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The Principal
ST. XAVIER'S COLLEGE
(Autonomous)

30 Mother Teresa Sarani, (Park Street)
Kolkata - 700 016

24 November 2016

MESSAGE

It gives me great pleasure in introducing the 9th volume of “**Aviskaar– A Xaverian Journal of Research**”.

This volume has contributions from the Departments of Biotechnology, Commerce, Computer Science, Education and Microbiology of the College and also from PG Institute of Education, Chandernagore and University of Calcutta.

The research interest and culture has been steadily improving in St. Xavier's College. The Ph.D. Cell has already started functioning and fifteen research scholars have been registered in the Departments of Biotechnology, Commerce, Microbiology and Physics.

I strongly believe that this tradition will definitely continue and there will be more meaningful contributions from all Departments of the College.

I congratulate Prof. Arup Kumar Mitra, Editor, the Editorial team and the contributors for this issue.

I take this opportunity to wish you all 'A Grace filled Christmas and a Prosperous New Year 2017'.

Nihil Ultra !

Rev. Dr. John Felix Raj, S.J.

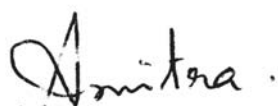
Principal
St. Xavier's College
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From the Editor's Desk

The multidisciplinary journal of “Aviskaar A Xaverian Journal of Research” has reached the ninth year of Publication. It has maintained a specific standard since its inception. This year is no exception, there are eight papers all together. It is worth mentioning researchers from other institutions have also started contributing in this multidisciplinary journal. The contribution from English Department includes a rhythmic voyage of self-discovery in the light of Swami Vivekananda and Sri Aurobindo, the problem of crime against women in India is being discussed in the paper from Management Department. There are three papers on Education discussing illegal trafficking of women for sex work and the issue of gender bias in the light of UNICEF and also a brief discussion on the Educational Implications of Economics. The Computer Science Department has come up with an innovative approach of smart electric metering system. There are two papers on biological science ; the one from Biotechnology discusses the role of collagenase on tissue remodelling and the one from Microbiology talks about the potentiality of dye degrading microbes in bioremediation isolated from contaminated site.

I firmly believe that this volume will be a useful source of information for the researchers and students of St. Xavier's College.



Dr. Arup Kumar Mitra,

Associate Professor Editor, Xaverian Journal of Research
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List of Professors who obtained the Ph.D. degree during the year 2016

Awarded Ph. D.

Dr. Supriyo Patra (25.01.16)	BBA
Dr. Tridib Sengupta (25.02.16)	COM-M
Dr. Amitava Roy (24.08.16)	COM-M
Dr. Maitreyi Sanyal (Chakrabarti) (09.09.16)	Sociology
Dr. Saugata Mitra (01.09.16)	COM-E



Statement of Grants Received During January to March, 2016

Sl. No.	Financial Year	Name of Faculty (Principal Investigator)	Name of the Funding agency	Date	Received Amount (Rs.)
1.	2015-16	Dr. Arup Kumar Mitra	Entrepreneurship Development Institute of India		₹ 3,36,000
2.	Jan'16-Mar'16	Ms. Jayati Ghosh Dastidar	Minor Research Project in Science	06.03.2016	₹ 40,000
3.		Dr. Argha Kumar Banerjee	Major Research Project in Humanities & Social Science	28.01.2016	₹ 42,000
4.		Mr. Sanjay Dey	Council of Scientific & Industrial Research	16.03.2016	₹ 2,28,400
5.		Ms. Sonia Bedi	Council of Scientific & Industrial Research	16.03.2016	₹ 4,45,100
6.		Dr. Jhimli Dasgupta	Department of Atomic Energy Board of Research in Nuclear Science (BRNS)	07.01.2016	₹ 83,483
7.		Dr. Dipankar Chakraborty	Indian Council of Agricultural Research	16.02.2016	₹ 5,83,590

TOTAL ₹ 1,75,8,573



Statement of Grants Received During April to November, 2016

Sl. No.	Financial Year	Name of Faculty (Principal Investigator)	Name of the Funding agency	Date	Received Amount (Rs.)
1.	2016-17	Dr. Arup Kumar Mitra	Entrepreneurship Development Institute of India		₹ 56,000
2.	Apr'16-Nov'16	Dr. Subhankar Ghosh	Major Research Project	04.04.2016	₹ 12,885
3.		Dr. Sanjib Kumar Basu	Major Research Project	06.04.2016	₹ 47,370
4.		Mr. Saikat Paul	Dept. of Biotechnology	04.04.2016	₹ 3,15,000
5.		Dr. Aryadeep Roy Choudhury	Council of Scientific & Industrial Research	05.08.2016	₹ 5,92,161
6.		Ms. Senjuti Banerjee	Council of Scientific & Industrial Research	15.04.2016	₹ 2,39,140
7.		Dr. Aniruddha Banerjee	Dept. of Science & Technology	15.07.2016	₹ 5,06,447
8.		Dr. Jhimli Dasgupta	Dept. of Science & Engineering Research Board	10.08.2016	₹ 14,65,000
9.		Dr. Dipankar Chakraborty	Indian Council of Agricultural Research	31.05.2016	₹ 6,23,960
10.		Dr. Ronita Nag Chaudhuri	Council of Scientific & Industrial Research	20.08.2016	₹ 2,83,600
11.		Mr. Sanjay Dey	Council of Scientific & Industrial Research	19.08.2016	₹ 4,56,800
12.		Ms. Sonia Bedi	Council of Scientific & Industrial Research	19.08.2016	₹ 4,56,800
13.		Dr. Ronita Nag Chaudhuri	Dept. of Bio-Tech	31.08.2016	₹ 13,36,795
14.		Dr. Uma Sidhanta	Dept. of Bio-Tech	26.09.2016	₹ 5,82,577
15.		Dr. Jhimli Dasgupta	Dept. of Bio-Tech	20.10.2016	₹ 12,55,980
16.		St. Xavier's College	Directorate of Rashtriya Uchchatar Shiksha Abhiyan (RUSA)	04.02.2016	₹ 72,91,667

₹ 1,55,22,182

TOTAL ₹ 1,72,80,755



BIOTECHNOLOGY

THE COLLAGENASES : KEY MOLECULES IN TISSUE REMODELLING

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Abstracts

Controlled degradation of the extracellular matrix (ECM) is of vital importance during tissue remodelling under physiological and pathological conditions. Matrix metalloproteinases (MMPs), a family of zinc dependant endopeptidases, are among the most important ECM degrading enzymes. The collagenases, MMP-1, MMP-8 and MMP-13, are crucial in ECM remodelling as they can degrade the interstitial collagens which are resistant to proteolysis by most other enzymes. Collagenases are involved in the regulation of tumour invasion and angiogenesis as well as in modulation of a number of vascular and neurodegenerative diseases. An improved understanding of the role of collagenases and the mechanisms for their regulation are thus important for understanding varied biological phenomena. Such knowledge may also help in development of therapeutic methods for alleviation of human diseases. The current review focuses on the collagenases and their roles, mainly in tumour biology, with special reference to MMP-1 (collagenase 1/ interstitial collagenase).

Keywords : matrix metalloproteinase, collagenase, MMP-1, tumour invasion, angiogenesis.

Introduction

A considerable part of tissues and organs in humans and animals is made up of extracellular spaces largely filled by a non-cellular extracellular matrix (ECM). The



ECM is composed mainly of proteoglycans and fibrous proteins including collagens, elastins, fibronectins and laminins [1]. Controlled degradation of the ECM is vital for physiological processes like morphogenesis, embryonic development, wound repair and tissue remodelling. Degradation of the ECM is also a characteristic feature of a number of pathological conditions including arthritis, ulceration and tumour invasion and metastasis [1,2]. The major class of enzymes involved in ECM degradation are a family of zinc dependant endopeptidases, the matrix metalloproteinases (MMPs) [3-7].

The MMPs are multidomain proteins which are either secreted from the cell or anchored to the plasma membrane. Till date, around 24 different vertebrate MMPs have been identified; all except MMP-18 are found in humans. They are divided into a number of groups on the basis of their domain organization and substrate specificity. These include the collagenases, gelatinases, stromelysins, matrilysins, membrane-type MMPs and a heterogeneous group composed of the remaining MMPs [3-7]. Interstitial collagens types I, II and III are among the most abundant proteins in the animal body with collagen type I and type II being highly resistant to general proteolytic enzymes [8]. The collagenases are capable of degrading interstitial collagens and thus play key roles in ECM remodelling during various physiological and pathological processes. The current review focuses on the collagenases and their roles, mainly in tumour biology, with special reference to MMP-1, the first MMP to be discovered and the most studied and best characterized among the collagen degrading MMPs.

The Collagenases

The structure of collagenases is “typical” for MMPs with a N-terminal signal peptide, a propeptide, a catalytic metalloproteinase domain containing a highly conserved zinc binding sequence HEXXHXXGXXH, a hinge region and a haemopexin (Hpx) domain which confers enzyme substrate-binding specificity for collagen [2,4,7,8]. The collagenase family includes :

- (1) MMP-1 (collagenase 1/ interstitial collagenase)
- (2) MMP-8 (collagenase 2/ neutrophil collagenase)
- (3) MMP-13 (collagenase 3)
- (4) MMP-18 (*Xenopus*)

MMP-1 was the first of the MMP family to be discovered by Jerome Gross and Charles Lapière in 1962. They cultured fragments of tissues from metamorphosing tadpoles on reconstituted collagen gels and recovered a collagenolytic enzyme which could attack native collagen fibrils [9]. MMP-1 was also the first vertebrate collagenase purified as a protein and cloned as a cDNA [8]. In humans, the genes coding for MMP-1, MMP-8, and MMP-13 are located on chromosome 11 [2]. MMP-18 (*Xenopus*) is not found in humans and appears to have a sequence somewhat divergent from MMP-1. Additionally two other members of the MMP family, MMP-2 and MT1-MMP show collagenolytic activity. However, these enzymes are classified into other subgroups



(gelatinases and membrane-type MMPs respectively) as their domain structures and other properties are appreciably different from collagenases [4,7].

Collagenase Substrates

Collagenases are characterized by their ability to cleave interstitial collagens types I, II and III at a specific site three-fourths from the N-terminus [2,4,7,8]. Gelatin produced by degradation of fibrillar collagens by the collagenases can then be degraded by the gelatinases (MMP-2 and -9). MMP-1 cleaves several ECM components including collagen types I, II, III, VII, VIII and X, aggrecan, perlecan, fibronectin, vitronectin, gelatin and tenascin-C [2,7,8]. MMP-1 also has significant activity against several non-matrix substrates. MMP-1 can activate protease-activated receptor-1 (PAR1) and increase bioavailability of insulin growth factor (IGF) through degradation of insulin-like growth factor binding proteins [8,10]. PAR1, a G-protein coupled receptor, is involved in regulation of gene transcription and cell proliferation, survival and migration [10]. The wide variety of substrates cleaved by MMP-1 indicates its possibly pivotal role in regulation of ECM remodelling. The principal substrates of MMP-8 are the fibrillar collagens. MMP-8 can also regulate inflammation by cleaving and activating chemokines [2]. MMP-13 can cleave a number of ECM components including fibrillar collagens, fibronectin, aggrecan, versican, gelatin and large tenascin-C. MMP-13 is also involved in activation of pro-TGF- β 3 [2].

Regulation of Collagenase Expression and Activity

Collagenase activity is usually negligible in normal tissues unless tissue remodelling is required [8]. Like other MMPs, collagenases are synthesized as inactive zymogens. Interactions between an unpaired cysteine-thiol group within a conserved sequence motif PRCGVPD at the carboxyl end of the pro-domain and the catalytic site zinc maintains pro-MMPs in an inactive state. Disruption of the so-called "cysteine switch" leads to MMP activation [4,6,7]. MMPs can be activated by proteinases *in vivo* or by chemical agents such as thiol-modifying agents (e.g. 4-aminophenylmercuricacetate), oxidized glutathione and sodium dodecyl sulphate (SDS) *in vitro* [7]. *In vivo* activation involves proteolytic cleavage of the pro-domain. Most pro-MMPs including MMP-1, MMP-8 and MMP-13 are secreted from cells and activated extracellularly by proteinases like plasmin [2,7,8]. Additionally, pro-MMP-13 can be activated by MT1-MMP at the cellular surface [8]. Endogenous inhibitors of collagenases include α 2 macroglobulin and the tissue inhibitors of metalloproteinases (TIMPs). The N-terminal domains of TIMPs interact with the catalytic domains of active MMPs, binding to them and inhibiting MMP activity [4,7].

MMP expression and activity is also regulated by cytokines, by interaction of ECM ligands with integrin receptors and by interaction of growth factors including epidermal growth factor (EGF) and fibroblast growth factor (FGF) with their corresponding



receptors [8,12].The MMP-1 promoter contains an AP-1 binding site and its transcription is upregulated by AP-1 [13]. MMP-1 is expressed by a variety of normal cells, including keratinocytes, fibroblasts, endothelial cells, monocytes, macrophages, hepatocytes, chondrocytes and osteoblasts, as well as by many different types of tumour cells [2]. MMP-8 is expressed in appreciable amounts by neutrophils. The physiological expression of MMP-13 appears to be somewhat limited but it is expressed in a number of pathological conditions and by tumour cells [2,10].

Role of Collagenases in Tumour Biology

A number of studies indicate that increase in MMP-1 expression and activity correlates with increased metastatic potential and a worse prognosis in cancers. MMP-1 expression is elevated in a numbers of cancers including breast, colorectal, gastric, ovarian, oesophageal and pancreatic carcinomas and in malignant melanomas. Studies indicate that an increase in MMP-1 expression has been associated with a poor prognosis in these cancers [2,14-17]. In human breast cancer, increased MMP-1 expression correlates with increased metastatic capacity,thus indicating the important role played by MMP-1 in tumour invasion and metastasis [2,14,16].Elevated levels of MMP-1 in serum correspond to a worse prognosis in patients with non-small cell lung cancer and overexpression of MMP-1 in human prostate cancer cells promotes tumour growth and metastasis [15,18]. Conversely, downregulation of MMP-1 has been shown to inhibit tumour invasion [15,19,20].

To metastasize, a cancer cell must detach from the primary tumour, migrate through the ECM, invade either the circulatory or lymphatic system, which will carry it to a new location, and establish itself in the new site to form a secondary tumour [21].Tumour metastasis thus involves a cascade of events including disruption of the basement membrane, cell migration and invasion, intravasation, extravasation and formation of secondary tumours. Controlled degradation and remodelling of the ECM is essential for tumour invasion. MMP-1 plays an important role in tumour invasion and metastasis by degradation of several ECM components, including, crucially, interstitial collagens type I, II and III thus creating pathways through which cells can invade. MMP-1 can also liberate or activate certain signalling molecules or their precursors e.g. IGF, EGF-like ligands,pro-tumor necrosis factor alpha (pro-TNF α) and transforming growth factor (TGF-)by degradation of matrix/ non-matrix components, thus promoting tumorigenesis[10,14]. MMP-1 may also promote tumour invasion via proteolytic activation of the G protein coupled receptor PAR1. The PAR-1/MMP-1 signalling axis has been implicated in promotion of cell invasion in melanomas and MMP-1 may be a key contributor in transformation of melanomas from a non-invasive to a malignant form [10,14,17].

Elevated expression of MMP-8 has been reported in ovarian cancers where it shows significant correlation with tumour stage and tumour grade [21]. Interestingly, certain



studies indicate that MMP-8 may have some tumour suppressive functions as well. Mmp8-deficient mice show increased occurrence of skin tumours and inactivating mutations in MMP-8 have been identified in a subset of human melanomas [10,22]. MMP-13, which was originally cloned from breast cancer cells, is expressed in several invasive cancers and appears to have tumour promoting functions similar to MMP-1 [2,10].

Role of Collagenases in Angiogenesis and Vascular Diseases

Angiogenesis, the spouting of new blood vessels from pre-existing ones, is crucial during normal development, embryo growth, morphogenesis and wound healing. Angiogenesis also plays an important role in tumour growth and metastasis. As cells within a tumour proliferate at an increased rate, tumours require a greater supply of oxygen and nutrients; else the cells within the interior of the tumour would become increasingly distant from nearby blood vessels resulting in hypoxia and consequently cell death. Thus, angiogenesis is essential to sustain tumour progression. Remodelling of the ECM is necessary for new blood vessels to arise from pre-existing ones. A number of MMPs including MMP-1, MMP-2 (gelatinase A) and MMP-9 (gelatinase B) play crucial roles in ECM remodelling during angiogenesis [23]. The interstitial collagens are important constituents of the perivascular ECM. MMP-1 and MMP-8 are capable of degrading interstitial collagen and thus play key roles during vascular development. Elevated expression of MMP-1 has been reported in endothelial cells. In many cancers, MMP-1 promotes angiogenesis, facilitating tumour growth and metastasis [20,23,24].

Vascular endothelial growth factor receptor 2 (VEGFR2) plays a crucial role in neovascularization and angiogenesis. Interaction of VEGFR2 with its cognate ligand vascular endothelial growth factor (VEGF) leads to activation of downstream signalling cascades involving extracellular signal related kinase (ERK), Jun related kinase (JNK), and mitogen activated protein kinase (p38MAPK). These signalling cascades modulate endothelial permeability and endothelial cell proliferation and survival. VEGF also increases angiogenesis by inducing expression of Bcl-2 and enhancing endothelial cell survival [24,25]. MMP-1 promotes increased transcription of the *VEGFR2* gene via stimulation of PAR-1 and NF- κ B, thus upregulating VEGFR2 expression [24]. Additionally, signalling through PAR-1 plays an important role in blood vessel development and MMP-1 is involved in modulating endothelial cell permeability [23,26].

Collagenases also appear to play important roles in numerous vascular diseases. Atherosclerosis occurs when plaques composed of fats, cholesterol and other substances found in blood are deposited on the walls of arteries causing them to harden and become less elastic. The lumens of the arteries become narrow, restricting blood flow and pathological conditions like coronary artery disease may then arise. MMP-1 appears to promote atherosclerosis by causing alternate cycles of plaque expansion and rupture [27,28]. MMP-1 is also downregulated in patients suffering from hypertension, resulting in enhanced collagen deposition in blood vessels, causing narrowing of their lumen



and leading to restricted blood flow and ischemia [28]. MMP-13 levels within the myocardium increase appreciably in congestive heart failure, suggesting a possible role for MMP-13 in pathological ECM remodelling during heart disease [29].

Role of Collagenases in Neurodegenerative Diseases

Serum levels of MMP-1 are increased in patients suffering from amyotrophic lateral sclerosis (ALS)[30].ALS causes a progressive degeneration of motor neurons that control voluntary muscles leading to problems in movement and eventually to difficulty in breathing. Multiple sclerosis leads to demyelination of neurons in the central nervous system and disrupts neural communications resulting in a range of physical and mental problems. In patients suffering from multiple sclerosis, serum levels of MMP-8 are elevated, suggesting its involvement in a possible pathogenic role. This is further indicated by the observation that patients treated with IFN-beta1b show a reduction in serum MMP-8 levels along with disease stabilization [30,31].

Conclusion

The collagenases, MMP-1, MMP-8 and MMP-13, play important roles in ECM and tissue remodelling. Aberrant collagenase expression and activity can promote a variety of pathological conditions including tumour invasion, tumour angiogenesis and vascular and neurodegenerative diseases. An improved understanding of the role of collagenases and the mechanisms for their regulation is of vital importance in unravelling these complex biological phenomena. Further studies on collagenases may lead to development of techniques for their therapeutic inhibition or stimulation, allowing the alleviation of various diseases.

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CRIME AGAINST WOMEN IN INDIA : A STUMBLING BLOCK TO DEVELOPMENT ENDEAVOUR

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Abstract

Violence against women is one of the ugly features of gender inequality and for women it is an extreme state of vulnerability in their life and livelihood. Such violence is not confined to a specific culture, region or country, or to particular groups of women within a society. It exists in every country and in society around the world. Gender-based violence is very complex and a widespread issue. Violence against women constitutes one of the most serious forms of violation of women's human rights. Despite its scale and social impact, it remains largely under-reported in India due to various socio-political reasons. It is observed that the roots of violence against women are ingrained in our social power structure, particularly in our domestic front. Present study, based on data available from National Crime Records Bureau, tries to highlight the issue which hinders growth process and defying our endeavour towards inclusive growth.

Keywords : Crime, Domestic Violence, Human Rights, Vulnerability.



Introduction

Men and Women are the twin architects of the human civilization. But, historically women have been depriving from their rights and privileges throughout the world. Despite rising levels of education, gender awareness and stringent pro-women laws, the general perception remains that women are less potential than men and thus have always been confined to household activities. Even in the 21st century, women are not given opportunities or rather deprived from revealing their potentiality in all spheres of life. In the present globalized hypercompetitive markets where human resources happen to be the prime factors towards maintaining or achieving competitive economic advantages, there is no reason to unutilize or underutilize nearly half of the economy's potential women resources.

One of the outcomes of gender inequalities in our socio-economic sphere is violence against women. In fact, violence against women is not confined to a specific culture, region or country, or to particular groups of women within a society. It has been continued to exist in every country and in society around the world. Violence against women takes many forms – physical, sexual, psychological and economic. These forms of violence are interrelated and affect women from before birth to old age. Now-a-days some other types of violence, such as trafficking, cross national boundaries are also on the rise and have become a major concern. Women who experience violence suffer a series of problems and their ability to participate in public life is diminished as well as violence against women impoverishes them, their families, communities and nations. Thus, violence against women harms families and communities across generations and reinforces other violence prevalent in society. Violence against women is one of the ugly expressions of inequality on the ground of sex and for women it is an extreme state of vulnerability in their life and livelihood. In true sense, violence is an expression of establishment of power over others. United Nations (1993) identify violence on women as the materialization of unequal power relationship between men and women (UN, 1993). Therefore, it can be argued that the roots of violence against women lie in the persisting discrimination against women.

The gender-based violence is very complex and a widespread issue. It constitutes one of the most serious forms of violation of women's human rights. Despite its scale and social impact, it remains largely under-reported in the less developed and developing countries, particularly in India, due to persisting orthodox social norms



and values. Sometimes under-reporting is caused by some exogenous fear factors, like political pressure, threat of killing etc.

Violence against women happens to be an age-old problem in both developed and developing countries. In India, violence against women has reached at an alarming stage (e.g. increased 60.4 per cent during 2012), especially during 2008-2012. Much of the violence against women in India is in the form of domestic violence, like dowry deaths, forced marriage, acid attacks, honour killings, rape, human trafficking and accused of witchcraft etc. Incidence of violence has also increased outside home, like kidnapping, gang rape, etc. Violence generate both physical (Campbell et al., 2002) as well as psychological (Parker & Lee, 2002a; Matud, 2005) distress among women. Such distresses seriously challenge their productivity and autonomy which is detrimental to development (Agarwal, 1997). Government of India has adopted specific legislative measures to eradicate this particular social crime, still violence against women is continued to perpetrate in the society. Violence against women has become a prominent topic of discussion in India in recent years. Both politicians and media have placed great focus on this issue due to continuously increasing trends during 2007-2012. In this background it becomes imperative to study the alarming issue on violence against women in India because such violence is not only a building block towards empowering women but also it hinders our growth process defying inclusive growth. The present study is an endeavour to unveil the present situation and tries to focus on some of the key issues.

Brief literature survey on violence against women

Majority of the studies on gender violence deals with domestic violence and dealt with its impact on working women with respect to the issues like their health, work place, productivity and employment stability. Studies identified that employed women's poor work performance, absenteeism and opt for termination of pregnancy are the consequences of their Intimate Partner Violence (IPV) which occurs on almost all women irrespective of their employment status (Baydoun, 2009). This IPV on employed women increases further if her partner is unemployed.

Theories on the causes of domestic violence established relationships between violence and actual or potential female earnings and also take accounts of female economic opportunities outside of the marriage like welfare, shelters, divorce



settlements, so on (Farmer & Tiefertaler, 1997). Existing economic models argued that higher economic and educational status of women affect the threshold “threat point” thereby reduces the incidence of violence (Roy, 2003) on them. However, only economic factors like employment status and relative earning cannot explain the reasons behind domestic violence because wealth status and decision making power of women also have played significant role. A study on Philippine women shows that women of the poor households who are more vibrant in their decision making are subject to higher rate of partner violence (Hindin & Adair, 2002). Rao’s, (1998) study on women of Karnataka, India, also confirms the same notion that wife-beating is significantly related to the extent of a woman’s empowerment within the family. Both sociological and Psychological theories divulge that economic independence of women is not accepted gladly in the domain of patriarchy. Sociological theories reveal a negative association between female economic independence and domestic violence. Psychological theories admit that violence is used as a weapon to limit women’s control over household resources by ways of preventing them from having a separate source of income and limiting their access to as well as information on household finances (González-Brenes, 2004; Rowe, Fakh Sutan & Iryna, 2006).

Again, couple and family interactions theory suggests that violence is rooted in dysfunctional relationship dynamics (Straus, Gelles, & Steinmetz, 1980). Structural and Status inconsistency theories of gender inequality also admit that male domination propels violence on women (Yick, 2001; Straus, 2006). Women of the poverty driven migrated families became the victim of isolation and discrimination in the society. Women of these families are also forced to join the job market producing a shift in power dynamics between men and women. This change in power dynamics enhances women’s vulnerability towards spousal violence.

P. Swami (2013) argued that India’s economic transformation due to globalization is producing ‘a mass of young, prospect-less men’, who feel huge pressure to succeed in an economic sense but do not find needed avenues to fulfill that. “This, in combination with sexualized popular culture plastered all around them, has led to a situation where women’s bodies have become ‘the principal terrain, on which male rage is venting it,’ and the sexually independent woman in particular is perceived as an implicit threat and insult”.



Data and Methodology

The present study is based on secondary information. The data analyzed and presented in this paper are taken from National Crime Records Bureau (NCRB) which are available under eight different crime heads (Rape, Kidnapping and Abduction, Dowry Death and Dowry Prohibition Act, Assault on Women with Intent to Outrage her Modesty, Insult to the Modesty of Women, Cruelty by Husband or his Relatives (IPS section 498A), Indecent Representation of Women (P) Act, and Others) for all-India and state/UTs level. For the sake of simplicity simple statistical techniques, like average, percentage distribution, growth rate etc. and simple tables and diagrams are used for the presentation of data.

Crime against Women in India

India's glorious image of cultural integrity and perseverance has been continuously declining because women are becoming more and more unsafe here which is revealed by the ever increasing incidences of violence or crime against women.

The incidents of crime under different crime heads over the period from 2001 to 2012 are analyzed and presented here. It is revealed from the analysis that the total crime against women has increased at an alarming rate in India from 2007 to 2012. Except *Insult to the Modesty of Women* and *Indecent Representation of Women (P) Act*, all other categories of crime show significant rise during this period. Over twelve years (2001-2012), the average incidents per year of *Cruelty by Husband or his Relatives (IPS Section 498A)* in India is ranked the top (71,867) followed by *Assault on Women with intent to Outrage her Modesty* (37,587), *Kidnapping and Abduction* (21,742), *Rape* (19,812). The lowest rank of the average incident of crime over the same period is appeared to be incident of *Indecent Representation of Women (P) Act* (1,282) (see table-1). Obviously the annual percentage distribution of all-India total crimes by crime heads over the period reveals almost similar picture where 'Cruelty by Husband or his Relatives' occupies the highest percentage (39.4%) followed by 'Assault on women with intent to Outrange her Modesty' (21.3%). Although 'Kidnapping and Abduction' (11.07%) comes before 'Rape' (11.01%) but percentage wise they are not significantly different. In this regard incident of 'Indecent Representation of Women (P) Act' occupies the lowest percentage (0.8%) followed by Others' incidents (2.8%) and 'Insult to the Modesty of Women' (6%) (see table-2 and chart-1).

Table 1 : Average Crime per year in India over 12 years (2001-2012) by Crimes Category

Year	Average Crime over the period 2001-2012									
	Total Crimes	Rape	Kidnapping and abduction	Dowry Death & Dowry Prohibition Act	Assault on Women with intent to Outrage her Modesty	Insult to the Modesty of Women	Cruelty Husband or his Relatives (IPS Section 498A)	Indecent Representation of Women (P) Act.	Others	
2001	1437951	16075	14645	10073	34124	9746	49170	1052	8910	
2002	143034	16373	14506	9638	33943	10155	49237	2508	6674	
2003	140601	15847	13296	8892	32939	12325	50703	1043	5556	
2004	154333	18233	15578	10618	34567	10001	58121	1378	5837	
2005	155553	18359	15750	9991	34175	9984	58319	2917	6057	
2006	164765	19348	17414	12122	36617	9966	63128	1562	4608	
2007	164765	19348	17414	12122	36617	9966	63128	1562	4608	
2008	195857	21467	22939	13727	40413	12214	81344	1025	2727	
2009	203804	21397	25741	14033	38711	11009	89546	845	2522	
2010	213585	22172	29795	13573	40613	9961	94041	895	2535	
2011	228650	24206	25565	15237	42968	8570	99135	453	2515	
2012	244270	24923	38262	17271	45351	9173	106527	141	2704	
Annual Average	179417.6	19812.3	21742.1	12274.7	37586.5	10255.8	71866.6	1281.7	4604.4	
Avg. of yr. to yr. Growth Rate	5.1	4.2	9.7	5.5	2.7	0.2	7.6	1.2	-8.9	

Source : Author's own estimation from the available NCRB data.

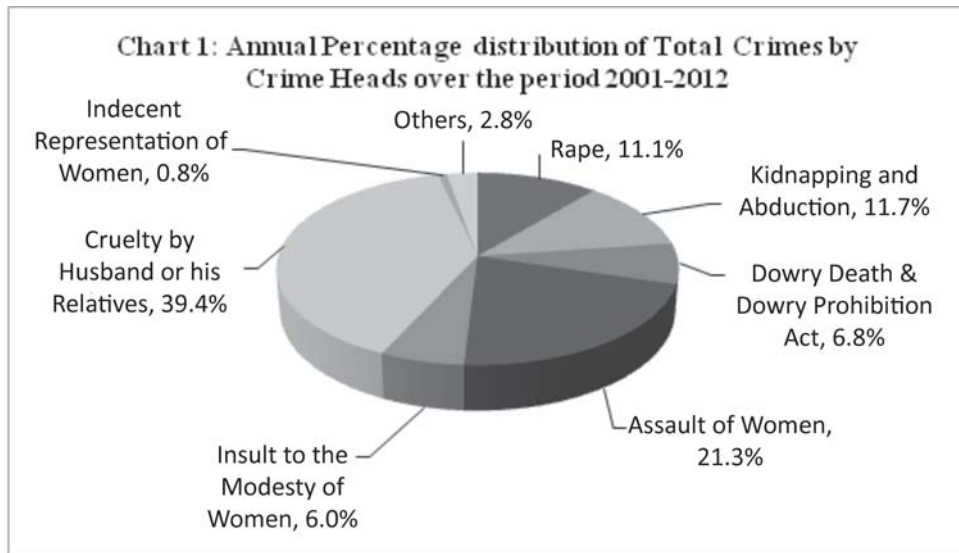


Table 2 : Annual Percentage Distribution of All-India Total crimes by Crime Category over the period 2001-2012

Year	Total Crimes	Rape	Kidnapping and abduction	Dowry Death & Dowry Prohibition Act	Assault on Women with intent to Outrage her Modesty	Insult to the Modesty of Women	Cruelty Husband or his Relatives (IPS Section 498A)	Indecent Representation of Women (P) Act.	Others
2001	143795	11.2	10.2	7.0	23.7	6.8	34.2	0.7	6.2
2002	143034	11.4	10.1	6.7	23.7	7.1	34.4	1.8	4.7
2003	140601	11.3	9.5	6.3	23.4	8.8	36.1	0.7	4.0
2004	154333	11.8	10.1	6.9	22.4	6.5	37.7	0.9	3.8
2005	155553	11.8	10.1	6.4	22.0	6.4	37.5	1.9	3.9
2006	164765	11.7	10.6	7.4	22.2	6.0	38.3	0.9	2.8
2007	164765	11.7	10.6	7.4	22.2	6.0	38.3	0.9	2.8
2008	195857	11.0	11.7	7.0	20.6	6.2	41.5	0.5	1.4
2009	203804	10.5	12.6	6.9	19.0	5.4	43.9	0.4	1.2
2010	213585	10.4	13.9	6.4	19.0	4.7	44.0	0.4	1.2
2011	228650	10.6	15.6	6.7	18.8	3.7	43.4	0.2	1.1
2012	244270	10.2	15.7	7.1	18.6	3.8	43.6	0.1	1.1
Annual Average	179417	11.1	11.7	6.8	21.3	6.0	39.4	0.8	2.8

Source : Author's own estimation from the available NCRB data.



It appears that the highest number of crime against women occurred on an average per year during the period 2001 to 2012 in Andhra Pradesh (22754) followed by Uttar Pradesh (19137), West Bengal (17050), Madhya Pradesh (15368), Rajasthan (14917) and Maharashtra (14064). It is noticed that except Assam the incidents of total crimes per year is significantly small in all the North-Eastern states compare to all-India figure (see table-3). Again, it is interesting to note that although total crime against women per year is much lower in the North-Eastern states compared to all India average, but in terms of percentage incident of Rape four North-Eastern states occupies the top four ranks among all states and union territories in India. At the same time, among the states the incident of ‘Kidnapping and Abduction’ as percentage of total crime against women appears to be highest in Manipur (48.9%) followed by Jammu and Kashmir (30.1%), Arunachal Pradesh (27.6%). Highest percentage of incident of ‘Dowry Death & Dowry Prohibition Act’ occurs in Bihar (28.4%), followed by Jharkhand (22.6), Orissa (17.5%) and Uttarakhand (13.5%) and the lowest in Nagaland (0%). It is observed that the percentage incident of ‘Assault on Women with intent to Outrange her Modesty, and ‘Cruelty by Husband or his Relatives (IPS Section 498A)’ have appeared to be significant in all the states and union territories (see table-3 and chart-2). The annual average growth of different forms of crimes against women in India by state and union territories during the period 2002 to 2012 has also been estimated. It appears from the estimates that annual average growth of total crime against women is highest in West Bengal (15.5%), followed by Meghalaya (14.5%), Tripura (13.1%), Goa (12.4%), Sikkim (11.8%) and Assam (11.4).

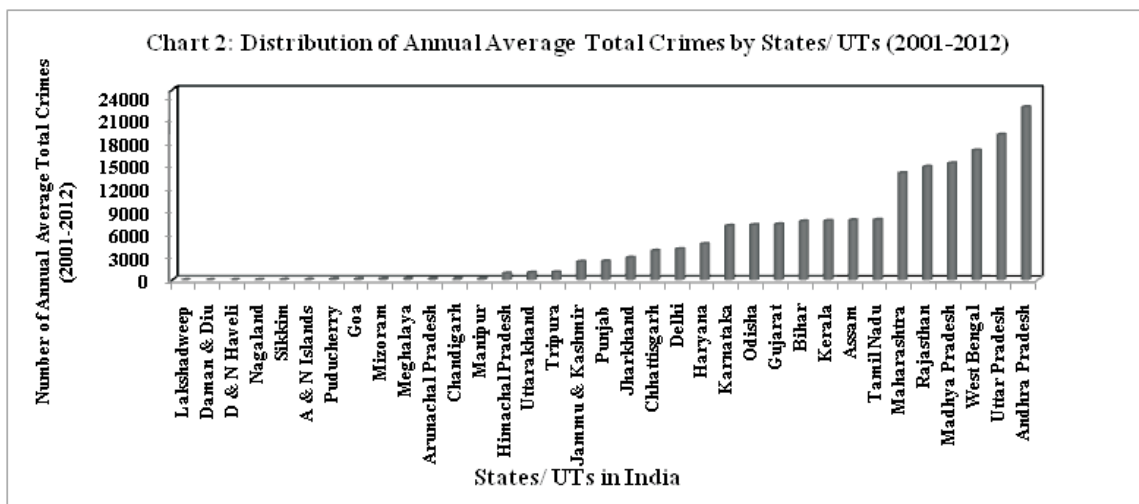




Table 3 : Average Percentage of different Nature of crimes against Women over total Crimes by State in India during the period 2001to 2012.

State/UTs	Percentage Distribution of Nature of Crimes by State/UTs (2001-2012)								
	Average Annual Total Crimes	Rape	Kidnapping and abduction	Dowry Death & Dowry Prohibition Act	Assault on Women with intent to Outrange her Modesty	Insult to the Modesty of Women	Cruelty Husband or his Relatives (IPS Section 498A)	Indecent Representation of Women (P) Act.	Others
Andhra Pradesh	22753.5	5.0	5.4	6.1	19.2	13.1	43.1	5.2	2.8
Arunachal Pradesh	169.2	24.7	27.6	0.1	39.0	0.9	8.1	0.0	0.0
Assam	7872.0	18.0	24.3	2.3	15.2	0.1	39.7	0.0	0.3
Bihar	7732.8	14.9	19.3	28.4	8.5	0.3	27.6	0.0	0.9
Chhattisgarh	3862.0	25.6	5.6	2.8	41.4	3.7	20.6	0.0	0.3
Goa	122.5	22.9	10.9	1.4	22.4	8.4	13.2	0.2	20.8
Gujarat	7346.3	4.8	14.6	0.7	10.5	1.6	66.9	0.0	0.8
Haryana	4763.0	11.1	10.4	5.7	9.5	14.9	47.1	0.0	1.4
Himachal Pradesh	896.1	16.8	14.2	0.9	33.7	4.0	30.2	0.0	0.3
Jammu & Kashmir	2428.8	9.7	30.1	0.6	39.0	14.1	5.8	0.0	0.2
Jharkhand	2958.0	26.4	14.3	22.6	11.7	0.7	23.4	0.0	0.7
Karnataka	7137.4	6.0	5.9	12.2	27.4	1.0	34.5	0.0	12.8
Kerala	7784.6	7.9	2.0	0.4	33.5	3.2	49.4	0.5	2.6
Madhya Pradesh	15367.8	19.6	5.0	5.2	43.4	5.1	21.6	0.0	0.1
Maharashtra	14063.5	10.7	6.4	2.8	23.3	7.2	47.6	0.0	2.0
Manipur	183.2	17.4	48.9	0.1	23.2	0.1	9.0	0.0	1.1
Meghalaya	169.0	49.6	13.6	0.7	27.5	0.4	7.1	0.0	1.0
Mizoram	144.8	46.3	0.5	0.4	48.1	0.5	3.0	0.0	1.4
Nagaland	37.2	50.6	15.8	0.0	20.5	2.4	1.7	0.0	9.2
Odisha	7253.7	13.4	9.2	17.5	34.0	3.6	21.6	0.0	0.4
Punjab	2490.1	18.2	17.8	5.4	13.8	2.7	40.1	0.0	2.1
Rajasthan	14917.3	8.8	13.9	2.9	18.0	0.2	54.8	0.6	0.6
Sikkim	46.3	34.2	10.7	0.3	40.0	4.9	7.7	0.0	1.6
Tamil Nadu	7932.3	7.6	13.9	5.1	20.3	10.4	19.9	0.3	22.5
Tripura	1048.3	17.8	7.1	2.8	22.0	0.2	50.6	0.0	0.0
Uttar Pradesh	19136.8	8.3	19.7	12.7	12.6	13.0	33.3	0.0	0.2
Uttarakhand	990.8	11.7	19.4	13.5	13.2	12.5	35.1	0.0	0.4
West Bengal	17050.2	11.0	10.2	3.2	12.1	0.7	62.0	0.0	0.6
Total (states)	176657.2	11.0	11.3	6.9	21.2	6.0	39.9	0.8	2.8
Delhi	4088.8	13.6	32.2	3.8	15.8	3.6	29.1	0.0	1.9
All India	181129.9	11.1	11.8	6.8	21.1	5.9	39.6	0.8	2.8



It is to be noted that five out of the above top six ranked states in terms of average annual growth of total crime against women are situated in the East and North-East region of India. The lowest annual average growth of total crime against women is observed in Tamil Nadu (-2.3%) over the same period. Among states highest annual average growth of the incidence of 'Rape' is observed in Sikkim (52.5%), followed by Goa (26%), Manipur (19.8%), Meghalaya (19.3%), Mizoram (16.2%). On the other hand, highest growth of 'Kidnapping and Abduction' is observed in Goa (31.1%), followed by Nagaland (30.6%), and Tripura (16.6%) and the lowest growth is observed in Sikkim (0%). Significant growths of the incident of 'Rape' and of 'Kidnapping and Abduction' have also observed in all most all the union territories (see table-4).

Again, among Indian states Orissa ranks the top in terms of annual growth (14.9%) of the incident of 'Dowry Death & Dowry Prohibition Act', followed by Tripura (13.9%) and Andhra Pradesh (13.2%) and some of the union territories show significantly very high growth rate. It is interesting to note here that the annual growth of the incident of 'Dowry Death & Dowry Prohibition Act' is observed zero in the six out of eight North-Eastern states. In case of the incident of 'Assault on Women with intent to Outrage her Modesty', the highest growth is observed in Nagaland (51%), followed by Tripura (20.75%) and Goa (14.2%) and the lowest growth is observed in Rajasthan (-1.7%). The growth of 'Insult to the Modesty of Women' is highest in Bihar (48.3%) and lowest in six North-Eastern states (0%). Although in Manipur average annual total crime against is 183 only but the growth of incident of 'Cruelty by Husband or his Relatives' appears to be highest (96.8%), followed by Delhi (77.8%) and Puducherry (38.9%). The annual average growth of 'Indecent Representation of Women (P) Act' is zero in all the states and union territories except in Tamil Nadu where the growth of this incident is very high (196.4%). In spite of the fact that the growth of 'Others' crime against women is negative (-9.4%) but it is very much significant in Jharkhand (125.3%), Jammu and Kashmir (65%), Nagaland (55.6%) and Assam (33.2%) (see table-4).



Table 4 : Annual Average Growth of different forms of crimes against Women in India by State in India during the period 2002 to 2012.

State/UTs	Average year to year Growth rate over the period 2002-2012								
	Total Crimes	Rape	Kidnapping and abduction	Dowry Death & Dowry Prohibition Act	Assault on Women with intent to Outrange her Modesty	Insult to the Modesty of Women	Cruelty Husband or his Relatives (IPS Section 498A)	Indecent Representation of Women (P) Act.	Others
Andhra Pradesh	5.2	4.4	6.4	13.2	3.3	5.7	8.3	0.8	0.1
Arunachal Pradesh	1.6	5.2	4.9	0.0	2.5	0.0	20.9	0.0	0.0
Assam	11.4	7.2	11.5	4.2	11.1	44.7	16.5	0.0	33.2
Bihar	8.1	2.4	21.2	5.3	-0.7	48.3	11.0	0.0	0.4
Chhattisgarh	0.7	0.8	7.4	2.5	-0.5	1.5	2.2	0.0	13.9
Goa	12.4	26.0	31.1	0.0	14.2	16.4	19.7	0.0	13.9
Gujarat	4.9	5.7	5.5	-2.0	0.1	1.8	6.0	0.0	3.6
Haryana	5.7	6.1	11.2	0.1	1.8	15.0	7.1	0.0	15.7
Himachal Pradesh	0.8	4.9	5.0	3.4	-1.0	21.2	-0.9	0.0	0.0
Jammu & Kashmir	7.0	6.2	7.3	10.2	7.7	4.4	19.7	0.0	65.0
Jharkhand	7.4	4.1	14.4	11.1	2.0	113.9	11.7	0.0	125.3
Karnataka	5.3	7.4	14.7	9.8	5.7	7.3	7.4	0.0	-9.3
Kerala	6.8	8.3	9.2	6.9	6.6	22.2	6.9	4.9	7.4
Madhya Pradesh	1.4	1.7	5.2	2.8	-0.5	0.8	4.8	0.0	26.0
Maharashtra	2.6	3.4	6.3	1.5	3.4	2.5	2.0	0.0	8.7
Manipur	11.1	19.8	7.8	0.0	19.9	0.0	96.8	0.0	0.0
Meghalaya	14.5	19.3	11.0	0.0	16.4	0.0	0.0	0.0	0.0
Mizoram	6.1	16.2	0.0	0.0	7.3	0.0	0.0	0.0	0.0
Nagaland	7.1	6.1	30.6	0.0	51.0	0.0	0.0	0.0	55.6
Odisha	8.0	6.5	11.7	14.9	9.2	0.4	14.3	0.0	13.8
Punjab	3.5	8.7	8.2	-1.2	0.8	14.9	2.0	0.0	15.9
Rajasthan	5.4	6.5	2.7	3.0	-1.7	-2.2	8.8	6.3	14.2
Sikkim	11.8	52.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tamil Nadu	-2.3	5.9	11.1	11.5	0.1	-1.7	11.0	196.4	-16.4
Tripura	13.1	9.0	16.6	13.9	20.7	0.0	14.3	0.0	0.0
Uttar Pradesh	2.6	3.1	12.6	1.8	5.4	7.7	6.1	0.0	12.5
Uttarakhand	4.1	7.8	7.9	-1.5	5.2	24.6	4.1	0.0	0.0
West Bengal	15.5	11.2	18.2	11.2	13.5	35.4	16.6	0.0	26.1
Delhi	10.1	6.6	8.7	2.4	4.8	15.3	77.8	0.0	-0.5
All India	5.0	4.2	9.4	5.5	2.7	0.1	7.4	0.9	-9.4

Source : Author's own estimation from the available NCRB data.



It is apparent from the above scenario that on an average the incident of crimes against women has increased significantly in all the states in India over the period 2001 to 2012, specifically at an alarming rate since 2007. Among the eight crime heads, 'Rape', 'Kidnapping and Abduction', 'Dowry Death & Dowry Prohibition Act' and 'Cruelty by Husband or his Relatives have been increased significantly and make women unsafe in all spheres of their life..

Concluding Remarks

Crime against women is not a new phenomenon in India. It appeared as an act of domination of the socially high-powered group over the less-powered group. Such domination makes the less-powered group more vulnerable towards their lives and livelihood but in turn, it is equally affects the powered group by creating vulnerable social order for their siblings. It is revealed that significantly highest incidence of crime against women is 'Cruelty by Husband or his Relatives'. This simply implies that the root cause of crime against women is ingrained within our household sector. The other forms of violence against women can be considered as its spread effect.

In our economic development endeavor we are trying to empower women and advocate inclusive growth but women are kept unsafe and in a vulnerable state - a paradox in itself. If serious efforts are not taken immediately to stop crime against women, the incidents of such crime will be increased over time. In order to minimize such crimes against women social and institutional reforms are necessary and for that initiative should be taken from the household sector itself. Sincere efforts have to be taken from the governments and non-government organizations on a long-term basis for the protection of women and this can be achieved by the proper implementation of the existing laws without looking into women's political, religion, economic and cultural background.

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COMPUTER SCIENCE

AN INNOVATIVE APPROACH : MICRONTROLLER BASED SMART ELECTRIC METERING SYSTEM

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Abstracts

The greatest problem of today's world lies on energy wastage and at times energy overuse. The authors have successfully built up a device specially used to generate a psychological effect on the end-user's brains and thus forcing him/her to reduce overuse of the energy resources. This device calculates current going through a particular given circuit and ultimately generates the money (in Rupees) that will be charged to the user for the consumption taking place in the particular circuit. If the consumption exceeds the user specified limit then the current in the circuit trips and warns the user before re-connecting it, that he /she has exceeded his/her usage limits. This has been specially designed for any electronic devices running in the common household like Air-Conditioners, Microwave Ovens, etc. This has been tested by placing the device in a series connection with the total house circuit and has proved very useful also to find the monthly bill every second.

Introduction

The main aim of technologists and engineers have been to reduce power usages in the electronic devices they built. The devices mainly placed on the market are given a "star - rating" to prove that the device is eco-friendly. So, it's a steady climbing task to provide every device with all the features of the modern day world and make it eco-friendly at the same time.

In this paper, the authors introduce a device which helps make usage of other devices eco-friendly. This device carries ACS-712 [1] sensor as its main worker and the whole software of the device is built on this sensor. The device can be placed on any particular circuit in the household or at the mains in the household.



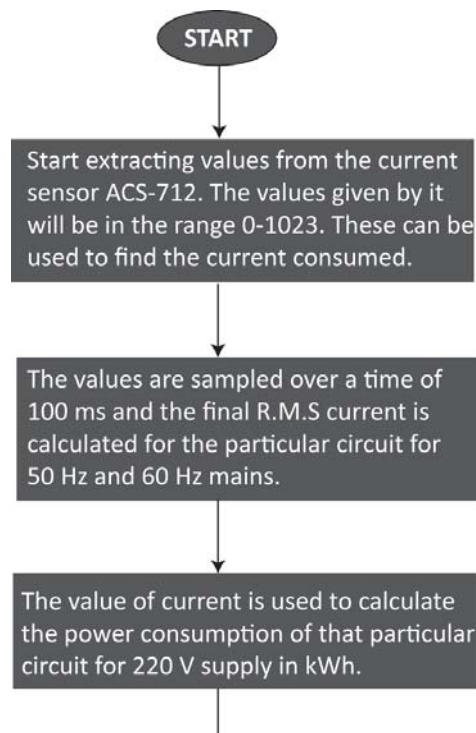
The device extracts values from the current sensor ACS-712 [1] which gives values in the range 0-1023. These values are converted into particular current values in Amperes using suitable formulae [1] specified in the data sheet of the sensor. These values are stored for sampling over a period of time of 100ms. This calculation is specially done for 50 Hz and 60 Hz supply mains (that is mainly for house hold objects). The values are then used to find the R.M.S [3] current of the circuit. This current can be also used to find if the device works properly within the current rating. This current values are used to generate the power consumed for 220 V supply mains. The power consumed is converted in kWh (Kilowatt Hour), a single unit of current consumption. This can be used to find the amount of money spend on running the circuit devices at that particular moment of time.

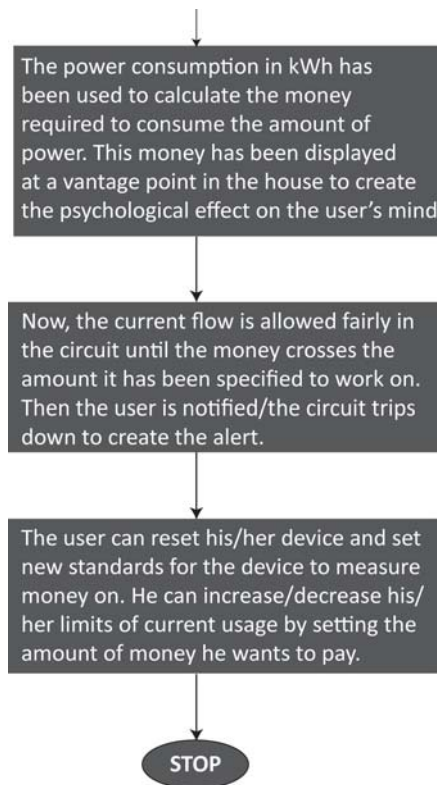
The device can be fairly customized by the user to specify an amount of consumption of money for a particular device and the device warns you back if it exceeds the consumption by tripping the circuit and indicating it.

This was tested to be more efficient than the present day meters [4] and thus can be useful not only in conserving financial resources but also in saving the fossil fuels used to generate electricity.

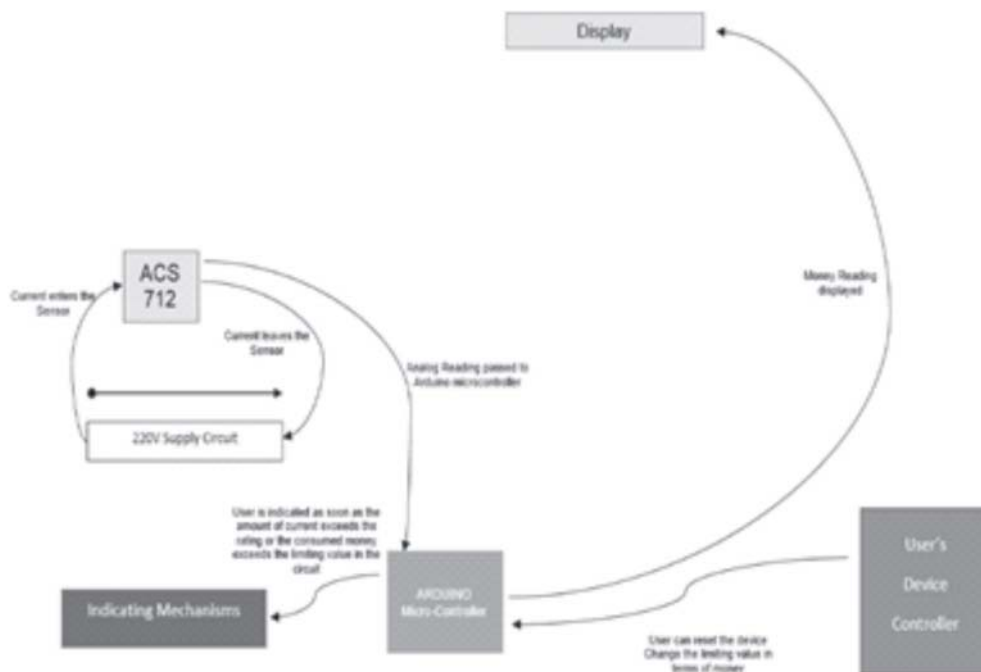
Algorithm

2.1 Block Model of the Algorithm :





2.2 Conceptual Flow of the process :





2.3 Algorithm of the software in a step-wise manner :

- Step 1 :** Set const current Pin = A0.
- Step 2 :** Set const unsigned long sampleTime = 100000 //sampling over 100 ms.
- Step 3 :** Set const unsigned long num samples = 250.
- Step 4 :** Calculate sample Interval by dividing sample time by number of samples.
- Step 5 :** Initialize the money in the sd-card file to 0, and the zero for the values returned by acs712[1] to be 512.
- Step 6 :** Initialize the file in the sd-card section and the Indicating Devices and also initialize serial transfer at 9600 baud rate
- Step 7 :** Extract the values from the analog pin A0 and store the values for 100 ms.
- Step 8 :** Using the stored values calculate the R.M.S [3] current passing through the circuit and use the calculated value for further use.
- Step 9 :** Calculate power consumed in kWh for 220 V supply.
- Step 10 :** Use the current supplier's algorithm to calculate the money consumed each moment.
- Step 11 :** Update the money in the file in the SD-Card.
- Step 12 :** Check if money exceeds the limiting value specified by the user. If it exceeds the value start the mechanism to indicate the situation and finally end in tripping current in the circuit where the device has been attached.
- Step 13 :** At every moment allow the user to change the limiting value specified by him/her although the current rating for a particular device remains the same. The user is not allowed to change it.

2.4 Governing Equations :

Equation for calculating RMS [3] current in the circuit

$$f_{rms} = \lim_{T \rightarrow \infty} \sqrt{\frac{1}{T} \int_0^T [f(t)]^2 dt.}$$

Equation for Power Consumption in the circuit :

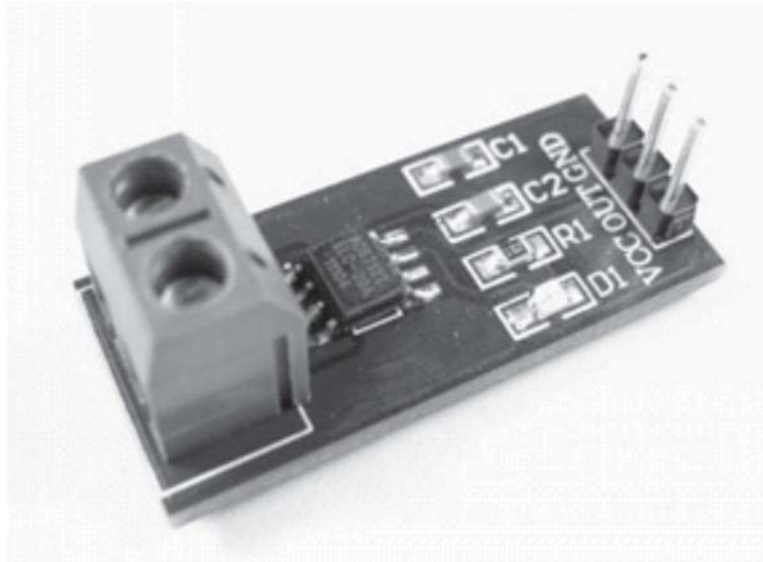
$$P=VI \text{ (where V = Voltage, I = Calculated current value)}$$

Now, Converting the calculated power into kWh:

$$E(\text{kWh}) = P(\text{W}) \times t(\text{hr}) / 1000$$

Here, t=time in hours.

2.5 Product design of the ACS712 :



Results and Discussions



Figure : 01. This model clearly shows the display of money and units consumed when two 100 Watt bulbs have been lit in a parallel connection. The white led in this case shows that the current is within fair limits and the money is also within the limiting value entered by the user.

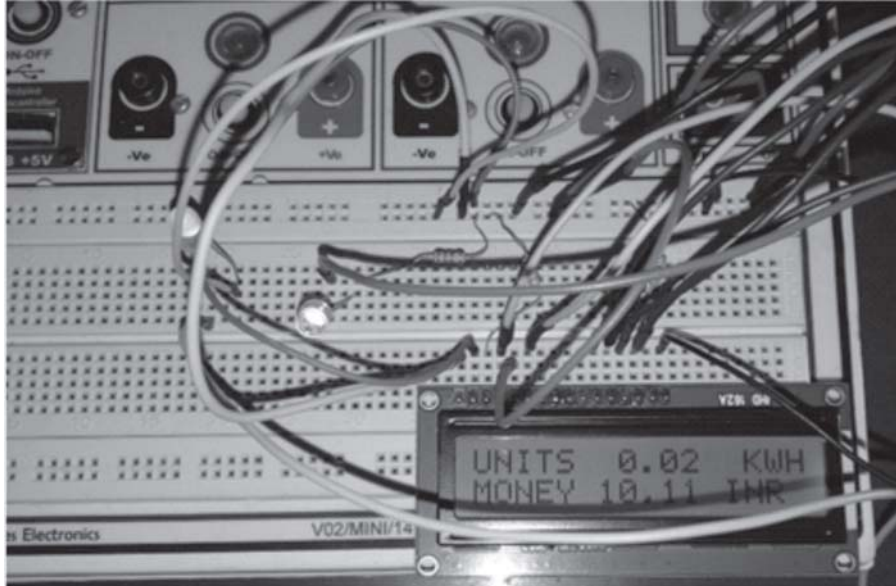


Figure : 02. (A very preliminary model of the device).

This model clearly shows the display of money and units consumed when two 100 Watt bulbs have been lit in a parallel connection. The white led in this case shows that the current is within fair limits and the green led indicates that the amount of money has passed the limits specified by the user and trips the circuit in the particular circuit.

This model shows that even after the user has re-connected the circuit to run over the defined limits the indicator still keeps glowing which always goes on creating a heavy impact on the user's mind.

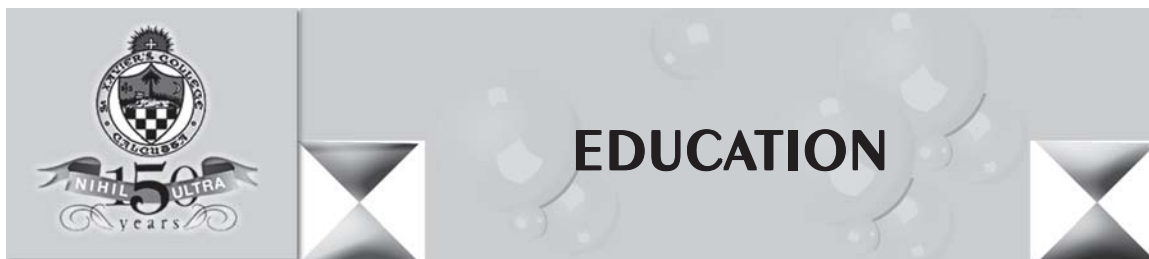
Conclusion

The device has been tested in various conditions in different household for a month and the bill generated by the energy provider company and the calculated value of the device has been almost equal with a very small distortion in the results. The device has given perfect results in determining if a device is running at its optimal state or not by measuring the current extracted by it all the time and comparing it with the rated current of that particular device. It has always been enhanced than the metering systems that users are provided with as it generates the bill at every moment. The device gives the user a huge option to plan for the monthly bill before hand and check the energy consumption and thus reserve his financial resources. It has an ultimate effect on the environment which will help reduce electricity usages and thus help in reducing pressure on the vanishing fossil fuels.



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A STUDY OF THE EDUCATIONAL IMPLICATIONS OF ECONOMICS : AN INTERDISCIPLINARY APPROACH

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Abstract

The paper adopts an interdisciplinary approach in the study of Economics in the classroom. An understanding of Economics helps us to comprehend important global issues and at the same time make critical decisions that influence the future of our world. Economic concepts, graphs, tables, equations and rules should not only be committed to memory. Students should be encouraged to grow in a deeper understanding of them and the crucial role that they play. Students need to assess for themselves that Economics is imperative for an understanding of the world. This in turn will motivate them to apply concepts learnt in Economics to a wide variety of settings. Application of Opportunity Cost, Demand and Supply and Equilibrium, Marginal Analysis should be encouraged by the educators in the classroom and beyond. Game Theory, Money, Multipliers, Accelerators and their implications on National Income need to be studied contextually in order that students retain a comprehensive understanding of whatever they learn.

The methods used for this study is Library Research that includes Text Analysis, Documentation Analysis and Content Analysis of Syllabi and curriculum of Economics in the secondary and higher secondary stages of education. The importance of Economics in education stems from the fact that knowledge is integral to growth and development of the economy. If the workforce is equipped with



appropriate skills for the knowledge economy, it will be able to respond intelligently to the economic, social and environmental prerequisites of our times, in a manner in which it is sustainable for future generations.

Keyterms : Economics, Education, Econometrics, Human Capital, Economic Analysis, Educational finance, Educational Expenditure, Public Private Partnership, School Based Management, Production function, Impact Evaluation.

Introduction

Economics is a very important part of our lives. An understanding of Economics helps us to comprehend important global issues and at the same time make critical decisions that influence the future of our world. A student bears testimony to economic literacy if years later he/she can apply fundamental economic concepts and theories to their life outside the classroom. The Teachers College of Columbia University points out that adequate attention should be paid to equip students with skills to apply economic methods and tools in order to solve critical educational problems. Research has provided clinching evidence that not only school attainment, but also cognitive skills, are critically influenced by economic factors such as individual earnings, distribution of income and economic growth (Hanushek & Woessmann, 2007).

Economics and Education

Economics as a subject is taught in the later and more mature years of schooling. College students at this stage are better equipped to deal with complex economic issues. Economic concepts, graphs, tables, equations and rules should not only be committed to memory. Students should be encouraged to grow in a deeper understanding of them and the crucial role that they play. Students need to assess for themselves that Economics is imperative for an understanding of the world. This in turn will motivate them to apply concepts learnt in Economics to a wide variety of settings. Application of Opportunity Cost, Demand and Supply and Equilibrium, Marginal Analysis should be encouraged with the aim of making Economics applicable to various life situations. Game Theory, Money, Multipliers, Accelerators and their implications on National Income need to be studied contextually in order that students retain a comprehensive understanding. Economic ideas assist in gaining valuable insight into relevant issues. Economic helps us to understand that productive resources are limited and that people have to make intelligent and informed choices.

Econometrics and Education

Econometrics is a discipline that applies statistical, mathematical and computational theories to economics in order to test hypotheses and forecast future trends. Econometrics can be used to evaluate educational policy. The traditional approach



may entail the use of structural parameters in which the performance of alternative policy rules are studied.

The Polish economist, Pawel Ciompa was the first to use the term Econometrics in the year 1910. It is to the economist Ragnar Frisch, that the contemporary sense in which Econometrics is used is credited today. Econometrics is the science of perusing through bundles of data in order to deduce certain relationships and make certain inferences from it. It relates to the quantifying of economic phenomena in terms of current theory and observation by utilizing appropriately suited methods of inference ("Econometrics," n.d.).

Econometric Methods and the Economics of Education

Various Econometric methods are used in the Economics of Education. The assumptions underlying these methods relate to the Economic Model. The Returns to Education can be estimated with the help of a Dynamic Discrete Model by Willis and Rosen (1979) and the Mincer Model (Meghir & Rivkin, 2010). Whenever the issues regarding the quality of Education, the relationship between the pupil's performance and the teacher's activity and quality of school education and other such topics are discussed, it is done from the point of view of Economics.

More and more sections of the population are becoming conscious of the fact that Education is an important activity and should be carried out with utmost care. Evidence shows us the rising returns to schooling. Education is considered as a determining factor of economic growth.

Human Capital and the Quality of Education

Research on Human Capital has become an important need of the hour. Educational Enrolment, Educational Attainment are the determinants of quality of Education. In the process of Education there is interaction between family, teachers, administrators. These pose certain complexities in the area of human capital formation, enrolment in education and quality of education both of which determine and are involved in human capital formation.

A variety of methods are used to estimate the effects of Education on wage. Mincer wage equations consider education as a continuous variable. In The Roy Model of Education, decision making was based on what was earlier chosen by Willis and Rosen (1979). The Model shows that there is heterogeneity in returns to Education, schooling, according to individual differences and also according to the levels of schooling. Furthermore the Model suggests that both labour and Education do not have to influence returns to schooling equally. The comparative advantage of one over the other determines the extent to which returns to education is influenced. The Model also explains the process through which school contributes to the formation of human capital (Meghir & Rivkin, 2010).



Economics also provides us with various methods through which we can study the effects of education on wages. Furthermore it highlights the factors that must be considered in order to get accurate estimates of the effects of education on schooling.

The Models and approaches provided by Economics show the implication of placing Education choice and wages within a general equilibrium framework. Thus Models from Economics are imperative for understanding interpretation of estimates as well as the implications of estimates in guiding Educational policy.

In the pricing of human capital, concepts from the Economics of Education are used. Production involves (k) types of human capital. The level of Education determines the type of human capital. Therefore, the returns to education in a competitive economy depend upon how education is priced at the different levels as well as the manner in which education contributes to the formation of human capital (Meghir & Rivkin, 2010).

Economics can be considered as an important tool for educators who would like to develop a better understanding of educational institutions and decisions. Economics provides a very important framework for addressing critical issues on education faced by policy makers. These critical issues include reasons behind investing in education, choosing between different types of schools and different levels of education, private returns to education and whether it is shaped by the number of years a person spends in school or by the level of skill and expertise he possesses.

It is because of Economics that there has been rigorous analysis on educational inequality, role of peer effects, educational expenditure and school management. Economics gives us the knowledge about factors that shape educational outcomes.

Key Themes in the Economics of Education

There are certain key themes that are addressed by the World Bank in the area of Economics of Education. They include the economic analysis of educational interventions, finance and expenditures in education, Private public partnership in education, school based management, impact evaluation and the quality of education (“Economics of Education,” 2014).

Economic Analysis of Educational Interventions

Educational projects that contribute to the welfare of the country can be assessed through economic analysis. It helps answer questions with regard to the fiscal impact of the project, the financial sustainability of the project, the risks involved and possible alternatives to the project.

Economic analysis assists in making intelligent choices so that scarce resources such as capital, labour, land and natural resources are put to a variety of uses in education. Economic analysis is directed towards a basic goal of reducing poverty and income inequalities and accelerating economic growth.



Determining Factors in the Economic Analysis of Educational Projects

For the economic analysis of educational projects ten factors according to the World Bank play an integral role. These factors are major determinants for the sound economic analysis of educational projects.

According to the World Bank, the determining factors in the Economic analysis of educational projects (“Economics of Education,” 2014) are as follows :

- In order to conduct an economic analysis of educational projects, a connection to the Macro Economic and sector specific analysis undertaken in the Country Assistance Strategy (CAS) and the Economic and sector work (ESW) is essential. The purpose of this factor of economic analysis of educational projects, is to ensure that the project is in tandem with the Country Assistance Strategy (CAS) and reflects the country policy based on the experience of the World Bank. Questions such as whether there is equitable access to education by girls, whether there are restrictions on the entry of the private sector, whether post primary education is responsive and sensitive to demand, whether teaching inputs in primary education are being safeguarded, are dealt with in this critical dimension of economic analysis.
- Evidence of Quantitative analysis of Alternative project designs. This factor includes and addresses questions pertaining to the extent and content of activities to be taken up by the Private and Public sectors .
- The fiscal dimension of the project is of macroeconomic significance. It is important that the importance of fiscal factors on the educational project be considered. The cost recovery mechanism should be consistent with issues concerning affordability.
- It is important that the cost benefits should be quantified in the process of framing estimates. This will determine the extent to which a project is worth pursuing. Issues with regard to reallocation of budgetary resources and evaluation of the objectives of the educational project should be taken into consideration and reflected upon critically.
- Sensitivity Analysis : The impact of varying Inputs, demand and costs on the final outcome of the educational project needs to be worked out and factored into the analysis.
- Institutional Capacity and risk analysis— An analysis of the influence of various factors on institutional capacity should be worked out. Political, Legislative, regulatory processes, management and administration make an impact on institutional capacity in the education sector.
- Poverty and Gender Analysis—The impact of the educational interventions on poverty and gender should be considered. Care should be taken to see that they have a positive impact on education. The intervention should not expand the gender divide but reduce or even eliminate it.
- Environment Analysis and linkage to economic analysis. The impact of the educational project on the environment should be assessed. This is especially true



when infrastructure is being built for educational purposes. The positive and negative effect on the environment should be estimated in economic terms and should be given a money value.

- Economic Performance criteria. The key economic indicators that will ascertain the progress of the educational project should be evaluated. The key indicators should be sensitive to the developmental aspects of the educational interventions.
- Overall ranking for Project Analysis. The educational policy and the conclusions from economic analysis should be in conformity with each other.

Finance and Expenditures in Education

For economic growth and Macroeconomic stability public spending should be consistent with financing ability in the long run. Public Resource allocation in education should reflect sound economic policies.

Public Private Partnerships in Education

Public Private Partnership in Education can help expand access of education equitably and at the same time improve learning performance. The public sector needs to form more innovative partnerships with the private enterprises in education.

School Based Management

Decentralization of authority to the school levels is called School Based Management (SBM). SBM can improve the quality of education as it enhances accountability of the school to the society it is part of. Budget allocation, curriculum development, improvement of infrastructure, setting of the school calendar can safely be taken care of by the SBM's.

Impact Evaluation

Impact evaluation helps to discern the consequences or impact of an educational project. It can help ascertain whether current policies are working out or not, whether they are feasible and to allocate scarce resources comprehensively. Project teams can be assisted in the design of an educational project by the Development Economics Team and the Economics of Education Team.

Quality of Education

Education can be considered as an investment that leads to great productivity and this is dependent upon the learning achievement. This can lead to improvement of learning outcomes, expansion of schooling, enhance productivity and contribute to the augmentation of National Income and growth.

International investments are used today for ascertaining the determinants of learning in developing and emerging economies. These approaches though varied use education as a production function.



Conclusion

Economists play a critical role in studying impact evaluations on interventions that influence educational policy. The dynamics of economics at play can be comprehended when we conceptualize teaching and education as a complex activity that involves a variety of different tasks (Jackson & Makarin, 2016).

The importance of Economics in education stems from the fact that knowledge is integral to growth and development of the economy. If the workforce is equipped with appropriate skills for the knowledge economy it will be able to respond intelligently to the economic, social and environmental prerequisites of our times in a manner in which it is sustainable for future generations.

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EDUCATION

PEACE EDUCATION AND ITS PROBABLE ROLE IN SOCIAL DEVELOPMENT BY RESOLVING THE ISSUE OF GENDER BIAS IN THE LIGHT OF UNICEF

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Abstracts

Gender plays the key role regarding how societies would assign responsibilities, resources and rights amongst men and women. The issue of gender bias and inequalities related to the educational provision as well as of social status between men and women creates a conflicting situation in the society which can only be resolved with the help of education rather peace education, which is the need of this hour.

Keywords : Peace Education, Development, Gender Bias, Conflict, UNICEF



Introduction

Change is inevitable in every dimension of our lives, culture and society. This is an age of development where overflow of knowledge can be observed due to the access of distance education, internet and globalization. The term “educational development” is nothing but the amalgamation of two words – education and development. If we try to analyze the word education, we can say that education is a never ending continuous process which brings about all round development of a person by moulding their behavior towards a desired direction through the process of learning. Thus, education is holistic, comprehensive as well as transformative in nature. The term education has been derived from two Latin words viz. **educare**(educere) which means to bring up or to draw out and **educatum** that denotes the act of teaching. Therefore, it can be said that education connotes the development of the latent possibilities or hidden qualities of a child, as it touches every sphere i.e. personal, physical, psychological, emotional, spiritual, aesthetic, moral and social dimensions of one’s life and thus education can be designated as an agency for development.

On the other hand, development can also be defined as another fundamental process which signifies systematic progression, proliferation and productivity of different components of a system (human-being or society)towards a positive direction.

Development involves changes which should not be random but cumulative in nature. It refers to the refinement, betterment and expansion of the existing skills (Schuster, 1992). It may be qualitative or quantitative in nature.

Development results in a consistent modification in one’s behavior and must contribute to a higher level of functioning in the individual. Therefore, it can be said that both the processes like education and development go hand in hand to construct and nurture the future citizens of a society rather a country in broader sense.

Therefore, it can be said, that educational development is very much essential for each and every member of a society irrespective of their gender, economic status, caste, creed and racial discrimination.

A society can’t prosper even a single step if, all the people of both genders, male and female are not equally treated, as they are the counterparts of the same society. Social progress actually depends on the well being of both the men and women but unfortunately the scenario is completely different in all over the world including India, in different ratio. Deprivation starts with women even before they are born. The women of our society are the victims of different sorts of inequality and injustice in different aspects of their lives, such as in social status, education and other opportunities. Inequal treatment of boys and girls, female infanticide, health hazards, child marriage and other types of abusive socio-economic conditions are responsible for the deplorable status of the women in the society.



Gender (the socially acquired notions of masculinity and femininity by which men and women are identified) is a widely used and often misunderstood term (Momsen, 2010). More often, the term has been misunderstood to imply “women only”. However, gender identities are socially acquired; they are flexible and not simply binary constructions, and today there is greater awareness of multiple sexualities and transgender individuals (Momsen, 2010). Currently, gender relations have been interrogated in terms of the way development policies change, the balance of power between men and women. Gender roles (the household task and types of employment socially assigned to women and men) are not fixed or globally consistent, and indeed become more flexible with the changes brought about by the economic development. Everywhere gender is crosscut by differences in class, race, ethnicity, religion and age that lead to conflicts. Gender analysis is not merely restricted to focus on women but also emphasizes on the interaction in between men and women of our society.

Gender plays the key role regarding how societies would assign responsibilities, resources and rights amongst men and women. Women have to go through both interpersonal and intra-household inequalities and discrimination which creates a social conflict that hinders the growth of the society.

When we are dealing with conflict, we must have an idea about it. According to Robbin (1974), conflict is a perceived difference of values between two or more situations or parties that results in mutual opposition (opposing interests or goals or opposing behavior). Conflict is integral to the nature of change and also inevitable. It is an inherent structural component in all social relations.

Therefore, the issue of gender bias and inequalities related to the educational provision as well as of social status between men and women creates a conflicting situation in the society which can only be resolved with the help of education rather peace education, which is the need of this hour. Education is universally acknowledged to benefit individuals and promote national development. Educating females and males produces similar increases in their subsequent earnings and expands future opportunities and choices for both boys and girls.

However, educating girls produces many additional socio-economic gains that benefit entire societies. These benefits include increased economic productivity, higher family incomes, delayed marriages, reduced fertility rates, and improved health and survival rates for infants and children also.

According to Smith and Vaux (2003), there are three main reasons why the relationship between education and conflict is important :

- ☒ Education is a fundamental right that should be maintained at all times, even in the most difficult circumstances. This is not simply an ideological statement. Where education is maintained in the midst of conflict it may provide an important mechanism for the protection of children against abuse.



- ☒ Education is an essential tool for human development and eradication of poverty. Children rarely get a second chance at education. Where the opportunity of education has been lost due to conflict, it is not just a loss to the individual, but a loss of social capital and the capacity of a society to recover from the conflict.
- ☒ Education can be part of the problem as well as part of the solution. Policies and practice at all levels within the education system need to be analyzed in terms of their potential to aggravate or ameliorate conflict.

Thus the provision for the equalization of educational opportunities should be arranged for both the men and women and this preamble had also been fostered in India through the regulations of NPE 1986 as well as through different constitutional provisions (Articles 45,46 &30) of free and compulsory education for all children of different strata of our society.

Peace Education

Peace education in UNICEF refers to the process of promoting the knowledge, skills, attitudes and values needed to bring about behavior changes that will enable children, youth and adults to prevent conflict and violence, both overt and structural; to resolve conflict peacefully; and to create the conditions conducive to peace, whether at an intrapersonal, interpersonal, intergroup, national or international level.

According to Abebeet. al. (2006), Peace Education is a process of developing knowledge, skills, attitudes, behaviors and values that enable learners to:

- ☒ Identify and understand sources of local and global issues and acquire positive and appropriate sensitivities to these problems.
- ☒ Resolve conflicts and to attain justice in a non-violent way.
- ☒ Live by universal standards of human rights and equity by appreciating cultural diversity, respect for the earth and for each other.

Peace Education means to learn about and to learn for peace. Learning about peace means obtaining knowledge and understanding of what contributes to peace, what damages it, what leads to war, what does 'peace' mean on each level anyway, what is my role in it, and how are the different levels connected ? Learning for peace means learning the skills, attitudes and values that one needs in order to contribute to peace and help to maintain it. For example, this means learning to deal with conflicts without the recourse to violence, learning to think creatively, learning to apply the methods of active non-violence or learning to deal with cultural differences in a constructive way (Space for Peace, 2010).

Peace education can be defined as the transmission of knowledge about requirements of, the obstacles to, and possibilities for achieving and maintaining peace; training in skills for interpreting the knowledge; and the development of reflective and participatory capacities for applying the knowledge to overcome problems and achieve possibilities (Reardon, 2000).



Therefore, peace education is holistic. It embraces the physical, emotional, intellectual, and social growth of children within a framework deeply rooted in traditional human values. It is based on philosophy that teaches love, compassion, trust, fairness, cooperation and reverence for the human family and all life on our beautiful planet (Schmidt and Friedman, 1988, as cited in Abebe et. al., 2006). Peace education is an attempt to respond to problems of conflict and violence on scales ranging from the global and national to the local and personal. It is about exploring ways of creating more justice and sustainable futures (R. D. Laing, 1978, as cited in Abebe, et. al., 2006) for all people i.e. both men and women.

Peace Education and Views of UNICEF

According to UNICEF the followings are the outline of the many factors that peace education must take into account and incorporate.

Schooling and other educational experiences that reflect UNICEF's approach to peace education should:

- ☒ Function as 'zones of peace', where children are safe from conflict in the community.
- ☒ Uphold children's basic rights as enumerated in the CRC (Convention on the Rights of the Child).
- ☒ Develop a climate, within the school or other learning environment that models peaceful rights and respectful behavior in the relationships between all members of the school community, teachers, administrators, other staffs, parents and children.
- ☒ Demonstrate the principles of equality and non-discrimination in administrative policies and practices.
- ☒ Draw on the knowledge of peace-building that already exists in the community, including means of dealing with conflict that are effective, non-violent, and rooted in the local culture.
- ☒ Handle conflicts - whether between children or between children and adults, in a non-violent manner that respects the rights and dignity of all involved.
- ☒ Integrate an understanding of peace, human rights, social justice and global issues throughout the curriculum whenever possible.
- ☒ Provide a forum for the explicit discussion of values of peace and social justice.
- ☒ Use teaching and learning methods that promote participation, cooperation, problem-solving and respect for differences.
- ☒ Allow opportunities for children to put peace-making into practice, both in the educational setting and in the wider community.
- ☒ Provide opportunities for continuous reflection and professional development of all educators in relation to issues of peace, justice and rights (Fountain, 1999).



Rationale for Peace Education in UNICEF

- ☒ **Article 29 of the Convention on the Rights of the Child (1989) states that :**
“...the education of the child shall be directed to...the preparation of the child for responsible life in a free society, in the spirit of understanding, peace, tolerance, equality of sexes, and friendship among all peoples...”
- ☒ **The 1990 World Declaration on Education for All states that :**
“Every person – child, youth and adult – shall be able to benefit from educational opportunities designed to meet their basic learning needs. These needs comprise both essential learning tools (such as literacy, oral expression, numeracy, and problem solving) and the basic learning content (such as knowledge, skills, values, and attitudes) required by human beings to be able to survive, to develop their full capacities, to live and work in dignity, to participate fully in development, to improve the quality of their lives, to make informed decisions, and to continue learning ... The satisfaction of these needs empower individuals in any society and confers upon them a responsibility to ... further the cause of social justice, ... to be tolerant towards social political and religious systems which differ from their own, ensuring that commonly accepted humanistic values and human rights are upheld, and to work for international peace and solidarity in an interdependent world.”
- ☒ **It has been observed in the study on *The Impact of Armed Conflict on Children* by Graça Machel (1996), reaffirmed the importance of education in shaping a peaceful future :**
“...Both the content and the process of education should promote peace, social justice, respect for human rights and the acceptance of responsibility. Children need to learn skills of negotiation, problem solving, critical thinking and communication that will enable them to resolve conflicts without resorting to violence.”
- ☒ **The UNICEF ‘Anti-War Agenda’, set out in *The State of the World’s Children* 1996, declared that :**
“...Disputes may be inevitable, but violence is not. To prevent continued cycles of conflict, education must seek to promote peace and tolerance, not fuel hatred and suspicion.”

Education for Development through Peace Education

Education for Development is the term used in UNICEF to describe an approach to teaching and learning which builds a commitment to global solidarity, peace, acceptance of differences, social justice and environmental awareness in young people (Fountain, 1995). Its aim is to empower children and youth to participate in bringing about constructive change, both locally and globally. Five basic concepts of Education



for Development are interdependence, images and perceptions, social justice, conflict and conflict resolution, and change and the future.

These concepts are approached as interdisciplinary perspectives that can be incorporated into the teaching of a wide range of subject-matter, rather than as specific subjects in themselves. Interactive, participatory, cooperatively-structure dteaching methods are as important as the content of Education for Development. These methods allow learners to better grasp complex concepts, build problem solving abilities and develop social skills. These approaches have been used in both formal and non-formal educational activities, and provide a human development-oriented framework for educating people about peace and social justice issues.

Peace Education and Gender Training

Gender conflict is found in societies around the globe, and gender discrimination and conflict is a leading cause of violence (UNICEF ROSA, 1998). A number of gender training initiatives have begun to address the prevention of violence against women, and alternative ways in which gender conflict may be handled. These initiatives promote attitudes and values that emphasize the rights of girls and women to safety, respect, non-discrimination, and empowerment.

Some programmes focus specifically on boys, helping them better understand their relationship to girls, their roles and responsibilities in family life, stereotypes about masculinity, and communication skills for dealing with conflict. Gender training initiatives have an essential perspective to add to peace education activities, which have sometimes tended to overlook the gender component in violence and conflict resolution.

Postulates of International Women's Rights Movement Regarding Gender Bias and Peace Education

- ☒ To organize and mobilize men, women and children to reiterate and reinforce the importance of secular values for a harmonious coexistence.
- ☒ To create pressure groups to condemn acts of violence and exclusion and to propagate actions and initiatives to promote peace and inclusion.
- ☒ To reaffirm secular values and multiculturalism for maintaining and strengthening democratic values based on respect for human rights.
- ☒ To encourage, facilitate and establish similar networks/coalition of citizens to promote secular values, religious tolerance, democracy and human rights and accelerate women's participation in secular movements striving for equality and justice.
- ☒ To counter violence on women, dalits, minorities, tribals and to contribute to the efforts for gender justice, social justice and distributive justice.
- ☒ To consistently raise our voices against fundamentalism and communalism and to initiate action against all forms of discrimination.



Conclusion

Therefore, in conclusion, it can be said that, peace is nothing but a state of mind and this is beautifully articulated in the Preamble of the UNESCO Constitution :

“Since wars begin in the minds of men, it is in the minds of men that the defence of peace must be constructed”.

Both at home and out of home, violence emerges out of intolerance for differences in beliefs, views, cultures and social traditions and mores. Hence, peace is more than absence of violence; it is tolerance, understanding, and respect of differences and moreover it is nothing but love. It is concerned for others over concern for self.

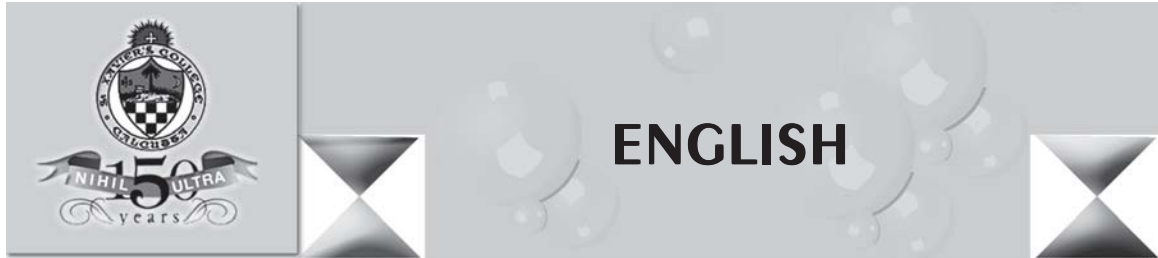
Therefore, we have to try our level best always, to begin peace at our home at first and spread it amongst every nook and corner of our society with the light of education (formal, informal, non-formal) equally.

Conflicts and bias actually emerged out of the attitude and mental set of an individual and society. Thus, for the social security, safety, emancipation and education of women, concerted efforts should be made by the people from all strata of the society to bring about the changes in the mind set and attitude of the people that would accelerate social progress by diminishing the gender discrimination through building and reconstruction of peace by giving equalization of educational opportunity.



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POETRY, SPIRITUALITY AND PATRIOTISM

An Exploration of Sri Aurobindo & Swami Vivekananda's Verse

'... it (poetry) is the spiritual excitement of a rhythmic voyage of self-discovery among the magic islands of form and name in these inner and outer worlds...' — Sri Aurobindo

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In his poem 'Lines on Ireland', composed in 1896, Sri Aurobindo exclaims at the fall of grace of Ireland: 'How changed, how fallen from her ancient spirit ! / She that was Ireland, Ireland now no more, / In beggar's weeds behold at England's door...' (Sri Aurobindo 12). The seeds of fervent nationalism or patriotism which were to further blossom and culminate in the coming decades, could be traced in his emphatic poetic address to Ireland. Sri Aurobindo's prescription for Irish redemption, was not a military strategy but a return to its roots, self-introspection, deeper spiritual communion, revival of its past glory and distinctive cultural identity. For subjugation and subservience of Ireland, he doesn't accuse the alien power but blames the enslaved state: 'But thou to thine own self disloyal, hast / Renounced the help divine, turning thy past / To idle legends and fierce tales of blood, / Mere violent wrath with no proposed good...' (Sri Aurobindo 13). The poet's attack culminates in the line which emphatically asserts : 'How fallen art thou being ruled by these!' His personal frustration is a spontaneous outburst of condemnation against a shameless surrender to a foreign



domination. As Shyam Kumari rightly observes in the critical essay 'The Spirit of Indian Nationalism in Sri Aurobindo's Early Poems': 'It is a sweet journey to follow in the footsteps of Sri Aurobindo's early poetry and trace the first dawns of the Indian spirit.' (Kumari 54)

Sri Aurobindo's entrapment in an alien culture (since he was eight years old) did not stand as a hindrance in his quest for search of traditional roots and discovery of Indian heritage. As the cited extract from the poem testifies, Sri Aurobindo's recommendation lay in spiritual regeneration and re-discovery of cultural roots for an emphatic assertion of nationalist identity. Quite naturally, it doesn't come as much of a surprise for us that Sri Aurobindo was drawn to the novelist Bankim Chandra Chatterji, who not only fused spirituality with nationalism in his *Anandamath*, but also advocated a confrontational path for the sanyasis in his novel as their means of liberation or nirvana. At the outset, it is interesting to make a couple of observations: first, that patriotism or nationalism is not alienated from spirituality and secondly, cultural self discovery, especially the rekindling of inherent tradition and heritage, in its true essence, has a sacramental dimension associated with it. The sanctity of the latter is to be preserved against all odds of life. Herein perhaps lay the spiritual resilience of a nation or a state against external subjugation. It is this spiritual empathy that Sri Aurobindo celebrated when he described the novelist in his poem entitled 'Bankim Chandra Chatterji' as 'The sweetest voice that ever spoke in prose.' (Sri Aurobindo 25). In his obituary lyric 'Saraswati with the Lotus', he evokes the muse of learning and bemoans the sad demise of the author :

Thy tears fall fast, O Mother, on its bloom,
O white-armed mother, like honey fall thy tears ;
Yet even their sweetness can no more relume
The golden light, the fragrance heaven rears,
The fragrance and the light for ever shed
Upon his lips immortal who is dead. (Sri Aurobindo 26)

Spiritual heritage and individuality is intrinsic to the national identity, a worthy cause to fight for and sacrifice oneself. It comes as no wonder that 'Sri Aurobindo started from this point and made spirituality and nationalism concomitant like a glorious and invincible union of the Ganges and Yamuna' thereby raising 'the pitch of the sacred past and upheld the mighty godhead of Sanatana Dharma' (Kumari 60).

It is this spirit that is also echoed in the celebration of the sacrifice of the Irish nationalist 'Charles Stewart Parnell', (1891): 'O pale and guiding light.../ Thou too wert then a child of tragic earth, / Since vainly filled thy luminous doom of birth' (Sri Aurobindo 15) 'Hic Jacet' glorifies yet another Irish patriot whom Aurobindo admired and eulogized in verse: 'He lies: this guerdon only Ireland gave, / A broken heart and



an unhonoured grave' (Sri Aurobindo 11). At that time Ireland, like India was struggling under British oppression. Aurobindo's identification with Parnell and correlation of India with Ireland is distinctly clear in the following lines:

Deliverer lately hailed, since by our lords
Most feared, most hated, hated because feared,
Who smot'st them with an edge surpassing swords! (Sri Aurobindo15)

As Shyam Kumari observes : 'Here the words "our lords" clearly emphasise the fact that Aurobindo was conscious of the bond of slavery common to his country and Parnell's'. (Kumari 57) These early poems clearly testify that while composing them, Sri Aurobindo was searching for an apt metaphor for his own Mother India. The general refrain in most of these lyrics is a clarion call to regain the lost pride and glory, which would pave the path for liberation of both the masses and from the alien rule.

Behind the guise of Ireland, Aurobindo revealed his concern for his own motherland. The mask however lies uncovered, though in a different context altogether, in the poem 'Night by the Sea', when the reflective poet lover cries out: 'In thy bosom's snow white walls... Shut my heart up; keep it closed / Like a rose of Indian grain...'. (Sri Aurobindo 19). Having resurrected the faith in his roots he became acutely conscious as to how he 'had wronged' his 'youth and nobler powers' by 'weak attempts, small failures, wasted hours' (Sri Aurobindo 22). The call for homeland and its freedom is distinct and clear. He has clearly heard the melodious chantings of Saraswati, the goddess of art and learning, a clarion call he could neither disregard nor distance himself any more. The final three lines of the poem 'Envoi' serve as 'a sacred invocation, a divine mantra of spiritual nationalism' (Kumari 60):

Me from her lotus heaven Saraswati
Has called to regions of eternal snow
And Ganges pacing to the southern sea,
Ganges upon whose shores the flowers of Eden blow.
(Sri Aurobindo 28)

According to Shyam Kumari, 'In the past the nine muses of Greece had attracted him by their magic colour and he had wooed them assiduously' but as of now 'the limpid transparent Ganga only could fulfil his widened consciousness with Valmiki's *Ramayan*, Vyasa's *Mahabharata* Sri Krishna's *Gita*. The mantric power of Vedic and Upanishadic hymns called to him incessantly' (Kumari 61).

It is perhaps for this reason that C. R. Das later glorified Sri Aurobindo as 'the poet of patriotism, as the prophet of nationalism and the lover of humanity' (Kumar. 114). Among poems which ardently express his nationalistic zest and quest for liberty, the most notable is 'Baji Prabhou', a long narrative poem that eulogises the fortitude and



valour of the Maratha warrior in the face of a crisis. The poem which is based against the backdrop of the historical episode of the valiant self sacrifice of Baji Prabhau Deshpande glorifies his effort in holding the pass of Rangana with a small army against the heavy odds of twelve thousand Moguls :

...

Descending stooped, towards the vesper verge
He gazed and cried: 'make iron of your souls.
Yet if Bhavani wills, strength and the sword
Can stay our nation's future from o'erthrow
Till victory with Shivaji return.'

...

Inflicted. And from time to time the gaze
Of Baji sought the ever-sinking sun.
Men fixed their eyes on him and in his firm
Expression lived. So the slow minutes passed. (Sri Aurobindo 289)

The poem marks a remarkable blend of form and content. As K. D. Sethna observes in *Sri Aurobindo: The Poet*, 'the metre is in the truest sense of the epithet, the heroic blank verse, breathing in every line the dauntless ardour of the protagonists... to thwart and foil the Moguls to the last.' (Sethna 17-18)

Sri Aurobindo's 'Vidula', first published under the title 'The Mother to her Son', also explores the theme of valour and courage against heavy odds of life. Based on a story from the *Mahabharata*, in the poem, Prince Sanjay's mother exhorts him to do his duty and fight for liberation of his lost kingdom. The following extract echoes the clarion call of mother India to her children:

Shrink not from a noble action, stoop not to unworthy deed!
Vile are they who stoop, they gain not Heaven's doors, nor here succeed—
When thou winnest difficult victory from the clutch of fearful strife,
I shall know thou art my offspring and shall love my son indeed; (Kumar 114)

Upon his return to India, Bankim Chandra's *Bande Mataram* continued to inspire the fervent surge of nationalism for Sri Aurobindo and other patriots. In tune with the novel *Anandamath*, the country came to be worshipped as a maternal deity, a cause to fight for, an ideal to cherish and liberate from the throes of an alien rule. As K. Srinivasa Iyengar points out: 'The traditional religious worship of Mother Durga merged with the patriotic adoration of the country as the Mother, and so Durga and Bharati fused into Bhavani' (Iyengar 220). The notion of the nation as mother seemed a natural continuation of Swami Vivekananda's evocation of the goddess in the poem 'Kali the Mother'. Written in Kashmir in 1898, the poem was composed during the



time of his pilgrimage to Kshir Bhavani. Sister Nivedita, who accompanied Vivekananda on that pilgrimage, observes in this context :

His brain was teeming with thoughts, he said one day, and his fingers would not rest till they were written down. It was that same evening that he came back to our house-boat from some expedition, and found waiting for us, where he had called and left them, his manuscript lines on Kali the Mother. Writing in a fever of inspiration, he had fallen on the floor, when he had finished – as we learnt afterwards – exhausted with his own intensity. (Vivekananda 88)

In the poem, Vivekananda glorifies Kali as an embodiment of power and glory. The evocation of divine Shakti is an indirect evocation of the energies of the universe to liberate the human spirit from its ignorant entrapment. The poet makes a fervent plea in this context : ‘Come, O Mother, come !’ (Vivekananda 25). In a similarly correlated poem ‘A Hymn to the Divine Mother’, Vivekananda’s personal prayer merges with the universal cry for freedom :

Manifestations of Her glory show
In power of immeasurable might,
Throughout the universe, powers that swell
The sea of birth and death, forces that change
And break up the Unchanged and changed again.
Lo! Where shall we seek refuge, save in Her ? (Vivekananda 59)

Both Swami Vivekananda and Sri Aurobindo advocated a massive upheaval for the spiritual resurgence of the country and ‘Shiva’ serves as a triumphant symbol of such a spiritual revival. In the lyric entitled ‘Shiva’, Sri Aurobindo evokes the mythological allusion, merging the masculine principle of force and creation with the feminine principle of nurture and nourishment : ‘Life springs in her and Mind is born; her face / She lifts to Him who is Herself, until / The Spirit leaps into the Spirit’s embrace.’ (Sri Aurobindo 150). Similarly, in his poem ‘The Dance of Shiva’ Vivekananda beckons the ‘all destroyer’, ‘Master of Yoga’ and ‘Lord of creation’, quite reminiscent of Aurobindo’s portrayal of ‘mystic loneliness of nude ecstasy’ in verse :

His flaming locks have filled the sky,
Seven worlds play the rhythm
As the trembling earth sways almost to dissolution,
Lo, the Great God Shiva is dancing. (Vivekananda 40)

It is interesting to note that the voices that recurrently guided Aurobindo during various stages of spiritual evolution, subsequent to his return to India were those of Shri Ramakrishna and Swami Vivekananda. The former incited him thrice. At Baroda he heard the distinctive message of Ramakrishna ‘Aurobindo...*Mandir Karo...Mandir Karo*’ (‘Aurobindo... build a temple...’). Later in Pondicherry he asked Aurobindo to



steadfastly evolve to the higher from the lower self and on 18 October 1912, he guided him further : ‘make complete sanyaasa of karma, make complete sanyaasa of thought, make complete sanyaasa of feeling...this is my last utterance’ (Sri Aurobindo 8) Akin to Ramakrishna, Swami Vivekananda too spoke to him, carrying the message of spiritual evolution. Recalling the inspiration of Swami Vivekananda in the Alipur jail, Aurobindo explained :

He explained to me in detail the work of the Supramental – not exactly of the Supramental, but of the intuitivised mind, the mind as it is organised by the Supramental. He did not use the word ‘supermind’, I gave this name afterwards. That experience lasted for about two weeks. (<http://intyoga.online.fr/viveka.htm>)

In an interview when Nirodbaran asked Sri Aurobindo ‘Was that a vision ?’ he replied in the negative : ‘No, it was not a vision. I would not have trusted a vision’ (talks with Sri Aurobindo vol. 1, 164). He asserted : ‘Vivekananda gave me the knowledge of intuitive mentality. I had not the least idea about it at that time. He too did not have it when he was in the body’. Sri Aurobindo further clarified: ‘He gave me detailed knowledge illustrating each point. The contact lasted for about three weeks then he withdrew.’ (<http://intyoga.online.fr/viveka.htm>). During his stay at the Alipur jail, Sri Aurobindo was allowed a half an hour walk in the morning and in the evening for recuperation. It was here that he heard the distinct voice of Vasudeva or Sri Krishna. As he recollected his experience in the famous Uttarpara speech :

... I looked at the jail that secluded me. I walked under the branches of the tree in my cell, but it was not a tree, I knew it was Vasudeva who surrounded me... it was Sri Krishna whom I saw standing there and holding over me His shade. I looked at the bars of my cell, the very grating that did duty for a door and again I saw Vasudeva. It was Narayana who guarding and standing sentry over me. Or I lay on the coarse blankets that were given me for a couch and felt the arms of Sri Krishna around me, the arms of my Friends and Lover. This was the first use of the deeper vision He gave me. I looked at the prisoners in the jail, the thieves, the murderers, the swindlers, and as I looked at them I saw Vasudeva, it was Narayana whom I found in these darkened souls and misused bodies. .. (*Tales of a Prison Life* 111-112)

As Lord Sri Krishna was born in prison to redeem the world, similarly the spiritual reincarnation of Sri Aurobindo took a decisive turn in the precincts of the Alipur Jail, Kolkata.

It is also interesting to note that Sri Krishna formed a common chord of support and inspiration for both Vivekananda and Sri Aurobindo in their verse. The vision of Narayan in every individual concretized the notion of worship of ‘living god’. It paved the way for humanism, altruism and universal brotherhood. It sowed the seeds of union among teeming millions on the basis of spirituality. In his lyric ‘The Living God’ Swami Vivekananda emphasises the need to worship the divinity within every individual : ‘He who is at once the high and low, / The sinner and the saint / Both God...’



(Vivekananda 20). Vivekananda gives the call to 'break all other idols' and worship the living god. In fact he has a note of reprimand in the final stanza of the poem for those who resort to other forms of worship being oblivious of the 'Living God':

Ye fools! Who neglect the living God,
And His infinite reflections with which the world is full.
While ye run after imaginary shadows,
That lead alone to fights and quarrels,
Him worship, the only visible !
Break all other idols ! (Vivekananda 20)

The supreme realisation that the individual self is not dissociated from the universal self, led Sri Aurobindo to celebrate the 'single self' in the sonnet 'Cosmic Spirit': 'I am a single Self all nature fills/... My life is the life of village and continent...' (Aurobindo 161).

The deep awareness of the universal soul led to a greater freedom and deeper awareness of the spirit. Earlier during his confinement in the Alipur jail, Aurobindo had composed the poem 'Invitation'. The poem starts of with a number of queries. The queries are directed to undertake an arduous journey of national reconstruction under challenging circumstances :

With wind and the weather beating round me
Up to the hill and the moorland I go.
Who will come with me ? Who will climb with me ?
Wade through the brook and tramp through the snow ? (Sri Aurobindo 39)

It concludes with a clarion call to fellow citizens to actualise the true freedom of the spirit and realize it on earth :

I am the lord of tempest and mountain
I am the Spirit of freedom and pride.
Stark must he be and a kinsman to danger
Who shares my kingdom and walks at my side. (Sri Aurobindo 39)

The above lines resonate with the same spirit as Vivekananda's poem 'The Song of the Free'. This poem too celebrates the true freedom of the soul and like Sri Aurobindo is verse advocates a sweeping call to the people. The call, in case of both these poet-prophets, is largely refracted through their own personal spiritual experiences :

From dreams awake, from bonds be free !
Be not afraid. This mystery,
My shadow, cannot frighten me !
Know once for all that I am He ! (Vivekananda 7)



Sri Aurobindo's advocacy of spiritual freedom along with his political involvement met its challenge in the tyranny of the oppressors. As the editor of *Bandemataram*, Sri Aurobindo was arrested for sedition on 16 August 1907. Eight days after his arrest, poet Rabindranath Tagore wrote his 'salutation' to Sri Aurobindo :

Rabindranath, O Aurobindo, bows to thee !
O friend, my country's friend, O voice incarnate, free,
Of India's soul!...
The fiery messenger that with the lamp of God
Hath come – where is the king who can with chain or rod
Chastise him ? Chains that were to bind salute his feet,
And prisons greet him as their guest with welcome sweet. (Poddar, Sarkar &
Zwicker 115)

The Bengali newspaper *Dacca Prakash* commenting on the incident reflected :
'the patriotism of this great man and his uncommon self-sacrifice attracted the heart of every son of Bengal' (Sarkar 116).

We all know that in 1910 Sri Aurobindo retired from active politics and lived in Pondicherry for the rest of his life in pursuit of Yoga and realisation of what he called the 'Supermind'. As his biographer points out, Sri Aurobindo chose Pondicherry as his 'cave of Tapasya, an impeccable choice in the given circumstances'. In 1910, Pondicherry, as Srinivasa Iyengar observes, 'was not quiet, it was actually dead'. It was often referred to as the 'dead city'. The general public opinion was that 'Sri Aurobindo has fixed upon a cemetery for his sadhana... a cemetery it was no doubt, but one with its full complement of ghosts and ghouls.' (Iyengar 382). This was to become the spiritual seat of Sri Aurobindo, a place for deep meditation, enlightenment, recollection and mystical visions. Various epiphanic moments were commemorated in verse, most notable among them being the divine contemplation while treading on the ridge of the Takht –i- Suleman in Kashmir, which is beautifully immortalised in the sonnet entitled 'Adwaita':

A silence that was Being's only word,
The unknown beginning and the voiceless end
Abolishing all things moment seen or heard,
On an incommunicable summit reigned,

A lonely Calm and void unchanging Peace
On the dumb crest of Nature's mysteries. (Sri Aurobindo 163)

He was now governed by the Divine Force of creation. As Manoj Das writes :
'Surging forth in his horizon were the outlines of fresh woods and pastures new. He



had now woken up to the supreme mission of his life : to plunge into the depth of spirituality and to discover and establish the principles of the Yoga integral to the transformation of man' (Kumar 107-108).

In the first decade and a half his creative output consisted more of prose than verse. This included *The Life Divine*, *The Secret of the Veda*, *Essays on the Gita*, *The Synthesis of Yoga*, *The Future Poetry*, *The Foundation of Indian Culture* etc. He wrote more poems in the latter half especially in the fifteen year span from 1933 to 1947. His contribution was prolific as he wrote nearly hundred and twenty poems during this period. Poetry now was a 'divine ananda' a reflection and manifestation of a great formative and illuminative power. As K. D. Sethna (Amal Kiran) points out in *The Poetic Genius of Sri Aurobindo*, 'poetry packed with a mask-removing quality is holy scripture in a special way...' (Sethna 79). It was also a call for a resurgent India. In this particular context, it is relevant to remember S. M. Banerjee's query in the essay entitled 'Vivekananda: Orator, Writer and Art Critic'. In that particular work, Banerjee draws a fine line between aesthetics and vision in verse. He asks :

...what is the essence of poetry? It is not, as Sri Aurobindo correctly points out, an aesthetic pleasure of the imagination, the intellect and the ear, a sort of elevated pastime. It is not a matter of faultlessly correct or at most an exquisite technique. True poetry is self vision or world- vision— it is the spiritual excitement of rhythmic voyage of self discovery among the magic islands of form and name in the inner and the outer worlds—...

Like the Vedic Agni, the poet is the youth, the Seer, the beloved, and the immortal Guest with his honeyed tongue of ecstasy. He is Truth-Conscious, the Truth-finder, and his poetry is born as a flame from earth, yet it is the heavenly messenger from the Immortals. (Banerjee 547)

For envisaging, guiding a resurgent India towards its spiritual destiny the state needed poet visionaries like Swami Vivekananda and Sri Aurobindo. As Dr. Kalaamani observes in his book 'Sri Aurobindo: His Mind and Art':

Aurobindo was a great and confirmed believer in the principle of poetic vision and to him vision was the most dominant and powerful faculty in a poet. It was something which was above other faculties, which transcend fancy, imagination and so on. It was as important and vital to the poet as the discriminative thought is to the philosopher, and analytic observation is to the scientist. To Aurobindo the poet is the 'Kavi', in the original sense of the Sanskrit word, for to the ancients, the 'Kavi' was the seer and revealer of Truth. (Kalaamani 86)

Perhaps, one of Sri Aurobindo's greatest philosophical achievements was to initiate the notion of evolution and progression into Vedantic thought. He proposed an evolution of the spirit along with that of matter in his verse. He explained the connection between Brahman and the external world of diversity by introducing the concept of the 'Supermind' in his works – the dynamic principle present in the transcendent Sat



(Being) — chit (consciousness)—ananda (eternal joy or bliss). In the sonnet ‘Evolution’ the mystic poet summarises his philosophy beautifully when he says: ‘O Thou who climbest to mind from the dull stone, / Face now the miracled summits still unwon.’ (Sri Aurobindo 137). In ‘The Infinitesimal Infinite’ he refers to the ‘poor light- bubbles of a trivial game’, the ‘fragile glimmer in the Infinite’, which is ‘Deathless, outmeasuring Space, outlasting Time.’ (Sri Aurobindo 138) According to Prem Tyagi, ‘the ultimate aim of his philosophy and yoga is the liberation of the spirit from the bondage of matter’. It is this liberation, according to him, that links his poems like ‘Urvasie, Love and Death, Savitri and a number of his philosophical lyrics’ (Tyagi 95). ‘The Supramental Consciousness’, in accordance with Dr Nikhil Kumar, ‘thus comes to be the ultimate path to the Supreme Divine transforming the earth-nature into its own Law’; just as ‘ignorance evolves into Knowledge’ and true freedom (Kumar 42).

As the explorations in verse and thoughts testify, both Vivekananda and Sri Aurobindo shared a vision that India must be reborn. The underlying reason behind this is their deep conviction and belief that in her regeneration lay the redemption of the humankind. Both held that India had the unquestionable prerogative to extend spiritual sway over the entire world. As Vivekananda pointed out in *My India: The India Eternal*, ‘India will be raised, not with the power of the flesh, but with the power of the spirit’. (Vivekananda 52) His hopes further fructified in Sri Aurobindo’s deeper conviction and optimism: ‘India’s spirituality is entering Europe and America in an ever increasing measure. That movement will grow...’ (Poddar, Sarkar Zwicker 158). This indeed does not imply spiritual imperialism of any kind ; on the contrary, it implies restoring the dignity and identity of every human individual with a spiritual goal. Both these great thinkers made their prophecies by linking the past with the present. Based on deep spiritual introspection and living in the true essence of the *Gita*, *Vedanta* and the *Upanishads* they envisaged a future of spiritual sway over the entire world for India. Perhaps it is for this reason it has been rightly observed, only a yogi of Sri Aurobindo’s intuitive perception could actualise and realise the life and teachings of Swami Vivekananda in the right perspective.

Acknowledgements

I am grateful to the Ramakrishna Mission Institute of Culture, Kolkata and Sri Aurobindo Ashram, Kolkata and Pondicherry for their help, resources and guidance.

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MICROBIOLOGY

ISOLATION AND CHARACTERISATION OF A POTENTIAL DYE DEGRADING MICROBES

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Abstract

Synthetic dyes are found in a wide range of products but are of primary importance to textile manufacturing waste water contain a variety of polluting substances including dye. Conventional and municipal waste water treatment processes involving light, chemicals or activated sludge are unable to degrade such recalcitrant dyes. The ability of microorganisms to decolourize and metabolise dyes has long been known and the use of bioremediation based technologies for treating textile wastewater has attracted interest. The major aim of this paper has been to try and exploit the isolated organisms to the fullest in order to remove all compounds having detrimental effects. The dye samples used here are eosin yellow and aniline blue. The bacterium and yeast isolated from the water sample could successfully degrade the dye due to the presence of various enzyme like azoreductase, (laccase) (for bacteria 18.94% and for yeast 86.38% of dye has been degraded), glucanase (for exo-glucanase expressed by the organisms itself. The exo glucanase enzymes released by the isolated organisms can be used in order to degrade the hazardous aniline blue and eosin yellow dye components to simpler non-hazardous hydrocarbons. However, since the organisms is an opportunistic pathogen it should not be use in drinking water purification system though it can be safely be used in industrial sludge treatment.



Introduction

Eosin is a fluorescent acidic dye used for staining proteins in the cytoplasm as well as collagen and muscle fibers as well for examination under the microscope. It is one of the principle stain, used in histology. But eosin poses chronic health effects as well. There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment.

Aniline is a toxic compound, which is mainly used in the manufacture of precursors to polyurethane polymers and other industrial chemicals. Other uses include rubber processing chemicals (9%), herbicides (2%), and dyes and pigments (2%). The acute (short-term) and chronic (long-term) effects of aniline in humans consist mainly of effects on the lung, such as upper respiratory tract irritation and congestion. Chronic exposure may also result in effects on the blood. Animal studies indicate that aniline causes tumors of the spleen.

Conventional and municipal waste water treatment processes involving light, chemicals or activated sludge are unable to degrade such recalcitrant dyes (Chung et. al., 1992). Such dyes are thus ejected into the aquatic environment causing severe environmental concerns and public health deteriorations. Chemical degradation deals further damage to the environment and hence it paves the way for biological treatment. The reported enzymes, Azoreductase, Laccase and Glucanase express themselves in the presence of the mentioned dye and are responsible for safe degradation to simpler, harmless compounds. The International Agency for Research on Cancer (IARC), classifies both eosin and aniline as class 3 human carcinogen. Hence, neutralization of such compounds in vivo in the environment is absolutely mandatory. Biodegradation thus provides a much environment friendly alternative to laborious, expensive and hazardous chemical degradation processes. The main aim of this experiment is the degradation of potential water pollutants like synthetic dye by microorganisms into harmless compounds.

MATERIALS AND METHODS

(1) Sources and collection :

The industrial water sample was collected from a stream near a textile industry located at BT college area in Kolkata, West Bengal. The water sample was collected not from the surface but a little deeper down.

(2) Characterization of the sample :

1. Colour : Grey with a greenish tinge.
2. Odour : Characteristic foul odour present.
3. Temperature : 25°C.
4. pH : 7.57.
5. TSS (Total Suspended Solid) : 0.0011 gm/ml.
6. Electrical Conductivity : 1.909 μ S.



(3) Isolation and Purification :

3.1. Bacterial isolation : The water sample was inoculated on Nutrient Agar plates and incubated at 37° C for 48 hours. Bacterial growth was observed. After 48 hours the plates showed the growth of pink and yellow coloured colonies. The different coloured colonies were re-inoculated on separate NA plates for isolation of pure culture. They were also inoculated in NB to check for pigmentation. (Fig. 1)

3.2. Fungal isolation : The water sample was inoculated on Potato Dextrose Agar plates and incubated at 25°C for 72 hours. Fungal growth was observed. After 72 hours the plates showed the growth of pink and yellow coloured colonies. The different coloured colonies were re-inoculated on separate PDA plates and for isolation of pure culture. They were also inoculated in PDB to check for pigmentation. Refer to Fig. 1.

(4) Characterization of the isolated organism :

4.1. Bacterial characterization : According to Gram staining, the isolated organism from the yellow coloured colonies was found to be Gram negative rods. The biochemical tests showed it to be Methyl Red positive and Indole positive, thus indicating that the isolated bacterial species may belong to *Enterobacteriaceae* family. Fig. 3 and 5.

4.2. Fungal characterization : The distinctive pink or coral coloured colonies indicated the fungal colonies to be of *Rhodotorula* spp.

On staining with Methylene Blue oval shaped blue cells, bigger than usual bacterial cells were observed under the microscope at 45X objective. (Fig. 4).

4.3. CHROMagar test : Both the fungal and bacterial colonies were re-inoculated on CHROMagar plates and incubated at 37°C to determine if the isolated organisms are pathogenic. After 24-48hours of growth blackish green colonies were observed on the plates with both fungal and bacterial cultures. The colonies indicated that both the isolated bacterial and fungal species were capable of producing disease and thereby are pathogenic. (Fig. 6).

(5) Mutability and viability of microbes after UV exposure and exposure to formalin vapour :

Pure cultures of *Rhodotorula* spp. was plated in Nutrient Agar. These were labelled as master plates. Sub-culturing of each culture was performed again for the purpose of exposing them to UV radiation and formaldehyde. One plate of each culture was exposed to UV radiation (short UV) for 10 minutes and to formaldehyde vapour for 30 minutes, respectively.

After the cultures were exposed to UV radiation and formaldehyde vapour, streaking was performed on fresh NA plates for each of the treated cultures and then incubated overnight in the incubator at 37°C. Control plates were maintained for



each culture in order to compare the effect on growth before and after treatment with the mutagens.

Also, suspension of the microbial cultures that had been treated with UV radiation and formaldehyde vapour were made in sterile water. Now, 100 μ l of each suspension was pipetted into a sterile petriplates and then Nutrient Agar was poured into it. The process was repeated for each culture having three sets - a control, UV treated and formaldehyde treated. All the petriplates were labelled accordingly. These NA plates were incubated for 24 hours in the incubator at 37°C. After 24 hours and 48 hours, cultures were checked to observe the effect on growth and CFU. After 7 days, effect on cellular morphology, cell size and budding ability were noted. Haemocytometer count was performed for each set-up as well. Refer to Table 1(a), 1(b), 1(c).

(6) Quantitative estimation of dye degradation :

6.1. Percentage of dye degradation at different bacteria : dye ratio.

In order to test the activity of the isolated bacterium pertaining to degradation of dyes, spectrophotometric assays were carried out in different Bacteria : Dye ratios for different concentrations of the Aniline and Eosin dyes. The percentage degradation was thus calculated. The reaction mixture of 3 ml for each test sample was incubated at 37°C for 24,48,72 and 96 hours. Refer to Table 2(a), 2(b), 2(c), 2(d), Fig. 7, 8, Graph 1, 2, 3, 4, 5, 6.

6.2. Percentage of dye degradation at different fungi : dye ratio.

In order to test the activity of the isolated yeast (*Rhodotorula spp.*) pertaining to degradation of dyes spectrophotometric assays were carried out in different Yeast : Dye ratios for Aniline and Eosin dyes. The percentage degradation was thus calculated. The reaction mixture of 3 ml for each test sample was incubated at 25°C for 2,4,6 and 8 days. Yeast culture was revived every alternate day. Refer to Table 2(e), Fig. 7, 8, Graph 7,8.

(7) Enzyme Assay :

Three bacterial enzymes were identified – Azoreductase, Laccase and Glucanase.

Azoreductase (EC 1.7.1.6) Assay- For both bacteria and *Rhodotorula spp*, this assay was performed by using 0.05 (M) acetate buffer (pH- 4) and 5% glucose. The assay mixture contained 1 ml of cell suspension + dye solution and was incubated for 15 minutes. The OD of final supernatants was taken at dye λ_{max} . Laccase (EC 1.10.3.2). Assay- 0.01 gm of Bromophenol blue dye was added in 10 ml of sterile water to prepare the required concentration of Bromophenol blue dye solution. Now, 4 ml of bacterial and yeast culture was added to respective 50 ml of nutrient broth in a conical and incubated for 24-48 hrs. at 30°C to revive the culture.

Revive the culture. Sterile test tubes were taken and labeled as control, bacteria and yeast for day 1 and day 3 respectively. Then following combination was prepared in respective test tubes :



- ☒ 100 μ l of Bromophenol blue solution was added in 5 ml of bacterial culture.
- ☒ 100 μ l of Bromophenol blue solution was added in 5 ml of yeast culture.
- ☒ 100 μ l of Bromophenol blue solution was added in 5 ml of nutrient broth in the control tube.

Then incubate for 24 hrs. and 72 hrs. and then absorbance was measured at 590 nm .

Then the test samples and control was centrifuged at 10000 r.p.m for 10 minutes and supernatant of the respective test sample was taken and absorbance was measured at 590 nm.

Also, sterile petriplates were taken and labeled as bacteria, yeast and control. Then 100 μ l of Bromophenol blue dye solution was added in 20 ml of nutrient agar and poured in petriplates and allowed to solidify. Then 100 μ l of bacterial and yeast culture was added in respective petri plates and 100 μ l of sterile water was added to the control plate and spread with the help of a spreader. Then it was incubated for 24 hrs. at 30°C and observations were taken. Refer to Table 3(a), 3(b), 3(c), Fig. 9a,b,c,d, Graph 9 and 10. Endo-Glucanase (EC 3.2.1.6) and Exo-Glucanase (EC 3.2.1.91) Assay- Overnight culture of the bacteria was taken and inoculated in 200 ml of NB and was kept in incubator at 37°C for 24 hrs. in shaking condition. While 200 ml PDB was inoculated with *Rhodotorula* spp. and was kept in incubator at 25°C for 48 hrs. in shaking condition. In 20 sterile falcum tubes 10 ml of NB (for bacteria) was poured and was centrifuged at 10,000 rpm for 10 minutes. For yeast, another 20 sterile falcum tubes were taken and 10 ml of PDB was poured and centrifuged at 10,000 rpm for 10 minutes.

The supernatant was collected individually for exo-glucanase assay of both bacteria and *Rhodotorula* spp. For bacteria the supernatant was further sonicated for 30mins.

For endo-glucanase assay of bacteria, the pellet which was obtained in the first falcum tube, to that 5 ml of 0.1(M) phosphate saline buffer (pH 7) was added and dissolved .This suspension was further added and dissolved to another falcum tube containing the pellet and so on. This suspension obtained, was sonicated for 30 minutes and the supernatant was collected for the endo-glucanase assay of bacteria.

For endoglucanase assay of yeast, the pellet obtained in first falcon tube, to that 5 ml of 0.1(M) Tris-HCl buffer (pH 7.4) was added and dissolved .This suspension was further added and dissolved to another falcum tube containing the pellet and so on. This suspension obtained was collected for endoglucanase assay of fungi. Endo-glucanase and exo-glucanase were assayed (for both bacteria & yeast) for the release of reducing sugar from carboxymethyl cellulose(CMC). The reaction mixture for reducing sugar assay contained (total volume 2 ml) 0.25 ml of enzyme solution, 1.5 ml buffer 0.05M citric acid (pH 4.8) and 0.25 ml of substrate (0.05 gm in 10 ml water) i.e. cellulose. After 1hr incubation at 50°C, the reaction was stopped by addition of 2 ml of 3, 5-Dinitrosalicylate reagent. The resulting mixture was boiled for 15 mins. The O.D. value was taken at 575 nm.

Results

(3) Isolation of Organisms :

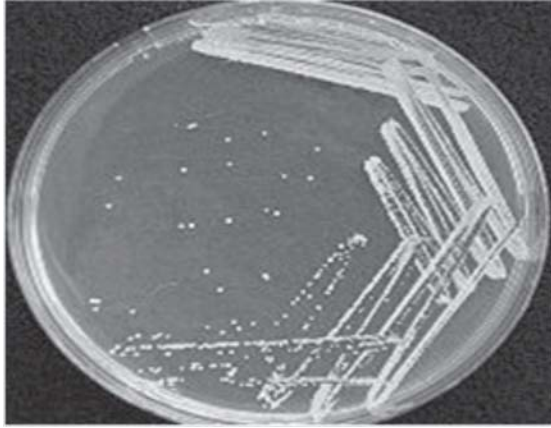


Fig. 1 : Yellow colonies in NA.

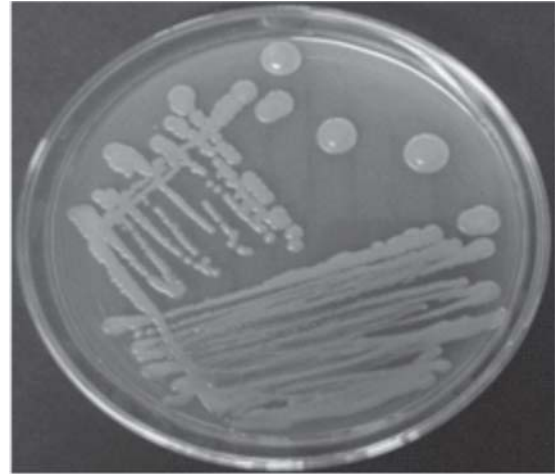


Fig. 2 : Red colonies in PDA.

(4) Characterisation of isolated organism :

(a) Bacterial characterization :

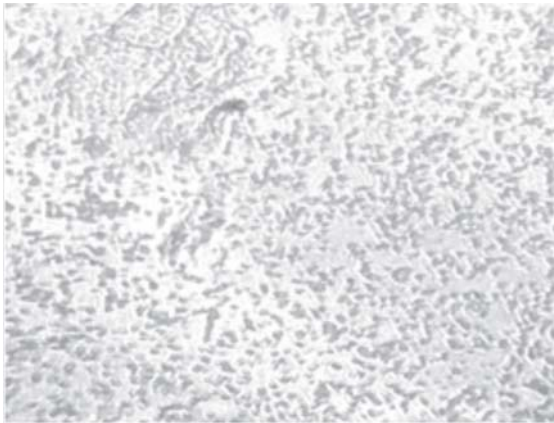


Fig. 3 : Gram Negative Rods under 45X.
(yellow pigmented colonies)

(b) Fungal characterisation :

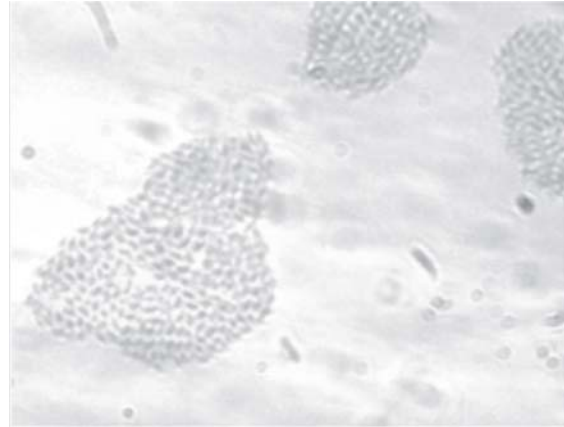


Fig. 4 : Typical oval Yeast cells under 45X.
(pink pigmented colonies)

(c) Biochemical test :

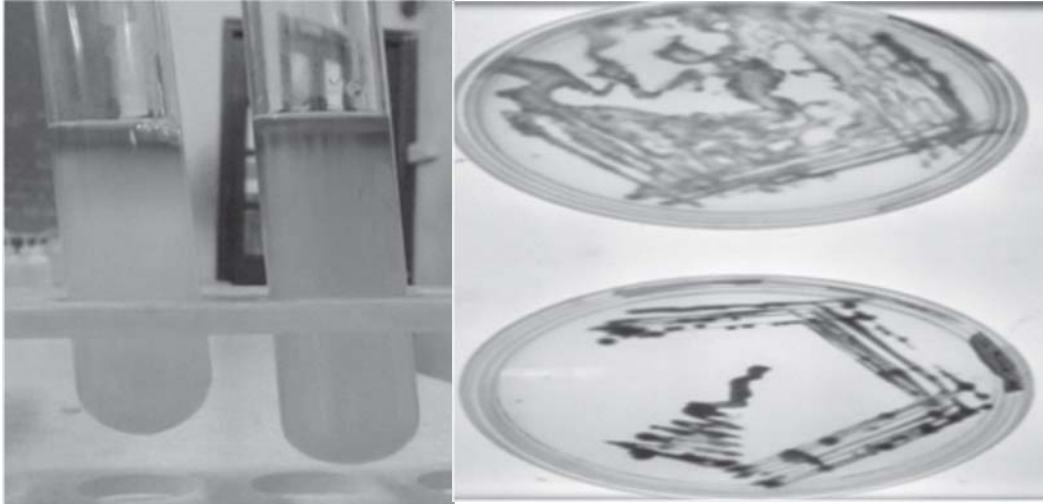


Fig. 5 : Positive Methyl Red Test (for Bacteria). Fig. 6 : CHROM agar detection.

4.3. Mutability and viability of microbes after UV exposure and exposure to formalin vapour :

Table 1(a) Effect of UV radiation and formaldehyde on cell growth

Sample	Rhodotorula spp. (%) of growth observed on the basis of area)
Control	100%
UV treated sample	75%
HCHO treated sample	60%

Table 1(b) Effect of UV radiation and formaldehyde on cfu

Sample	Rhodotorula spp.(observed colonies on plate)
Control	82
UV treated	57
HCHO treated	18



Table 1(c) Haemocytometer count

Sample suspension	Rhodotorula spp.
Control	$18 + 27 + 32/3 = 25$
UV treated	$8 + 6 + 4 = 6$
HCHO treated	$2 + 4 + 3 = 3$

(5) Quantitative estimation of dye degradation :

It is seen that with the progress in time the % dye degradation increases in each of the reaction mixture. Also with the increase in bacterial culture the dye degradation is enhanced. The quantitative estimation was carried out by using the following formula :

$$\% \text{ Dye Degradation} = \frac{(0.D \text{ of control} - 0.D \text{ of test sample})}{0.D \text{ of control}} \times 100.$$

Using this we saw that the isolated bacterium is more potent in dye degradation as compared to the yeast. Also it can degrade Aniline more efficiently as compared to Eosin.

Table 2(a) Dye Degradation for 100 mg/1 concentration of the Aniline dye

Bacteria : Dye Ratio	Incubation Time (in hours)	Optical Density at 595 nm		% Dye Degradation
		Control	Test	
1 : 1	24	1.054	0.381	63.85
	48	1.023	0.350	65.78
	72	1.023	0.337	67.05
	96	1.591	0.488	69.32
1 : 2	24	1.143	0.511	55.29
	48	1.158	0.413	64.33
	72	1.158	0.370	68.04
	96	1.731	0.507	70.71
2 : 1	24	0.943	0.230	75.60
	48	0.903	0.203	77.51
	72	0.903	0.183	79.73
	96	1.538	0.278	81.92

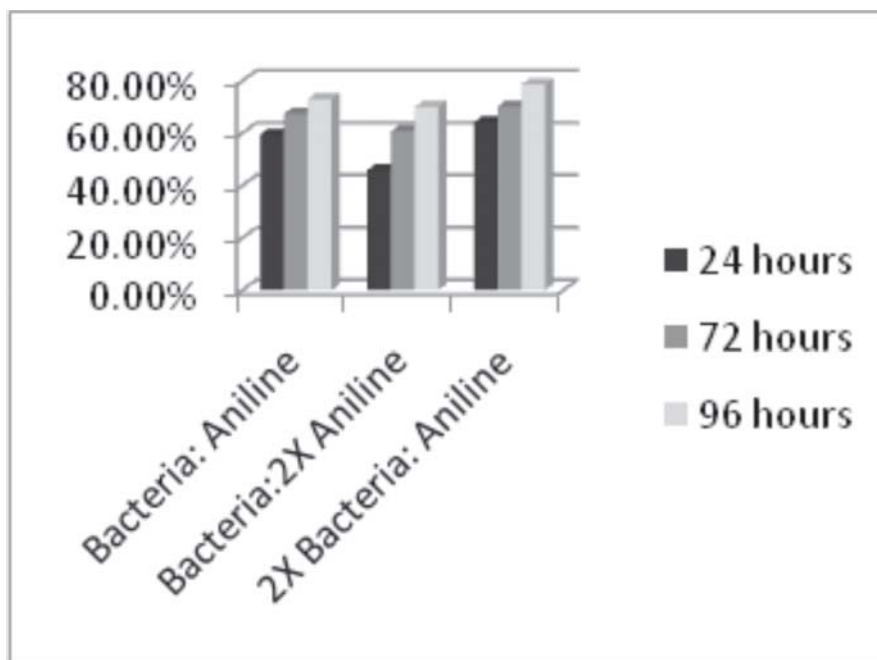


Table 2(b)

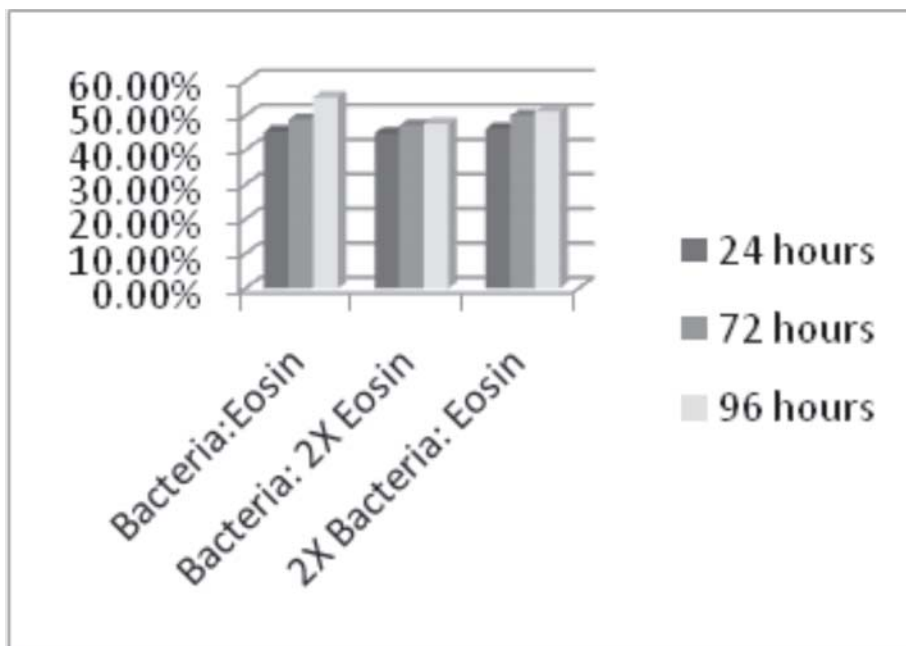
Dye Degradation for 100 mg/1 concentration of the Aniline and Eosin dye

Bacteria : Dye Ratio	Incubation Time (in hours)	Optical Density				% Dye Degradation	
		Control Aniline (at 595nm)	Test Aniline (at 595nm)	Control Eosin (at 595nm)	Test Eosin (at 595nm)	Aniline	Eosin
1 : 1	24	3.018	1.222	3.984	2.126	59.5	45.38
	72	3.443	1.122	4.0409	2.252	67.41	48.92
	96	3.736	1.008	4.702	2.099	73.01	55.35
1 : 2	24	3.142	1.699	4.109	2.261	45.92	44.907
	72	3.567	1.398	4.543	2.398	60.80	47.21
	96	3.860	1.155	4.827	2.523	70.07	47.73
2 : 1	24	2.796	1.000	3.661	1.967	64.23	46.27
	72	3.221	0.959	4.086	2.041	70.22	50.04
	96	3.514	0.75	4.379	2.135	78.65	51.24

From the above table we can see that the dye degradation by the isolated bacteria is more potent for aniline dye.(upto 78.65% degradation) as compared to the eosin dye (only about 50% degradation).



Graph 1 : Bacterial Degradation of Aniline (1000 mg/l).



Graph 2 : Bacterial Degradation of Eosin (1000 mg/l).

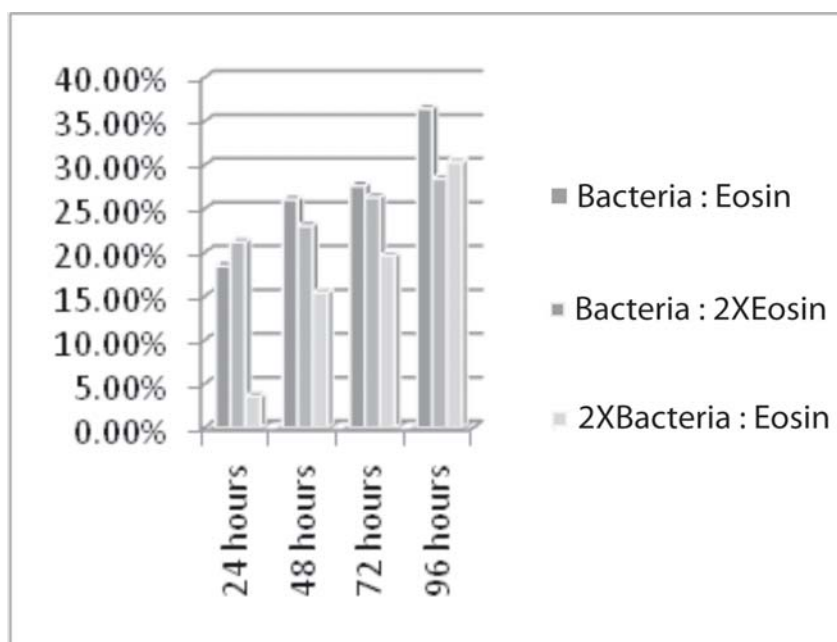
Table 2(c) Dye Degradation for 150 mg/l concentration of the Aniline dye

Bacteria : Dye Ratio	Incubation Time (in hours)	Optical Density at 595 nm		% Dye Degradation
		Control	Test	
1 : 1	24	1.348	0.465	65.50
	48	1.397	0.383	72.58
	72	1.773	0.496	72.60
	96	2.006	0.565	72.65
1 : 2	24	1.399	0.513	63.33
	48	1.448	0.437	70.51
	72	1.824	0.515	71.76
	96	2.134	0.590	72.95
2 : 1	24	1.106	0.352	68.17
	48	1.155	0.301	73.93
	72	1.531	0.358	76.61
	96	1.824	0.380	79.16

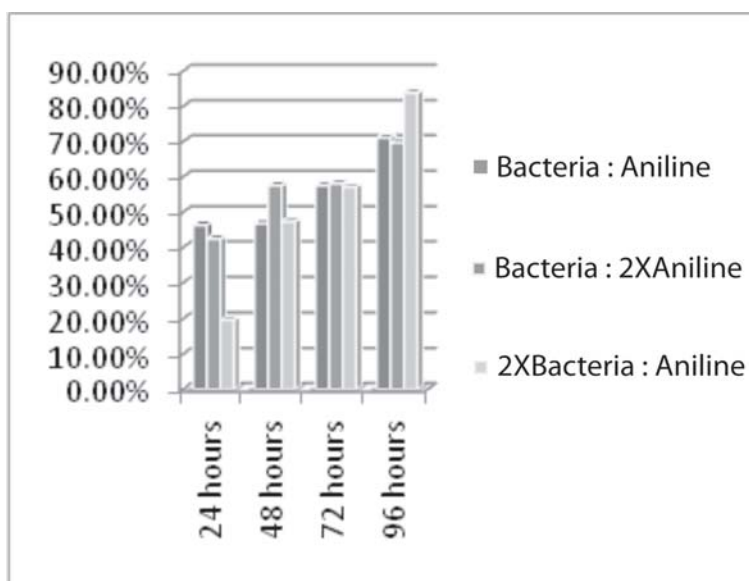
Table 2(d)

Bacterial Dye Degradation for 50 mg/1 concentration of Aniline and Eosin dye

Bacteria : Dye Ratio	Incubation Time (in hours)	Optical Density				% Dye Degradation	
		Control Aniline (at 595nm)	Test Aniline (at 595nm)	Control Eosin (at 595nm)	Test Eosin (at 595nm)	Aniline	Eosin
1 : 1	24	1.555	0.888	4.190	3.301	42.89	21.21
	48	0.848	0.360	3.846	2.958	57.54	23.09
	72	1.060	0.444	2.603	1.917	58.11	26.35
	96	1.147	0.348	3.469	2.481	69.65	28.48
1 : 2	24	0.969	0.490	3.800	3.0973	46.41	18.50
	48	0.746	0.397	3.575	1.903	46.78	26.09
	72	1.086	0.461	4.212	3.046	57.55	27.68
	96	1.576	0.456	3.970	2.523	71.06	36.44
2 : 1	24	0.691	0.554	3.344	3.222	19.64	3.6
	48	0.859	0.452	3.038	2.596	47.38	15.43
	72	1.060	0.521	1.828	19.82	57.13	19.64
	96	1.711	0.276	4.627	3.222	83.86	30.36



Graph 3 : Bacterial Degradation of Eosin (50 mg/l).



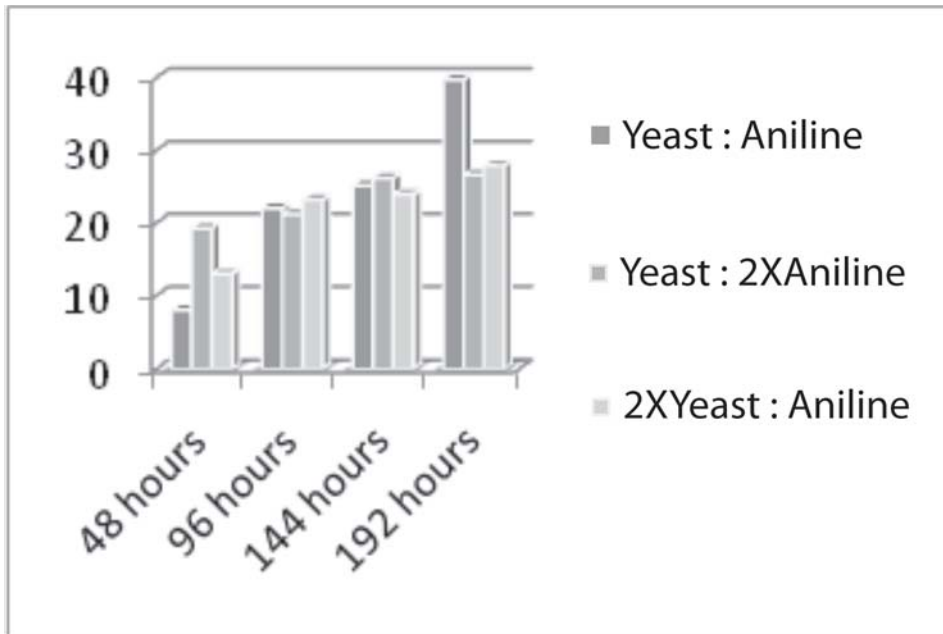
Graph 4 : Bacterial Degradation of Aniline (50 mg/l).

Table 2(e)

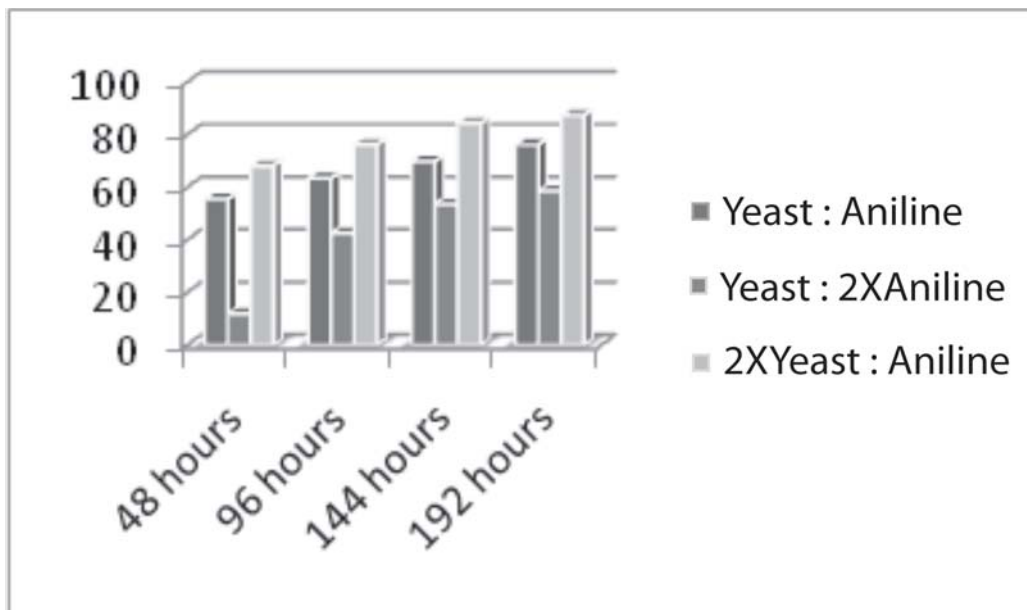
Fungal Dye Degradation for 50 mg/l concentration of Aniline and Eosin dye

Yeast : Dye Ratio	Incubation Time (in hours)	Optical Density				% Dye Degradation	
		Control Aniline (at 595nm)	Test Aniline (at 595nm)	Control Eosin (at 595nm)	Test Eosin (at 595nm)	Aniline	Eosin
1 : 1	48	2.108	1.701	2.725	2.435	19.30	11.90
	96	1.905	1.501	3.438	1.974	21.20	42.48
	144	1.566	1.515	2.873	1.337	26.18	53.46
	192	2.658	1.950	3.469	1.439	26.63	58.51
1 : 2	48	0.876	0.806	3.173	1.415	7.99	55.40
	96	2.301	1.794	4.415	1.616	22.03	63.39
	144	1.870	1.399	4.452	1.349	25.18	69.69
	192	1.431	0.862	1.010	39.76	39.76	76.02
2 : 1	48	1.545	1.344	3.201	1.021	13	68.10
	96	1.410	1.083	4.803	1.144	23.19	76.18
	144	2.328	1.770	4.625	0.726	23.96	84.30
	192	2.495	1.799	3.815	0.485	27.89	87.28

Standard error- 2.168.



Graph 5 : Dye degradation by Yeast at 50 mg/l aniline.



Graph 6 : Dye degradation at Yeast at of 50 mg/l of eosin.



(6) Enzyme Assay :

Axoreductase (EC 1.7.1.6) Assay.

The amount of dye reduced was determined from a molar absorbance of 21,440/M/cm.

(a) Initial O.D at 461 nm for Aniline blue dye is 0.52.

For yeast, O.D = 0.10 $\Delta O.D = . C.1$ Or, $0.52-0.10 = 21440 \times C \times 1$ Or, $0.42 / 21440 = C$ $C = 0.0000195 M$ Enzyme activity = C/t (t = 15 mins.) = $1.305 \times 10^{-6} M/min.$	For bacteria, O.D = 0.29 $O.D = . C.1$ Or, $0.52-0.29 = 21440 \times C \times 1$ Or, $0.23 / 21440 = C$ $C = 0.0000107 M$ Enzyme activity = C/t (t = 15 mins.) = $7.15 \times 10^{-7} M/min.$
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(b) Initial O.D at 540 nm for Eosin yellow dye is 0.696.

For yeast, = 0.12 $O.D = . C.1$ Or, $0.696-0.12 = 21440 \times C \times 1$ Or, $0.576 / 21440 = C$ $C = 0.0000268 M$ Enzyme activity = C/t (t = 15 mins.) = $1.791 \times 10^{-6} M/min.$	For bacteria, = 0.45 $O.D = . C.1$ Or, $0.696-0.45 = 21440 \times C \times 1$ Or, $0.246 / 21440 = C$ $C = 0.0000114 M$ Enzyme activity = C/t (t = 15 mins.) = $7.649 \times 10^{-7} M/min.$
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6.1. Laccase (EC 1.10.3.2) Assay :

Table 3(a) Bacterial test sample

Days	Control O.D at 590 nm	Bacteria test sample O.D at 590 nm	After centrifugation control O.D at 590 nm	After centrifugation bacterial test sample O.D at 590 nm	Percentage of degradation = (initial. D – final O.D/ initial O.D)*100
Day 1	0.908	0.853	–	–	6.05%
Day 3	0.908	0.736	–	–	18.94%
Day 3	–	–	0.940	0.836	11.06%



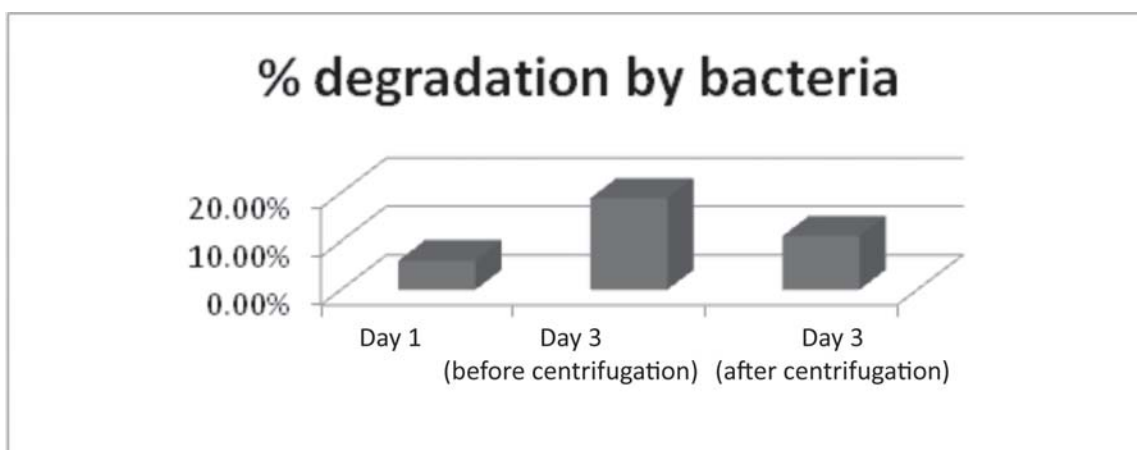
Table 3(b) Yeast test sample

Days	Control O.D at 590 nm	Test sample O.D at 590 nm	After centrifugation control O.D at 590 nm	After centrifugation bacterial test sample O.D at 590 nm	Percentage of degradation = (initial. D – final O.D/ initial O.D)*100
Day 1	0.908	0.846	–	–	6.8%
Day 3	0.908	0.507	–	–	44.16%
Day 3	–	–	0.940	0.128	86.38%

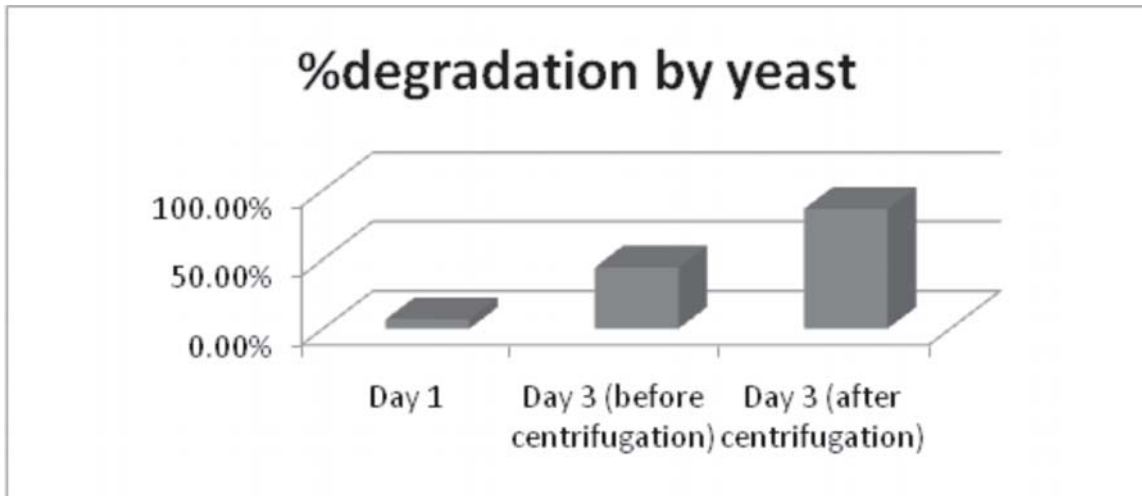
Table 3(c) Spread plate test

Sample	Observation
Bacterial plate	No discoloration observed
Yeast plate	Discoloration observed
Control plate	No change

From the above result it can be concluded that yeast (*Rhodotorula* spp.) is able to degrade bromophenol blue dye at a much higher rate than bacteria. % of degradation in case of yeast is 86.38% where as in case of bacteria it is only 18.94%. As well as no discoloration was observed in case of bacterial plate where as discoloration was observed in case of *Rhodotorula* spp. plate.



Graph 7 : Laccase Test showing % degradation of bromophenol blue dye.



Graph 8 : Laccase Test showing % degradation of bromophenol blue dye.

6.2. Endo-Glucanase (EC 3.2.1.6) and Exo-Glucanase (EC 3.2.1.91) Assay :

☒ For endo-glucanase assay.

From standard O.D of Glucose standard curve, enzyme activities were calculated to be –
For yeast = 0.029 mg/ml/min.

For bacteria = 0.012mg/ml/min.

☒ For exo-glucanase assay.

From standard O.D of Glucose standard curve, enzyme activities were calculated to be –
For yeast = 0.045 mg/ml/min.

For bacteria = 0.15 mg/ml/min.

Discussion

Industrial effluents containing recalcitrant compounds have been a major source of pollution. Various experiments have been carried out to remove these pollutants using chemical treatments. However, mostly it has been the biological treatment of these hazardous compounds that has gained an upper hand in the successful removal of toxicity.

Toxicity of azodyes has been found to be removed by fungal treatment as reported by Apohan and Yesilada (2005). Exploiting the enzymatic activity of different microorganisms like *Pseudomonas aeruginosa*[5], *Bacillus spp.*[7], *Klebsiella pneumonia*[10], *Micrococcus spp.* *Listeria spp.* and *Nocardia spp.* (Hassan MM et. al., 2013) have been reported for different dye samples showing the versatility of these organisms in the removal of toxic dye compounds. Also, *Enterococcus faecalis* was found to decolourize Reactive Orange dye upto 77.73%.

The major aim of this paper has been to try and exploit the isolated organisms to the fullest in order to remove all compounds having detrimental effects. The dye



samples used here, are eosin yellow and aniline blue. The bacterium isolated from the water sample could successfully degrade the dye due to the presence of various enzymes like azoreductase, Laccase and Glucanase expressed by the organism itself. Researchers like Umme Kalsoom et. al. (2013) had administered enzymes like horseradish peroxidase externally for the same purpose to get similar results.

The exo-enzymes released by the isolated organisms can be used in order to degrade the hazardous aniline blue and eosin yellow dye components to simpler non-hazardous hydrocarbons. Since these recalcitrant dyes are present in industrial effluents which are released into the environment, untreated, they tend to pollute it and are potential source of environmental hazard. So the isolated organism can be deployed into these polluted bodies for the manifestation of its enzymatic activity leading to the biological treatment of the waste water. However, since the organism is an opportunistic pathogen it has to be removed by water purification techniques.

The major usage of this organism can be in bioremediation. So, this Gram negative bacterium can be used to degrade such pollutants to simpler eco-friendly forms.

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ILLEGAL MIGRATION AND TRAFFICKING FOR SEX WORK

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Abstracts

Human trafficking, especially sex trafficking of women and children, causes crucial violation of womanhood *vis a vis* human rights. Millions of women and girls from each and every parts of world migrated to the other side due to poverty, searching for better future, better employment opportunity, and fulfilment of dream. Migration also happens for war, displacement and natural disasters. They move from less developed countries to richer countries. Research is focused on sex trafficking, which takes place by way of illegal migration organized by traffickers. Having been trafficked for sex destroys and distorts women's life in various ways. This paper is on four cases of traffic victims who migrated from neighbouring countries into India and were trapped by traffickers and dragged into prostitution. This study is conducted in two government Homes in West Bengal India.

Keywords : *Sex trafficking, illegal migration, violation of human rights, unemployment.*

Introduction

Illegal Migration and sex trafficking are interlinked terms because research has shown that in disaster, communal riots, seasonal unemployment etc. Poverty is one of the crucial factors. Poor, helpless, women and girls migrate for better life and better job



opportunity. Research has shown most cases of sex traffic takes place through illegal migration. There are two main reasons for migration. One is voluntary, when people move out in search for better job, or for better employment opportunity; the other is forced migration like displacement from native place due to war, natural disasters that most of the migrant women and girls are exploited at the time of migration from one country to another through unauthorised agents.

Selected Literature on the topic

According to Tom O'Neill's opinion State has to take more active role in stopping illegal migration and trafficking. Due to globalization and the modification of labor rules it has become quite easy. Poverty and unemployment, better employment opportunity, pull people from developing country to developed countries(O'Neill, 2001). In the name of better job opportunity and economic security millions of helpless women and girls are trafficked globally every year. At the same time by way of illegal migration innocent women and girls from poverty stricken families are trapped by sex trafficking rackets in an organised way. This resulted in the trafficked victim's identity crisis, mental disorder, physical and sexual distortion, contraction of various kinds of venereal diseases(Perry McGregor and McEwing, 2013). PardisMahdavi and Christine Sargent (2011)pointed out in there article "Questioning the Discursive Construction of Trafficking and Forced Labor in the United Arab Emirates" that, most of the unskilled labor and women are facing several problems after illegal migration because they are not properly aware of legal migration procedure and also are not aware of their job responsibility or job description. They are mostly misinformed about the job type. Traffickers also retain the victims' passport and other documents and start blackmailing them for prostitution and other offensive works. The victims donot know how to come out from that situation or where they can go for help. They are trapped in the traffickers' net(Mahdavi and Sargent, 2011). Illegal migration not only violates human being's life and rights, it also gives rise to destruction and disasters for life(Konrad, 2002). Tanja Bastia (2006), in her article, "Stolen Lives or Lack of Rights ? Gender, Migration and Trafficking", wrote that trafficking is one of the results of illegal labour migration. Systematic research analysing the pitfalls of illegal migration and trafficking combating. Reframing of global policy needs attention and continuous monitoring for combating illegal migration (Huijsmans, 2011).

Elabor-Idemudia (2003) draws attention towards debt bondage as one of the major reasons of migration from poor country to wealthy country. Most of the cases Migrants are searching for their livelihood. Agent who is facilitating the migration process exploited migrants in various ways. They control entire documents of migrants in illegal ways. Sometimes they exploited victims in the name of employment, for better future and for fake love or marriages and livelihood. Moreover victims are trapped by agents, who in border areas are facilitating illegal migration in an



organized way through the bribe network of traffickers and corrupted security system (Elabor-Idemudia, 2003). Afroza Anwary (2007) emphasised on legal and institutional enforcement of policy through which border control system can combat illegal migration and trafficking problems. Policy programme implementation alone is not enough for this matter. It needs continuous supervision and monitoring process and strict follow-up of border security personnel. Data regarding illegal migration and trafficking of victims are very hard to find (Munro, 2006). Traffickers or agents facilitating this process of illegal migration should be seriously punished by the State. Women, who are in high risk and vulnerable situation, need apparent protection and restoration from border areas (Chapki 2003). Singh *et.al* (2012) drew attention to trafficking of women and children and its vulnerable effects in a very critical way. MarttiLehti and KaukoAromaa (Lehti, and Aromaa 2006) suggested that joint enforcement of policy, and political stakeholders' active sustainable activity can eradicate this brutal crime of trafficking through illegal migration.

Objective of present study

Present study aims at understanding several factors of migration. These are : (i) reasons behind migration of victims, (ii) situation which prompted migration, (iii) Process of migration, (iv) Mechanism by which women are trapped into trafficking wave, (v) Nature of struggle women went through in the incidents of trafficking.

Methodology

Methods prevalent in social science are followed for the present research. These are; interview method with the use of both structured and unstructured schedules, narrative and observation methods. Secondary data were collected from records and from website.

For the purpose of research the author visited two Government run girls' Homes named SMM Home in Liluah, Howrah and Sukanya Home in Salt Lake, Kolkata, both in West Bengal and interviewed women and girls who are victims of sex trafficking through illegal migration. In SMM and Sukanya Home victims go through processes of rescue, observation, special care and after care. These two Homes assist government for repatriating traffic victims, migrated girls, who are from Bangladesh, Nepal, and other countries. Interview of women and girls rescued from brothel through police raid had been taken by the researcher. Case studies are made. Information about their native place, their family, how they were trafficked, entire journey and their future plan were collected by interviewing them. Strict confidentiality regarding their identity is maintained. Since these are very sensitive issue objective of study was explained at the time of interview. Names of all the interviewees are changed for maintaining confidentiality.



Case Studies

Most of the girls are from very poor family and they migrated due to poverty and for better opportunity for life. Most of the time victims are trapped by the traffickers with wrong information about job facilities, luring with fake love and false promise for marriage. Traffickers take advantage of the victims misfortune.

Case 1 The person interviewed from SMM Home is called Sonali here. She is 25 years old from Khulna, Bangladesh. Her father is a lather worker and mother is house wife. They were extremely poor. She was given false hope of a job and was trapped through fake love. Apart from her parents, she has two brothers. One of them is 12 years old and other 15 years. She has two sisters, 17 and 29 year old respectively. Her father lost his leg while working in the leather factory. At the age of 7-8 years, she used to work as a domestic help in her locality. Life was miserable for her and her family without any source of income. Her mother was always worried about marriage for her and her elder sisters. Sonali wanted to find a permanent domestic job in order to support her family. She was introduced by one of her aunts to a person called Sabir (Name changed). Sabir assured her of a job as an attendant in the house of a family known to him in India. They were supposed to pay her a good amount with which she thought to be able to maintain her family. Sabir also promised to marry her. Sonali finally agreed and accepted his proposal. She came with him to India. For a few days she lived with Sabir in his friend's house. She blindly trusted him. She said she fell in love with Sabir because of his kind words. Sonali was innocent of the evil life that awaited her. Then Sabir told her that he has fixed a date for Sonali to meet his aunt at Kolkata before their marriage. Sonali was excited at the prospect of meeting Sabir's aunt, visit to Kolkata and of their impending marriage. She went to Kolkata with him. He took her to a dirty, crowded place, where people were giving her unpleasant looks. Sonali was handed over to a woman introduced by Sabir as his aunt. Sabir left her with the woman, saying that after a few days he will come back to collect her and marry her and then he will take her to the family where she will be employed as an attendant. She will be paid well and there will be no problem in sending money to her family in Bangladesh. A few days later she was informed by Sabir's so called aunt, the brothel keeper that Sonali was sold to her for a good sum of money. She was to live at the place and entertain the customers sexually. She was not ready to accept that Sabir sold her. The brothel keeper subjected her to various mental and physical tortures, at one time she tried to escape from the brothel but did not succeed. She was subjected to severe torture. Even when she was describing the past misery her eyes were filled with tears. Mournfully she said. "*Didi duto poysa rojgar korte cheyechilam poribar tare bachanor jono, kintu nijei kokhon sesh hoye gelam, sobi amar kopal.*" (Sister, I wanted to earn to save my family but I am ruined, everything is due to my bad luck).



Sonali was rescued from the brothel through raid by the police. She was put to the custody of the Home. She is reluctant to return to Bangladesh, because she thinks that she will not be accepted kindly by her neighbours, her locality and even by her parents. Everyone will question about her past. At present Sonali is taking lessons in primary education and is being trained in vocational courses at the SMM Home under Government projects.

Case 2 Chandni, aged 27 was another person interviewed at SMM Home. Chandni is from Mymensingh, Bangladesh. She has migrated searching for job in beauty parlour in India. Her father was a daily labour and mother is a housewife. She has two elder sisters. Chandni's father left them when she was 12 years old. Her father left them for another woman and never kept any contact with them. Chandni used to work in her village as a helper for a cook. She earned very little amount of money in that work. One of her elder sisters was a mentally disturbed patient. Her life was miserable. Her mother arranged for a marriage for her with a person 30 years older than her. The person was supposed to take care of the family. Chandni refused to marry him because of his age and that he left his previous wife and two children. But she had to marry him because her mother forced her saying that if she did not marry, her mother will commit suicide. Chandni had no choice. Chandni got married to that man. Chandni's life became quite complicated. She said that her life was like hell after her marriage. She was tortured because she did not bear male child. Above all she had to do gruelling domestic work for her in-laws and the whole family. Chandni decided to commit suicide. She even attempted suicide but was saved by the neighbours. After she gave birth to a girl child torture increased manifold. Few days later her daughter contracted malaria and died. Her in-laws informed her that they are not going to take her responsibility because her husband was going to marry once more for he longs for a male child. Chandni had no choice but to return to her mother's place. Her mother told her to look for job to support herself and her family, since there was no fixed income of the family. Chandni started searching for work, so that she may support her mother and her family. At that time she met a lady from her locality. That lady arranged for a job in a beauty parlour in Dhaka, which she joined but the pay was very little. That lady told her that in India she can earn eight times more than what she got in Bangladesh. She explained that there is great demand for women to work in beauty parlours in India. Chandni agreed to visit India with her. Chandni came to India and found herself in a brothel in Mumbai. The woman was a trafficker and sold her. Chandni was a sex worker for ten years. She was rescued at the time of police raid and brought to SMM Home at Liluah. A process for her repatriation is going on. But she does not want to go back because firstly she will not be accepted back and the dire poverty be still there. To quote her, "*Didi amar to sob sesh hoye gache, jeye r ki hobe, sei ager Chnadni to more gache*" (Didi, I have lost everything, what for I shall go back). She does not want to go back to her country. According to her she has lost everything



including her respect, identity, even name also. If she goes back to her country, is there anybody who will accept her? Again to quote her, “*Ami kothya jabo, somajer chokhe ami to nosto meye, keu amay mene nebe na didi*” (where shall I go, no one will accept me as a good woman, In their eyes I am a fallen woman). Chandni is also taking vocational training at SMM Home. The authority of the Home is of the opinion that she is not serious about her training.

Case 3 This case is from Sukanya Home. This is outcome of an interview with a 17 year old woman called Sultana from Rajsahi, Bangladesh. She hails from a very poor family. Her father is a shopkeeper, and mother is housewife. From childhood days she wanted to be a dancer. She used to perform at local events. Later on she got admission in a dance school in Dhaka. Her parents told Sultana that they could not afford expenses for her dance lessons. They could somehow manage to give her school education. Sultana dropped out of school after finishing class three. She dreamt to be a famous dancer and perform in movies. She met an agent in her dancing school in Dhaka who told her that he can organise a good opportunity for her in Indian movie theatres, where she can flourish her career as a dancing star. In India she can get good money and career compared to those in Bangladesh. She will have good life. She told her father about this but her parents did not give permission for her to visit India. Sultana ran away with that Bangladeshi agent to India. The Bangladeshi agent organised her pass port and other documents and gave a shelter at Basirhat town in 24 Parganas in India. Later he started blackmailing Sultana to sleep with customers for money. He threatened to hand her over to police for entering India with false documents. Sultana felt helpless and agreed to his proposal. Few days later Sultana was handed over to another agent who sold her at a dance bar at Mumbai. Sultana said, “*Didi, ami je kokhon bikri hoye gelam jantei parlam na, akjon bhalo dancer hote cheyechilam, akta bhalo jibon ceyechilam, bare nachte hobe jante parini, etai ki kopale chilo*” (Sister, I did not know when I was sold. I wanted to be a dancer, wanted a good life. I never knew that I shall dance in a bar. Is this my destiny?). Sultana had to spend three years in that dance bar and had to work as a sex worker. She was forced to entertain clients. She tried to escape but was not able to do so. She blamed herself and her luck for her painful life. Sultana was rescued from a dance bar from Mumbai and right now she is in SMM Home. Her repatriation process is going on. But she does not want to go back due to fear of acceptance and shame. Sultana concedes that one mistake in her life dragged her into dark world. She is confused about returning home. She thinks of permanent stigma which will never be lifted from her life. She has lost all hope from life.

Case 4 This case is of 16 years old girl named Sukhi from Sukanya Home. She migrated from Nepal for leather worker’s job in India. Sukhi, is from a very remote village of Nepal. Her father was a daily labour and her step mother a housewife. She



has got a six year old step brother and two step sisters. Her step mother made her work as a domestic servant in her own house. Sukhi was treated in an inhumanly fashion at home. Her step mother used to torture her severely. She used to work as a child labourer in a *biri* factory in Nepal. She had to hand over all her earnings to her step mother. Sukhi's father was a drunkard. He lost his job because of an accident. Earning for family became Sukhi's responsibility. Sukhi was only 13 at that time. Her step mother everyday forced her to earn more money. Sukhi became miserable. She had not gone to school and is non-literate. Her step mother introduced her to a man who had worked in India for a long time. He told Sukhi that he will arrange for her to join a leather factory in Kolkata, India, as a worker. He assured Sukhi that she will be able to earn ten times more than what she did at home. She will also get free accommodation and will earn extra money if she worked overtime. Sukhi did not want to go to India. She agreed because of family pressure. Sukhi came to Kolkata with that man. A few days later Sukhi found herself in a brothel. She was informed that she was sold and from that time she had to live in the brothel. Her step mother knew about the whole thing. She received a good amount of money from that man. Sukhi had to spend two years in a brothel in Kolkata. She was rescued from that brothel by police and was brought to Sukanya Home. She is much confused about her life. She is studying at primary level at the home. She does not want to go back to her country for fear of her step mother.

Observation

Most of the girls are from poverty stricken families. Sultana was trapped by the trafficker because of her aspiration to be a dancer and for her ambition to be a star. Sonali was prey to poverty and had fallen in love with a person whom she trusted and was lured with the vision of good life but was betrayed and sold. Both Chandni and Sukhi were subjected to domestic violence. Sukhi wanted to find a good job through which she could support her family but she never knew that her mother already sold her for money. Chandni also wanted to support her family for this she migrated but her destiny also pushed her in prostitution through trafficking. All of the girls' cases show that the traffickers took advantage of their situation. It appears that the traffickers are always on the prowl and can identify the weakness of the victims. They wait for the opportunity. Once trafficked, life is doomed for the victim. They are hardly accepted back in the family and society.

Conclusion

In conclusion it may be suggested that State should be implementing more restriction in border areas. Passport visa and stated reasons for migration should be verified by expert personnel. Illegal crossing along the unmanned borders should be strictly monitored. A systematic research and pitfall analysis should be revised. Poverty is at



the bottom of all misery. Rehabilitation policy for the traffic victims should be more with utilitarian value. Micro finance, vocational training, adult education programme should have to be implemented with vigour and its continuous monitoring is needed. Society has got to be motivated for accepting the victims back into the fold of the mainstream. In case of cross border traffic victim, international media is necessary to keep track of the welfare of the trafficked women as it is also a part of the human right violation. There should be legal mandate for severe punishment of the trafficker.

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