compare to normal concrete. By use of fly ash as admixture, the cost of construction is also considerably reduced. Non-biodegradable fly ash is effectively utilized in binary concrete, so it reduces the disposal problem of fly ash. For 43 grade cement with M40 mix, by adding 0%, 0.5%, 1.0%, 1.5% of super plasticizer to the mix prepared the strength is slightly increased and at adding 2.0% of plasticizer to the mix prepared the strength will slightly decreased. The test results show that on addition of 1.5% of super plasticizers to concrete it has gained maximum strength at 28 days period. The compressive strength increased by 20.22%, split tensile strength increased by16.32% when compare to normal concrete. Super plasticizer may not increase the strength of concrete directly. But it helps in reducing the w/c ratio, which in turn result in the increase of strength of concrete due to reduction of w/c ratio. It is concluded that when compare to super plasticizer, fly ash gives more desirable properties to concrete and ecofriendly.

V. ACKNOWLEDGEMENTS

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Utilization of Fly Ash and Super Plasticizers Filled Binary Concrete on Split Tensile Strength

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ABSTRACT

In the present research presents the performance of binary concrete when filled with fly ash and plasticizers were discussed based on the soaking water in predetermined no of days such as 3, 7 and 28 days respectively. Split tensile strength was evaluated for both fly ash filled concrete and super plasticizers. Hand layup technique was used to prepare the composites. Super plasticizers were proved that when the concrete filled with them with less weight ratio 1.5wt.% itself they showed good results when compared with flay ash filled binary concrete.
Keywords: Concrete, Flay Ash, Super Plasticizers, Split Tensile Strength

I. INTRODUCTION

It has been above 70 years to research and use fly ash. With its application, the action mechanism of fly ash had been recognized. During the initial stage, only its pozzolanic activity is paid attention. Many researchers devoted themselves to the research of the potential activity of fly ash and the hydration process of fly ash cement. With the deepening of the cognition for fly ash properties, some people found that the particles of fly ash have the morphology that is different to other pozzolanic materials. It is the unique particle morphology to make it have the ability reducing water, which other pozzolanic materials do not have . It influences not only the rheological property of fresh mortar but also the initial structure of hardened cement stone.

Jan de Zeeuw and Abersch in the end of 1970s put forward that the role of fly ash, which its particle size is less than 30 , may be similar to that of the micro-particle of un hydrated cement in cement stone. Danshen et al., in 1981 summarized the previous research results and put forward the hypothesis of "fly ash effects." They

considered that fly ash has three effects in concrete, i.e., morphological, activated and micro aggregate effects. The three effects are relative each other. This shows that the morphological effect is the important aspect of fly ash effects. The morphological effect means that in concrete, mineral-powdered materials produce the effect due to the morphology, structure and surface property of the particle and the particle size distribution. From the influence of fly ash on the properties of cement-based materials, the morphology effect includes three aspects: filling, lubricating and well distributing. These roles depend on the shape, size distribution, etc., of fly ash and influence many properties of concrete. Dayal and Sinha (1999) have reported the specific gravity of Indian coal ashes to range between 1.94 and 2.34 with a mean value of 2.16 and standard deviation of 0.21. The specific gravity of fly ash decreases as the particle size increases. The specific gravity increases when the fly ash particles were crushed. Typical values of the specific surface of Indian fly ashes (3267 to 6842 cm2/g) were comparable with that of the foreign ashes (2007 to 6073 cm2/g).Diamond 1986 studied the fly ash contained spherical particles of wide size range about 1m to more m with smooth surface. Some of the particles were covered with surface irregularities or deposits. The

interior structure of a particle revealed the presence of iron rich magnetic grain on a sphere and in the adjacent sphere needle shaped particles of mullite crystals were present. Garg (1995) studied the morphology of Indian fly ashes. The fly ashes contained angular as well as rounded black particles, spheroid glass, and minute silica grains. Sharma (1993) has classified Indian fly ashes based on the shape of particles as one of the parameters. According to him group-fly ashes contained mainly spherical particles with the size range between 2-25m. The surfaces of glassy spheres in this group are predominantly smooth without any deposit, only some adherence was observed. Poon, C.S.,et al.(2002) Low calcium fly ash (ASTM Class F) has been widely used as a replacement of cement in normal and high strength concrete. In normal strength concrete, the replacement level can be more than 50%, while in high strength concrete; the replacement level is usually limited to 15± 25%. According to ASTM C 618-89, fly ash, or pulverized fuel ash (PFA) in the U. K., is a "finely divided residue that results from the combustion of ground or powdered coal." It is primarily the inorganic portion of the source coal in a particulate form. The amount of literature concerning fly ash is considerable, including an ASTM standard (C 311-89) for sampling and testing fly ash for use as an admixture in Portland cement concrete. A number of standards exist which specify the desired properties of the fly ash. In the United States, ASTM C-618 is the standard. The hydraulic behavior of a fly ash is influenced by (1) its carbon content, which should be as low as possible; (2) its silica content, which should be finely divided and as high as possible; and (3) its fineness, which should be as high as possible Orchard 1973b. Fly ash is normally produced by burning coals which have been crushed and ground to a fineness of 70 to 80% passing a 75μm sieve. Different types of coal produce different quantities of ash. Depending on the concentration of mineral matter in that type of coal the ash content of the coal used in the western countries is generally less than 20% as the coal is processed prior to delivery at the power point, while in India the ash content of coal used is as high as 50% as the coal contains a higher percentage of rock and soil. Two kinds of fly ash are produced from the combustion of coal are Class C - High, more than 10%, calcium content produced from sub-bituminous coal and Class F - Low, less than 10%, calcium content produced from bituminous coal. The addition of fly ash to concrete has a considerable effect on the properties of fresh concrete. There is agreement that low calcium ashes show some retarding influence on the mix. This may be due to the fact that the cement is becoming more "diluted." The effects of fly ash on fresh concrete are well known. Workability and pump ability of concrete is improved with the addition of ash because of the increase in paste content, increase in the amount of fines, and the spherical shape of the fly ash particles. Note that this improvement in workability may not be true for coarse, high carbon fly ashes. The use of fly ash may retard the time of setting of concrete. This is especially true of Class F ashes. C lass C ash may or may not extend setting time and there are results that show reduction of setting time. Fly ash, in contrast to other pozzolans, reduces the water requirement of a concrete mix. It has been suggested that the major influencing factor in the plasticizing effect of fly ash is the addition of very fine, spherical particles. In fact, it has been shown that as the particle size increases, the plasticizing effect decreases. This indicates that some fly ashes do not improve workability. The rheology of fly ash cement pastes has been shown to behave as a Bingham model. Finally, the inclusion of some fly ashes in a mix reduce bleeding and segregation while improving finishibility. This again can be attributed --to the increased amount of fines in the mix and lower water requirement. It is reported that the use of some fly ashes causes an increase in the amount of air entraining admixture required in concrete. It is proposed that carbon in the fly ash absorbs the AEA therefore requiring more to be used as an active role in the mix. In general class C fly ashes require less AEA than class F ashes. Also, there may be an increased rate of air content loss with manipulation if this ash is used. Plasticizers or water reducers, and super plasticizer or high range water reducers, are chemical admixtures that can be added to concrete mixtures to improve workability. In order to produce stronger concrete, less water is added (without "starving" the mix), which makes the concrete mixture less workable and difficult to mix, necessitating the use of plasticizers, water reducers, super plasticizers or dispersants. Plasticizers are also often used when pozzolanic ash is added to concrete to improve strength. This method of mix proportioning is especially popular when producing high-strength concrete and fiber-reinforced concrete. Adding 1-2% plasticizer per unit weight of cement is usually sufficient. Adding an excessive amount of

plasticizer will result in excessive segregation of concrete and is not advisable. Depending on the particular chemical used, use of too much plasticizer may result in a retarding effect. Super plasticizers have generally been manufactured from sulfonated naphthalene condensate or sulfonated melamine formaldehyde, although newer products based on polycarboxylic others [1-14]. The main objectives of using fly ash in high strength concrete are to reduce heat generation and to obtain better durability properties. However, in concrete mixes prepared at a low water-to-binder (w/b) ratio, 20% fly ash content may not be sufficient to suppress the excessive heat of hydration. Manz and others (1982) have suggested that high-calcium fly ashes (Class C ashes) are best distinguished from the low-calcium (Class F) ashes by the incrementing properties. Thus, a general term 'mineral admixtures' has been suggested to describe all classes of slags, ashes, pozzolans and other cement supplements, with a further distinct on being drawn the basis of their self-cementing capabilities. The above form of classification has been proposed as being preferable to the current division of fly ashes. Ramezanianpour, (1994) Haw ever the terminology, 'high-calcium' and 'low calcium have been used in this study, in general, and Class C and Class F, while referring reporting the type of fly ashes actual used by various researchers, in their investigations. Tcnoutasse and Marion (1986) investigated the selective dissolution of different Began low-calcium fly ashes with water, hydrochloric acid solutions by chemical and microscopically techniques. 'The behavior of fly ashes was also studied in lime-saturated solution. The hydration mechanism was investigated as a function of time, for OPC and OPC' containing 10% to 80% of fly ashes. Cannon (1968) research carried out on the methods of proportioning fly ash concrete mixtures to obtain equal strength to those of conventional control mixtures. Cannon employed Abrams' law and a factor that accounted for the relative costs of fly ash and concrete. Rosen (1976), Gosh (1976) and Popovers (1982) extended the above concept to develop mixture proportions for fly ash concrete.Ghoul (1976) approach, are the standard guidelines available for proportioning pozzolana cements. U.K., Munday and others (1983) proposed a procedure for obtaining any desire strength at 28 days, which requires the collection of data, for a fly ash source. Brown (1982) found that both slump and vee-bee time improved

increased substitutions and the changes were found to depend on the level of ash substitution on the water content. He also observed an increase in workability up to 8% replacement of sand or aggregate by ash. Further increase in the percentage replacement caused a rapid decrease in workability. The main objective of thesis is to investigate the strengthen characteristics of the concrete using different proportions of fly ash and super plasticizers. Here fly ash is a product of pulverized coal, considered as a waste by product finding difficulty to be disposed off. Using different proportions of fly ash the maximum strength can be reached in certain proportion of fly ash value. Similarly, super plasticizers are also using different proportions the maximum strength can be reached certain proportion of super plasticizers. The scope of the study is to know the properties of the fly ash and super plasticizers in different proportions. It can be used for find the strength values and find out the maximum strength of the concrete.

II. METHODS AND MATERIAL

Materials used in Binary Concrete concrete are Cement, Fine aggregate, coarse aggregate, water, fly ash, and super plasticizer were used in this project. Zuari 43 grade ordinary Portland cement is used for casting the elements. The following test are conducted such as Fineness test, Standard consistency test, Initial setting time test, Final setting time test, Specific gravity test, Compressive strength test were conducted. In this study we can find out the various tests like compressive strength, split tensile strength and flexural strength are done. The strength properties are done M40 grade concrete mix design. The advantage of binary concrete can be enhanced by substituting some of the cement with other materials, such as fly ash. Fly ash is one of the by-products coal combustion in power generation plants. Large amount of fly ash are discarded each year, increasing costs for disposal. On the other hand, fly ash has been shown to improve the overall performance of concrete, when substituted for a portion of the cement. In same manner super plasticizers is also added different proportions the maximum strength can be reached certain proportion of super plasticizers. Then the maximum strength can be given at a certain proportion of adding fly ash and super plasticizers at various tests. These tests based on we can identified strength of

concrete in addition of fly ash and super plasticizers. Results of the cement are tabulated in the **Table 1** as mentioned below.

The mathematical editor on which along with text you can also write

Table 1   Test results on cement

S.NO	TEST NAME	RESULT		
1	sieve test	8 %		
2	standard consistency	29 %		
3	Initial setting time	52 min		
4	Final setting time	480 min		
5	Specific gravity test	3.15		
6	Compressive strength	3 days N/mm^2 22.12	7 days N/mm^2 30.12	28 days N/mm^2 44.23

In this investigation fine aggregate is naturally available sand and it is free from dirt, dust and any organic matter. The fine aggregate used for the project was obtained from Penna river .The following tests were conducted on the sand such as Sieve analysis, Bulking of sand by volume method, Specific gravity test. **Table 2** indicates the results of the fine aggregates as mentioned below.

Table 2 Test result on fine aggregates

S.NO	TEST NAME	RESULT
1	Sieve analysis	Zone lll
2	Bulking of sand by volume method	12.5%
3	Specific gravity test	2.51
4	Relative density	45% (medium dense)

In this investigation hard broken granite aggregate is used. The size course aggregate is various from12 mm to 20 mm. The source the aggregates is Srikalahasti. The following tests like sp. gravity test, fineness modulus test, water absorption test, aggregate impact test, and aggregate crushing strength tests were conducted. The final results thereof as mentioned below in the **Table 3.**

Table 3 Evaluation of course aggregates concrete composites

S.NO	TEST NAME	RESULT
1	Fineness modulus	7.5
2	Specific gravity	2.33
3	Water absorption	2.1%
4	Crushing strength	22.43%
5	Impact test	28.12%

The following tests of fly ask such as Moisture content, Loss on ignition, Silicon oxide content, Alumina oxide content, Calcium oxide content, Chloride content, Free calcium oxide content, Total alkali oxides content, Particle density determination (by Pycnometer bottle and Le-Chatlier Flask methods), Fineness determination (by dry sieving, wet sieving, Blaine air permeability and laser methods) were conducted. The following tests for fly ash cement pastes, mortars, or concretes are outlined and they are namely Soundness (expansion test), water requirement (expressed as water content of test specimen divided by water content of control specimen to achieve equal specified consistencies), Preparation and curing of specimens, determination of compressive strength (28 days).

III.   RESULT AND DISCUSSION

The following tests are conducted on binary concrete in this study for different proportions of fly ash and super plasticizer.

Split Tensile Strength Test:

This test was developed by Chapman at the U.S in1913, this is the simplest test and that most commonly used in on site testing and it has been referred in B.S 1881. This is used to measure the compressive strength of concrete, and it can be used in laboratory. The apparatus for conducting the compressive strength test essentially consists of 40t U.T.M., weighing balance, scale, cube moulds of 15cms sides, vibrator, pan for mixing cement & sand, measuring jar, trowel, and non-porous plate. Place the green concrete in moulds in equal three layers and with vibrator. Keep the specimens in the moulds at 90% relative humidity. After curing period is completed, moisture around the specimen is wiped-out and weighs the specimen. The non-casting faces are placed in the

jaws [10]. Apply the uniaxial load at a rate of 140 kg/cm²/min up to the specimen is crushed. The ultimate load is note down. **Figure 5** shows the variation of split strength as a function of fly ash after 3 days soaking in the water conforms that the tensile strength is gradually increases when the fly ash increases on other hand. It was also observed that the when the fly ash was 30wt.% maximum tensile strength was observed as 2.75N/mm² and after that strength was decreased. **Figure 6** shows the variation of tensile strength as a function of fly ash after 7days soaked in the water was indicates that the tensile strength is gradually increases when the fly ash increases on other hand. It was also observed that the when the fly ash was 30wt.% maximum tensile strength was observe as 3.08 N/mm² and after that tensile strength is decreased [12].

This test was developed by BRAZILAN at japan in 1943, this is the simplest test and it has been referred in ASTM 496.This method is used to measure the tensile strength of concrete, and it is a laboratory test.
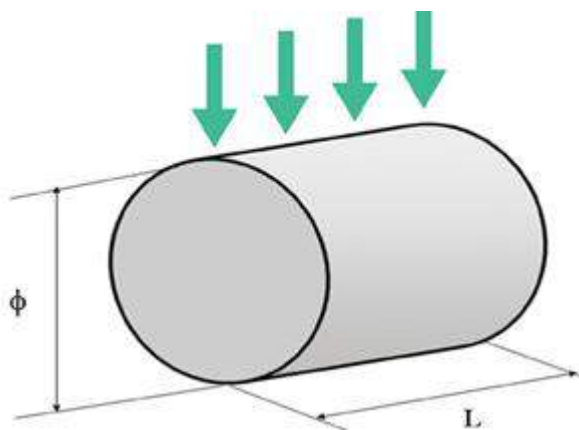
Figure 2. Application of load on cylinder

The apparatus for conducting the split tensile strength test essentially consists of 40t U.T.M., weighing balance, scale, cylinder of size 15 cm diameter and height 30 cm, vibrator, measuring jar, pan for mixing cement & sand, trowel, and non-porous plate. The test is carried out by placing a cylinder specimen horizontally between loading surface of the tensile testing machine. The load is applied till the failure of the specimen. The compressive stress is acting for about 1/6th depth and remaining 5/6th depth is subjected to tension. Metal strip 25 mm wide, 5mm thick and 30 mm long is used as packing to allowing distribution of load over a

reasonable area. This will reduce high compressive stress near the point's application of load.

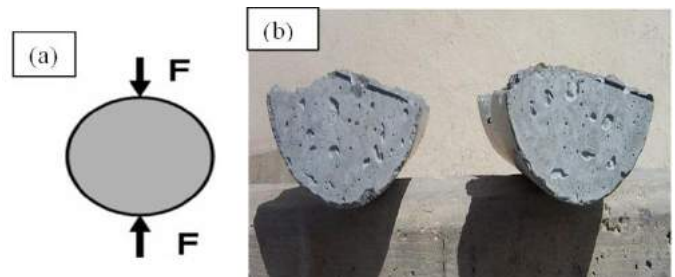Split tensile strength $f = \frac{2p}{\pi dl}$

Figure 3 Nature of (a) force applied on the splitted cylinder and (b) fractured cylinder after load is applied.

Figure 4 Illustration of compressive strength testing machine with cylindrical shape binary concrete.

Table 4 Variation of split tensile strength as a function of fillers

Specifications	Split tensile strength (N/mm²)		
Addition of fly ash	3 days	7 days	28 days
0%	2.26	2.50	3.00
10%	2.40	2.68	3.51
20%	2.60	2.90	3.53
30%	2.70	3.08	3.70
40%	2.16	2.55	2.8
Super plasticizers			
0%	2.26	2.67	2.9

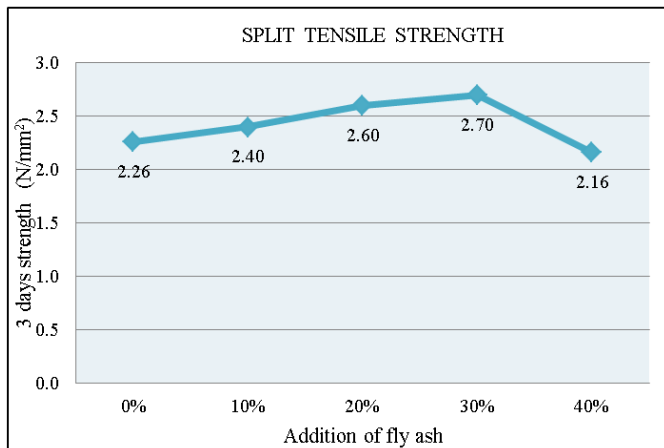|			
0.50%	2.70	3.20	3.54
1.0%	2.87	3.35	3.68
1.50%	2.96	3.45	3.72
2.0%	2.22	2.54	2.85

Figure 5 Variation of tensile strength as a function of fly ash when binary concrete soaked in to water for 3 days.
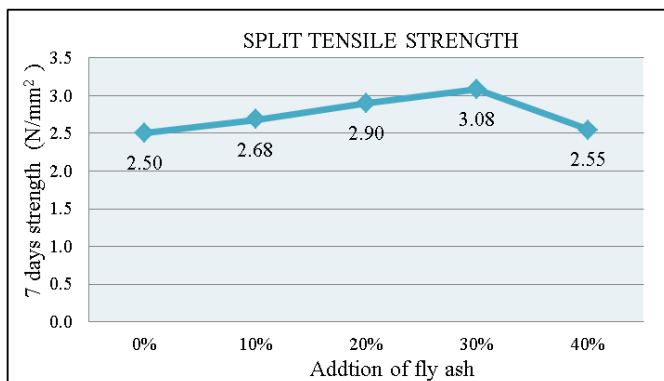

Figure 6 Variation of tensile strength as a function of fly ash when binary concrete soaked in to water for 7 days.
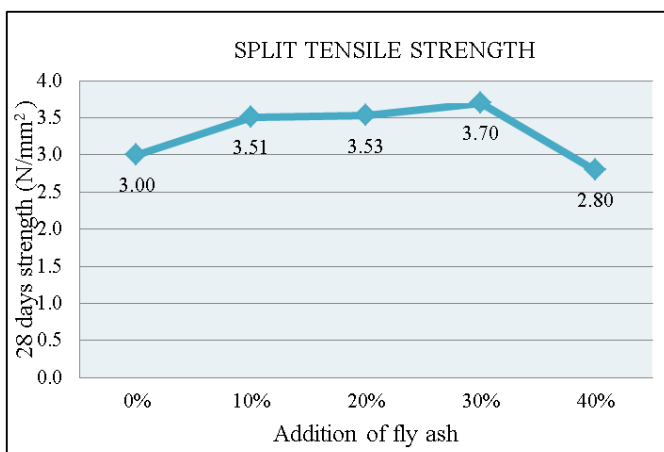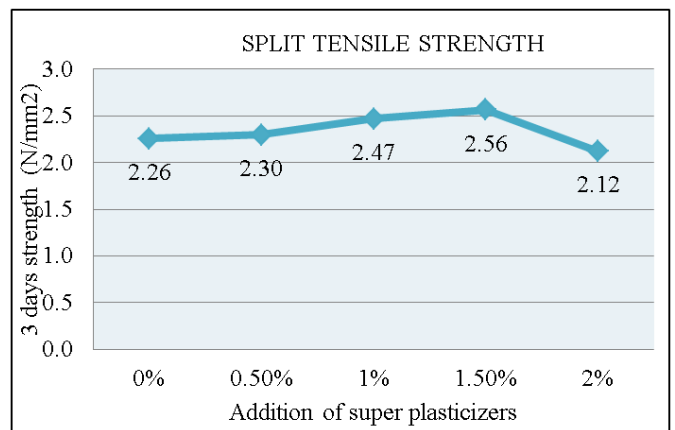

Figure 7 Variation of tensile strength as a function of fly ash when binary concrete soaked in to water for 28 days.

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Figure 8 Variation of tensile strength as a function of super plasticizers when binary concrete soaked in to water for 3 days.
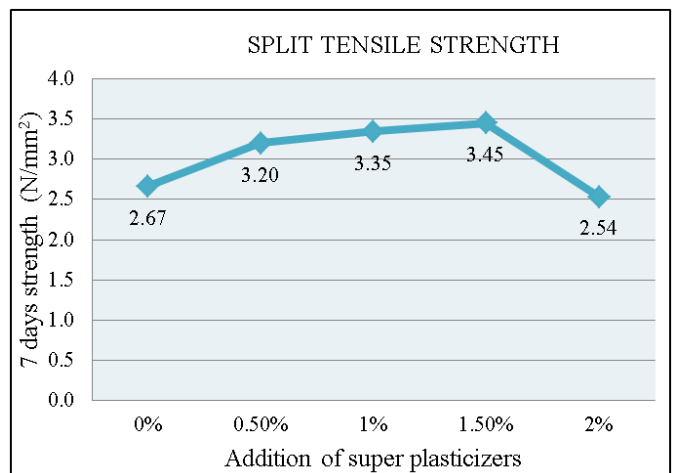

Figure 9 Variation of tensile strength as a function of super plasticizers when binary concrete soaked in to water for 7days.

Figure 7 shows the variation of tensile strength as a function of fly ash after 28days soaked in the water was indicates that the tensile strength is gradually increases when the fly ash increases on other hand. It was also observed that the when the fly ash was 30wt.% maximum tensile strength was observe as 3.70 N/mm^2 and after that tensile strength is decreased [13]. **Figure 8** shows the variation of tensile strength as a function of super plasticizers after 3days indicates that the tensile strength is gradually increases when the plasticizers increase on other hand. It was also observed that the when the fly ash was 1.5wt.% maximum compressive strength was observe as 2.56/mm^2 and after that tensile strength is decreased. When soaking days are increased as a result of that strength is gradually increases.
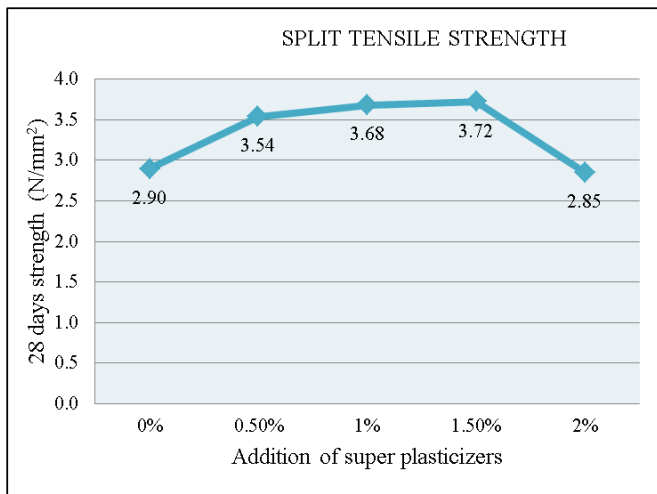
Figure 10 Variation of tensile strength as a function of super plasticizers when binary concrete soaked in to water for 28days.

Figure 9 shows the variation of tensile strength as a function of fly ash after 7days indicates that the tensile strength is gradually increases when the plasticizers increase on other hand. It was also observed that the when the fly ash was 1.5wt.% maximum tensile strength was observe as 3.45N/mm^2 and after that tensile strength is decreased. When soaking days are increased as a result of that strength is gradually increases. **Figure 10** shows the variation of tensile strength as a function of fly ash after 28days indicates that the tensile strength is gradually increases when the plasticizers increase on other hand. It was also observed that the when the fly ash was 1.5wt.% maximum tensile strength was observe as 3.72N/mm^2 and after that tensile strength is decreased. When soaking days are increased as a result of that strength is gradually increases.

IV. CONCLUSION

➢ Fly ash is added at different proportions namely 0%, 10%, 20%, 30% and 40%.
➢ For 43 grade cement with M40 mix, by adding up to 30% of fly ash to the cement, the strength is increased and by adding 40% of fly ash the strength is decreasing.
➢ The test results show that on addition of 30% of fly ash to cement it has gained maximum strength at 28 days period but the rate of strength gain compared to ordinary Portland cement concrete OPCC is at slower rate at initial days.

➢ Split tensile strength increased by18.37% and flexural strength increased by 16.18% when compare to normal concrete.
➢ By use of fly ash as admixture, the cost of construction is also considerably reduced.
➢ Non-biodegradable fly ash is effectively utilized in Binary concrete, so it reduces the disposal problem of fly ash.
➢ For 43 grade cement with M40 mix, by adding 0%, 0.5%, 1.0%, 1.5% of super plasticizer to the mix prepared the strength is slightly increased and at adding 2.0% of plasticizer to the mix prepared the strength will slightly decreased.
➢ The test results show that on addition of 1.5% of super plasticizers to concrete it has gained maximum strength at 28 days period
➢ Split tensile strength increased by16.32% and flexural strength increased by 13.46% when compare to normal concrete.
➢ Super plasticizer may not increase the strength of concrete directly. But it helps in reducing the w/c ratio. Which in turn result in the increase of strength of concrete due to reduction of w/c ratio.
➢ It is concluded that when compare to super plasticizer, fly ash gives more desirable properties to concrete and ecofriendly.

V. ACKNOWLEDGEMENTS

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