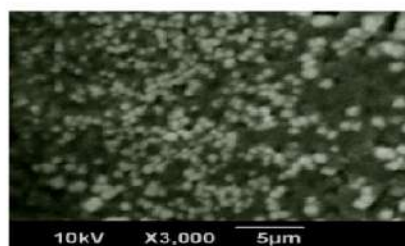
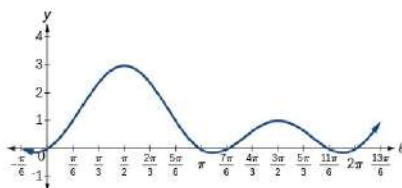


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Colleges impart higher education and function as the core units for transmitting and advancing knowledge. As a part of persistent pursuit for academic excellence, Kuriakose Elias College, Mannanam is publishing Volume X, Issue 1 of the peer reviewed, interdisciplinary research journal, "*New Numbers and Letters*". This is an attempt to develop insight and to chart possible future in the frontier areas of Science, Engineering, Education, Management and Arts. The journal provides a platform for researchers, academicians and students to share their knowledge in the form of high quality research work which cover all disciplines. Hope the current issue of the journal will help to advance further research in the respective fields. On behalf of the Editorial board, I am glad to present the Volume X, Issue 1 of the journal, "*New Numbers and Letters*".

Dr. Jesty Thomas

(Chief Editor)

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Generalized type-2 Beta density

Dhannya P. Joseph

K. E. College, Mannanm

Kerala, India

[dhannyapj@gmail.com]

Abstract

By taking the pathway model of Mathai (2005) as a basis, a generalization is given to type-2 beta densities. Its limiting form is discussed. Multivariate analogues of the generalized beta density are considered which will provide multivariate extensions to Tsallis statistics and superstatistics.

1 Introduction

We start with looking at generalized type-2 beta density of the form

$$f_{\alpha}(x) = k_1 x^{\gamma} [1 + a(\alpha - 1)x^{\delta}]^{-\frac{\eta}{\alpha-1}}, \quad \alpha > 1, \quad a > 0, \quad \delta > 0, \quad \eta > 0, \quad x > 0 \quad (1)$$

and generalized type-1 beta density of the form

$$g_{\alpha}(x) = k_2 x^{\gamma} [1 - a(1 - \alpha)x^{\delta}]^{\frac{\eta}{1-\alpha}}, \quad \alpha < 1, \quad a > 0, \quad \delta > 0, \quad \eta > 0, \quad (2)$$

$1 - a(1 - \alpha)x^{\delta} > 0$, $\gamma > 0$, where k_1 and k_2 are the normalizing constants and are given by

$$k_1 = \frac{\delta(a(\alpha - 1))^{\frac{\gamma+1}{\delta}} \Gamma(\frac{\eta}{\alpha-1})}{\Gamma(\frac{\gamma+1}{\delta}) \Gamma(\frac{\eta}{\alpha-1} - \frac{\gamma+1}{\delta})}$$

and

$$k_2 = \frac{\delta(a(1 - \alpha))^{\frac{\gamma+1}{\delta}} \Gamma(1 + \frac{\eta}{1-\alpha} + \frac{\gamma+1}{\delta})}{\Gamma(\frac{\gamma+1}{\delta}) \Gamma(1 + \frac{\eta}{1-\alpha})}, \quad \Re(\gamma + 1) > 0, \quad \Re(\frac{\eta}{\alpha - 1} - \frac{\gamma + 1}{\delta}) > 0.$$

The above models are actually special cases of the pathway model of Mathai (2005), with pathway parameter α . Without the normalizing constants k_1 and k_2 the functions in (1) and (2) can act as models for physical situations. Note that when $\alpha \rightarrow 1$ the forms in (1) and (2) reduce to generalized gamma density

$$f(x) = k x^{\gamma} e^{-bx^{\delta}}, \quad x > 0, \quad b = a\eta > 0 \quad (3)$$

where $k = \frac{\delta b^{\frac{\gamma+1}{\delta}}}{\Gamma(\frac{\gamma+1}{\delta})}$, $\Re(\gamma + 1) > 0$, is the normalizing constant. When deriving or fitting models for data from physical experiments very often the practice is to take a

member from a parametric family of functions and try to fit that model for the data. But it is often found that the model requires a function with a more specific tail than the ones available from the parametric family, or a situation of right tail cut-off. The model may reveal that the underlying function is in between two parametric families of functions. In order to create a distributional pathway for proceeding from one functional form to another, a pathway parameter α is introduced and a pathway model is created, see Mathai and Haubold (2007).

For $\alpha = 2, a = 1, \delta = 1, \eta - \gamma - 1 > 0$ in (1), we have the regular type-2 beta density in statistical distribution theory, namely

$$f_3(x) = k_3 x^\gamma (1+x)^{-\eta}, \quad x > 0, \tag{4}$$

where $k_3 = \frac{\Gamma(\eta)}{\Gamma(\gamma+1)\Gamma(\eta-\gamma-1)}$, $\eta > 0, \gamma + 1 > 0$, is the normalizing constant. Beck and Cohen's superstatistics (Beck and Cohen (2003); Beck (2006)) belongs to this case (1). For $\gamma = 0, a = 1, \delta = 1, \eta = 1$ in (1), it will become the Tsallis statistics of non-extensive statistical mechanics of Tsallis (1988). For $\alpha = 2, a = 1$ and $\delta = 1$, and make the transformation $y = \ln x$ in $f_\alpha(x)$, one has the generalized Logistic density, see Mathai and Provost (2006). For $\alpha = 0, a = 1, \delta = 1, \eta - \gamma - 1 > 0$ in (2), we have the regular type-1 beta density. From the graphs given here, one can see the movement of the generalized beta densities denoted by $f_\alpha(x)$ and $g_\alpha(x)$ towards the generalized gamma density $f(x)$, for various values of the pathway parameter α .

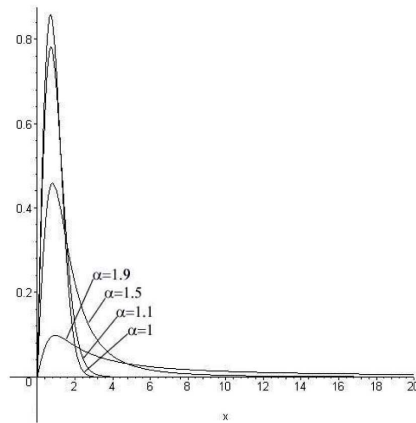


Figure 1

Figure 1: The graph of $f_\alpha(x)$, for $\gamma = 1, a = 1, \delta = 2, \eta = 1$ and for various values of α .

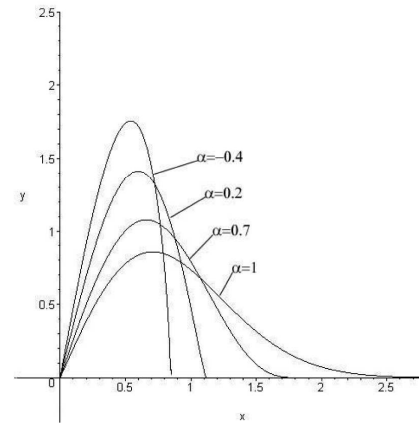


Figure 2

Figure 2: The graph of $g_\alpha(x)$, for $\gamma = 1, a = 1, \delta = 2, \eta = 1$ and for various values of α .

From the Figure 1 we can see that, as α moves away from 1 the function $f_\alpha(x)$ moves away from the origin and it becomes thicker tailed and less peaked. From the path created by α we note that we obtain densities with thicker or thinner tail compared to generalized gamma density. From Figure 2 we can see that when α moves from -1 to 1 , the curve becomes thicker tailed and less peaked, see Joseph (2011).

2 Densities derived from generalized beta

Lemma 1: Let x be a random variable having generalized type-2 beta density of the form $f_\alpha(x)$ given in equation (1) and let $y = x^p$, $p > 0$, then the density of y is also in the form of generalized type-2 beta density and is given by

$$f_y(y) = \frac{k}{p} y^{\frac{\gamma+1}{p}-1} [1 + a(\alpha - 1)y^{\frac{\delta}{p}}]^{-\frac{\eta}{\alpha-1}}, \quad y > 0, a > 0, \eta > 0, \delta > 0, \\ p > 0, \alpha > 1. \quad (5)$$

The result follows trivially by taking the power transformation $y = x^p$, $p > 0$.

Lemma 2: Let x be a random variable having generalized type-1 beta density of the form $g_\alpha(x)$ given in equation (2) and let $y = x^p$, $p > 0$, then the density of y is also in the form of generalized type-1 beta density and is given by

$$f_y(y) = \frac{k_1}{p} y^{\frac{\gamma+1}{p}-1} [1 - a(1 - \alpha)y^{\frac{\delta}{p}}]^{-\frac{\eta}{1-\alpha}}, \quad 0 < y < \left[\frac{1}{a(1-\alpha)}\right]^{\frac{p}{\delta}}, a > 0, \eta > 0, \delta > 0, \\ p > 0, \alpha < 1. \quad (6)$$

Theorem 3: Let x be a random variable having generalized type-2 beta density of the form $f_\alpha(x)$ given in equation (1) and let $y = \frac{1}{1+a(\alpha-1)x^\delta}$, then y has type-1 beta density with parameters $\frac{\eta}{\alpha-1} - \frac{\gamma+1}{\delta}$ and $\frac{\gamma+1}{\delta}$.

This can be easily seen from the following:

$y = \frac{1}{1+a(\alpha-1)x^\delta}$ gives $x = \left[\frac{1-y}{ya(\alpha-1)}\right]^{\frac{1}{\delta}}$ and the Jacobian $J = \left|\frac{dx}{dy}\right| = \frac{(1-y)^{\frac{1}{\delta}-1}}{\delta(a(\alpha-1))^{\frac{1}{\delta}}y^{\frac{1}{\delta}+1}}$. The density of y is then

$$f_y(y) = f(x)J \\ = \frac{\Gamma\left(\frac{\eta}{\alpha-1}\right)}{\Gamma\left(\frac{\gamma+1}{\delta}\right)\Gamma\left(\frac{\eta}{\alpha-1} - \frac{\gamma+1}{\delta}\right)} y^{\frac{\eta}{\alpha-1} - \frac{\gamma+1}{\delta} - 1} (1-y)^{\frac{\gamma+1}{\delta} - 1}, \quad 0 < y < 1 \quad (7)$$

for $\alpha > 1$, $\gamma + 1 > 0$, $\frac{\eta}{\alpha-1} - \frac{\gamma+1}{\delta} > 0$.

Theorem 4: Let x be a random variable having generalized type-2 beta density of the form $g_\alpha(x)$ given in equation (2) and let $y = 1 - a(1 - \alpha)x^\delta$, then y has type-1 beta density with parameters $\frac{\eta}{1-\alpha} + 1$ and $\frac{\gamma+1}{\delta}$.

The proof is straightforward and hence deleted.

3 Multivariate generalized type-2 beta density

Let us consider the multivariate case of the generalized type-2 beta density in equation (1), see Mathai and Provost (2006). For $x_i > 0, i = 1, 2, \dots, n$, let

$$f_\alpha(x_1, x_2, \dots, x_n) = K_\alpha x_1^{\gamma_1} x_2^{\gamma_2} \dots x_n^{\gamma_n} [1 + (\alpha - 1)(a_1 x_1^{\delta_1} + a_2 x_2^{\delta_2} + \dots + a_n x_n^{\delta_n})]^{-\frac{\eta}{\alpha-1}},$$

$$\alpha > 1, \eta > 0, a_i > 0, i = 1, 2, \dots, n. \quad (8)$$

This multivariate analogue can also produce multivariate extensions to Tsallis statistics and superstatistics. Here the variables are not independently distributed, but when $\alpha \rightarrow 1$ we have a surprising result that x_1, x_2, \dots, x_n will become independently distributed generalized gamma variables. Here $\delta_1, \delta_2, \dots, \delta_n$ can be positive or negative and both cases will produce multivariate densities. δ_j 's can be individually negative or positive. We can find out the marginal density of x_i , by integrating out $x_1, x_2, \dots, x_{i-1}, x_{i+1}, \dots, x_{n-1}$, and is given by

$$f_\alpha(x_i) = K_{\alpha_i} x_i^{\gamma_i} [1 + (\alpha - 1)a_i x_i^{\delta_i}]^{-\frac{\eta}{\alpha-1} + \frac{\gamma_n+1}{\delta_n} + \dots + \frac{\gamma_{i-1}+1}{\delta_{i-1}} + \frac{\gamma_{i+1}+1}{\delta_{i+1}} + \dots + \frac{\gamma_1+1}{\delta_1}}, \quad (9)$$

$K_{\alpha_i} = \frac{\delta_i(a_i(\alpha-1))^{\frac{\gamma_i+1}{\delta_i}} \Gamma(\frac{\eta}{\alpha-1} - \frac{\gamma_n+1}{\delta_n} - \dots - \frac{\gamma_{i-1}+1}{\delta_{i-1}} - \frac{\gamma_{i+1}+1}{\delta_{i+1}} - \dots - \frac{\gamma_1+1}{\delta_1})}{\Gamma(\frac{\gamma_i+1}{\delta_i}) \Gamma(\frac{\eta}{\alpha-1} - \frac{\gamma_1+1}{\delta_1} - \dots - \frac{\gamma_n+1}{\delta_n})}$. Integrate out x_i from (9) and equate with 1, we will get the normalizing constant K_α as

$$K_\alpha = \frac{\delta_1 \delta_2 \dots \delta_n (a_1(\alpha - 1))^{\frac{\gamma_1+1}{\delta_1}} (a_2(\alpha - 1))^{\frac{\gamma_2+1}{\delta_2}} \dots (a_n(\alpha - 1))^{\frac{\gamma_n+1}{\delta_n}} \Gamma(\frac{\eta}{\alpha-1})}{\Gamma(\frac{\gamma_1+1}{\delta_1}) \Gamma(\frac{\gamma_2+1}{\delta_2}) \dots \Gamma(\frac{\gamma_n+1}{\delta_n}) \Gamma(\frac{\eta}{\alpha-1} - \frac{\gamma_1+1}{\delta_1} - \dots - \frac{\gamma_n+1}{\delta_n})}. \quad (10)$$

The conditional density of x_i given $x_1, x_2, \dots, x_{i-1}, x_{i+1}, \dots, x_n$ is given by

$$f_\alpha(x_i|x_1, x_2, \dots, x_{i-1}, x_{i+1}, \dots, x_n) = \frac{f_\alpha(x_1, x_2, \dots, x_n)}{f_\alpha(x_1, x_2, \dots, x_{i-1}, x_{i+1}, \dots, x_n)}$$

$$= \frac{\delta_i [a_i(\alpha - 1)]^{\frac{\gamma_i+1}{\delta_i}} \Gamma(\frac{\eta}{\alpha-1})}{\Gamma(\frac{\gamma_i+1}{\delta_i}) \Gamma(\frac{\eta}{\alpha-1} - \frac{\gamma_i+1}{\delta_i})} x_i^{\gamma_i}$$

$$\times [1 + \frac{(\alpha - 1)a_i x_i^{\delta_i}}{1 + (\alpha - 1)(a_1 x_1^{\delta_1} + a_2 x_2^{\delta_2} + \dots + a_{i-1} x_{i-1}^{\delta_{i-1}} + a_{i+1} x_{i+1}^{\delta_{i+1}} + \dots + a_n x_n^{\delta_n})}]^{-\frac{\eta}{\alpha-1}}$$

$$\times [1 + (\alpha - 1)(a_1 x_1^{\delta_1} + a_2 x_2^{\delta_2} + \dots + a_{i-1} x_{i-1}^{\delta_{i-1}} + a_{i+1} x_{i+1}^{\delta_{i+1}} + \dots + a_n x_n^{\delta_n})]^{-\frac{\gamma_i+1}{\delta_i}} \quad (11)$$

When we take the limit as $\alpha \rightarrow 1$ in equation (11), we can see that the conditional density will be in the form of a generalized gamma density and is given by

$$\lim_{\alpha \rightarrow 1} f_\alpha(x_i|x_1, x_2, \dots, x_{i-1}, x_{i+1}, \dots, x_n) = \frac{\delta_i (\eta a_i)^{\frac{\gamma_i+1}{\delta_i}}}{\Gamma(\frac{\gamma_i+1}{\delta_i})} x_i^{\gamma_i} e^{-a_i x_i^{\delta_i}}. \quad (12)$$

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A Survival Study on Heroin Addict Data Set

Smitha S, Tintumol Xavier

*Department of Statistics, Kuriakose Elias College, Mannanam, Kottayam,
Kerala 686561*

Abstract

Survival analysis method is common in clinical trials and other type of investigation. It used predominantly in biomedical science where the interest is in observing time to death either of patients or of laboratory animals. Here we analyzed Addicts Dataset (addicts.dat) and concluded that medicine dosage and clinics are statistically significant. Criminal background is non-significant and will not be considered further.

Keywords: Survival Analysis, hazard functions, survival data.

1. Introduction

Survival analysis is a branch of statistics which deals with death in biological organisms and failure in mechanical systems. Survival analysis method is common in clinical trials and other type of investigation. It used predominantly in biomedical science where the interest is in observing time to death either of patients or of laboratory animals. Time to event analysis has also been used widely in the social sciences where interest is on analyzing time to events such as job changes, marriage, birth of children and so forth. It deals with statistical methods for analyzing survival data derived from laboratory studies of animals, clinical and epidemiologic studies of humans and appropriate applications.

Heroin was synthesized as a legal drug in 1895. It was found to be a highly addictive drug in the early twentieth century, and became

popularly abused after the mid-twentieth century. Heroin users develop tolerance to heroin quickly and suffer from severe withdrawal symptoms when they stop using heroin. Hence, heroin addicts have a very high relapse rate. Heroin addiction became a serious problem in southeastern and southwestern Asia recently. Like that in other countries, heroin users not only had a high recidivism rate but also had the highest mortality rate among the addictive substance users in Taiwan. Current illicit drug use among teens is continuing to increase in many countries around the world. Heroin is an addictive drug that is one of the most abused drugs and is processed from morphine and usually appears as a white or brown powder. According to the 2006 National Survey on Drug Use and Health (NSDUH), approximately 3.8 million Americans aged 12 or older reported trying heroin at least once during their lifetimes, representing 1.5% of the population aged 12 or older. A variety of effective treatments are available for heroin addiction. For example, methadone, a synthetic opiate that blocks the effects of heroin and eliminates withdrawal symptoms, has proven successful for the treatment of heroin addiction.

2. Data Description

Addicts Dataset (addicts.dat) In a 1991 Australian study by Caplehorn et al., two methadone treatment clinics for heroin addicts were compared to assess patient time remaining under methadone treatment. A patient's survival time was determined as the time (in days) until the person dropped out of the clinic or was censored. The two clinics differed according to its live-in policies for patients. For the whole homework we are investigating a dataset from a study by Caplehorn et al. (Methadone Dosage and Retention of Patients in

Maintenance Treatment, Med. J. Aust., 1991). These data comprise the times in days spent by heroin addicts from entry to departure from one of two methadone clinics. Two other covariates, namely, prison record and maximum methadone dose, are believed to affect the survival times. A listing of the variables is given below: Column 1: Clinic (1 or 2) Column 2: Survival status (0 = censored, 1 = departed from clinic) Column 3: Survival time in days Column 4: Prison record (0 = none, 1 = any) Column 5: Maximum methadone dose (mg/day) 1.

The variables are defined as follows

ID – Patient ID

Time – the survival time of the patient

STATUS – Indicates whether the patient is cure is coded as 1 or was not cure is coded as 0.

CLINIC – Indicates the patient attended for treatment in which clinic (coded as 1 or 2)

PRISON – Indicates whether the patient had prison record (coded 1) or not (coded 0)

DOSE – A continuous variable for the patient maximum dose

Objective of the study

We now state the basic goals of survival analysis,

Goal 1: To estimate and interpret survivor and/or hazard functions from survival data.

Goal 2: To compare survivor and/or hazard functions.

Goal 3: To assess the relationship of explanatory variables to survival time.

3. Analysis

SPSS Statistics is a software package used for interactive statistical analysis. The software name originally stood for Statistical package for Social Sciences. It is widely used program for statistical analysis in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners and others. It is one of the user friendly statistical software available today.

3.1 Comparing survival functions on different levels by Kaplan-Meier estimator

Here we use Kaplan-Meier estimator to find which variables are significant

Survival of different clinics

Case Processing Summary				
Clinic	Total N	N of Events	Censored	
			N	Percent
first clinic	163	122	41	25.2%
second clinic	75	28	47	62.7%
Overall	238	150	88	37.0%

Overall Comparisons			
	Chi-Square	Df	Sig.
Log Rank (Mantel-Cox)	27.884	1	.000
Test of equality of survival distributions for the different levels of clinic.			

3.2. Does survival depend on treatment Dose?

Case Processing Summary				
dose	Total N	N of Events	Censored	
			N	Percent
20	1	1	0	0.0%
30	2	2	0	0.0%
35	2	2	0	0.0%
40	30	18	12	40.0%
45	10	7	3	30.0%
50	27	15	12	44.4%
55	21	20	1	4.8%
60	52	37	15	28.8%
65	22	17	5	22.7%
70	24	14	10	41.7%
75	6	3	3	50.0%
80	35	12	23	65.7%
90	2	1	1	50.0%
100	3	1	2	66.7%
110	1	0	1	100.0%
Overall	238	150	88	37.0%

Overall Comparisons			
	Chi-Square	Df	Sig.
Log Rank (Mantel-Cox)	52.562	14	.000
Test of equality of survival distributions for the different levels of dose.			

Here the p- value is significant. So the dose variable can be considered as a factor for survival analysis.

3.3 Does the survival depend on prison variable?

Case Processing Summary				
Prison	Total N	N of Events	Censored	
			N	Percent
Criminal	127	81	46	36.2%
not criminal	111	69	42	37.8%
Overall	238	150	88	37.0%

Overall Comparisons			
	Chi-Square	Df	Sig.
Log Rank (Mantel-Cox)	1.262	1	.261
Test of equality of survival distributions for the different levels of prison.			

Here p - value is insignificant .So the prison variable cannot be considered as a factor for further survival analysis.

Statistical significance:

From the column headed p value. Medicine dosage and clinic are statistically significant. Criminal background is non-significant and will not be considered further.

3.4 COX PH Regression model

We first fit COX Regression with single factor. Here we use clinic as single factor.

Variables in the Equation						
	B	SE	Wald	Df	Sig.	Exp(B)
clinic	1.009	.215	22.041	1	.000	2.742

3.5 COX Regression with multiple covariates

Variables in the Equation							
		B	SE	Wald	df	Sig.	Exp(B)
	dose	-.036	.006	36.084	1	.000	.965
	prison	-.327	.167	3.813	1	.051	.721
	clinic	1.009	.215	22.041	1	.000	2.742

B coefficients

The B coefficient for Clinic is positive, telling us that the treatment receiving the smaller numeric code (Clinic 1 - coded as 1 in the first table.) will be associated with a greater hazard therefore, shorter survival. Patients who are under treatment of Clinic 2 have the greater survival.

Dose has negative coefficients. This means that the increase in dose will be associated with low hazard and long survival.

Exp(B) the Hazard Ratio

The HR for dose is .965, so patients receiving an increase in one dose of medicine have a hazard that is only .965. The HR for clinic is 2.742, so those receiving treatment from clinic 1 have a hazard that is 2.742 fold increases in the hazard rate of clinic 2.

Covariate Means	
	Mean
Dose	60.487
Prison	.538
Clinic	.686

This shows the mean value for dose is 60.487. It also reports the “clinic” as 0.686

Conclusion

Survival analysis provides special techniques that are required to compare the risks for death (or of some other event) associated with different treatments or groups, where the risk changes over time. In measuring survival time, the start and end-points must be clearly defined and the censored observations noted. Only the most commonly used techniques are introduced in this review. Kaplan Meier provides a method for estimating the survival curve, the log rank test provides a statistical comparison of two groups, and Cox's proportional hazards model allows additional covariates to be included.

From the analysis we can conclude that medicine dosage and clinic are statistically significant. Criminal background is non-significant and will not be considered further.

The HR for dose is .965, so patients receiving an increase in one dose of medicine have a hazard that is only .965. The HR for clinic is 2.742, so those receiving treatment from clinic 1 have a hazard that is 2.742 fold increases in the hazard rate of clinic 2. So the clinic 2 is better for the treatment.

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Acceptance Sampling Plan: A Review of Literature

Maya T Nair¹ & Arya V.²

1. Department of Statistics, SVR NSS College, Vazhoor,

2. KUFOS, Kochi

Abstract

Acceptance sampling is an important field of statistical quality control. It is used to decide whether to accept or reject a lot based on a random sample of the product. While there is no direct control of quality in the application of an acceptance sampling plan to an isolated lot, when that plan is applied to a stream of lots from a vendor, it becomes a means of providing protection for both the producer of the lot and the consumer. A sampling plan establishes the set of rules guiding the sampling and the criteria for accepting or rejecting the lot. As there exists a great diversity in possible scenarios of process parameters and since different situations necessitate different objectives, development of acceptance sampling plans which give better results in a wider range of situations is an area of great interest to researchers. In this paper, we present an overview of the prominent studies in the field of acceptance sampling.

Keywords: Acceptance Sampling, Consumer's risk, Producer's risk, Operating characteristic function.

Introduction

Acceptance sampling is the process of evaluating a portion of the product/material in a lot for the purpose of accepting or rejecting the lot as either confirming or not confirming to a quality specification. In acceptance sampling, a sample is taken from the lot and some quality characteristic of the units in the sample is inspected. Based on the information in this sample, a decision is made regarding lot disposition. The decision-making rule involves the acceptance threshold and a description of how to use the sample result to accept or reject the lot. Acceptance sampling plan is usually done when products leave the factory and in some cases even within the factory. It involves both the producer of materials and the consumer. Consumers require acceptance sampling to limit the risk of rejecting good quality materials or accepting bad quality materials. Realising the importance of acceptance sampling plans in statistical quality control, this work attempts to present a brief overview of prominent studies done in this field.

Review of Literature

Balasoorya (1995) examined the failure censored sampling plans for two- parameter exponential distribution based on m random sample each of size n . The proposed approach was based on exact results and only first failure time of each sample was needed. The values of the acceptability constant were tabulated for selected values of consumer's and producer's risk. Further a comparison of the suggested sampling plans with ordinary sampling plans using a sample of size mn was made and the given plan has an advantage in terms of shorter test time and saving of resources.

Balasoorya and Saw (1998) presented reliability sampling plans for the two-parameter exponential distribution under progressive censoring and operating characteristic curve was derived using the exact distributional properties of the maximum likelihood estimators. The suggested sampling plan was quite useful as it provides savings in resources and total test time. The same also offered the flexibility to remove functioning test specimens from additional testing at various stages of the experiment.

Kantam et al (2001) studied the problem of acceptance sampling when the life test was truncated at predetermined time. For several acceptance numbers, confidence levels and values of ratio of the specified experimental time to the specified average life, the minimum sample size needed to ensure the fixed average life were obtained under the assumption that the lifetime variate of the test items follows a distribution belonging to Burr's family XII of distributions known as the log-logistic model. The operating characteristic values of the given sampling plan and producer's risk were obtained and also the results were illustrated by an example.

Baklizi and Al - Masri (2004) developed acceptance sampling plans assuming that the life test was truncated at a pre-assigned time and the lifetimes of the test units were assumed to follow the Birnbaum Saunders distribution. The minimum sample size needed to make sure that the determined average life was obtained and the operating characteristic values of given sampling plans and producer's risk were also presented.

Rosaiah et.al (2006) considered a generalization of the log-logistic distribution known as exponentiated log-logistic distribution.

They determined the operating characteristic for a sampling plan for the case that a lot of products were submitted for inspection with lifetimes assigned by an exponentiated log-logistic distribution. Tsai and Wu (2006) considered the problem of an acceptance sampling plan based on the truncated life test when life distribution of test items was generalized Rayleigh. For various acceptance number, confidence levels and values of the ratio of the fixed experiment time to the specified mean life, the minimum sample size required to ensure the specified mean life were obtained and some tables were also provided in this paper to illustrate the use suggested plans conveniently.

Balakrishnan et.al (2007) developed acceptance sampling plans when the life test was truncated at a predetermined time. The minimum sample size necessary to make sure that the specified mean life was obtained by assuming the life times of the test follows generalized Birnbaum-Saunders distribution. The operating characteristic tables of the given sampling plans as well as producer's risk were discussed.

Aslam (2008) provided a reliability sampling plan assuming that the lifetime of the product follows Rayleigh distribution with known value of the shape parameter. They obtained test truncation ratio by considering the producer's risk for given values of the sample size and acceptance number. They also provided the comparison of proposed sampling plan with existing acceptance sampling plan.

Aslam and Jun (2009) proposed a group acceptance sampling plan for a truncated life test when a multiple number of items as a group can be tested at once in a tester assuming that the lifetime of a product follows the Weibull distribution with known shape parameter. With the specified termination time and the specified number of

testers, the design parameter such as number of groups and the acceptance number were determined by satisfying the producer's and consumer's risks at the specified quality levels and the results were explained with tables and examples.

Burr XII had been shown to be a useful model in the areas of quality control, reliability studies, duration and failure time modelling. So, Lio et.al (2010) illustrated acceptance sampling plans for Burr type XII distribution percentiles when the life test was truncated at a pre-assigned time. The minimum sample size needed to ensure the detailed life percentile was obtained under a given consumer's risk. The operating characteristic tables as well as producer's risk were presented. The R package named *sp Burr* were formulated to execute the sampling plans. Aslam et.al (2010) provided acceptance sampling plans for Generalized Exponential distribution when the life time experiment was truncated at a pre-specified time. The tables were provided for the minimum sample size necessary to ensure a certain median life of the experimental unit when the shape parameter was two. The operating characteristic function values of the proposed sampling plans and the associated producer's risks were also discussed. It was also shown that the tables discussed can be used instead of median life and another percentile life was chosen as the criterion if the sample parameter was not two. Aslam and Jun (2010) extended a double acceptance sampling plan for the truncated life test assuming that the lifetime of a product follows a generalized log-logistic distribution with known shape parameters. They mainly considered the zero and one failure scheme where the lot was accepted if no failures were noted from the first sample and it was rejected if two or more

failures happened. When there was one failure from the first sample, the second sample was drawn and tested for the same duration as the first sample. The minimum sample sizes of the first and second samples were fixed and second samples were fixed on to make sure that the true median life was longer than the given life at the specified consumer's confidence level. The operating characteristic was analyzed sorting to life at the specified consumer's confidence level. The minimum of these ratios were also acquired so as to lower the producer's risk at the assigned level.

Aslam et.al (2011) considered the Birnbaum Saunders distribution as a life model to develop several acceptance sampling schemes based on the truncated life tests. They developed the double sampling plan and determined the design parameters satisfying producer's risk and consumer's risk simultaneously for the specified reliability levels in terms of mean ratio to the predetermined life. They also proposed a group sampling plan and determined the parameters by the both two above mentioned method. Mugal et.al (2011) developed economic reliability acceptance sampling plan for Burr type XII distribution when the life test was truncated at pre-assigned parameters. The minimum termination time needed to make sure that the specified life percentile was found under a given producer's risk and for various parameters, the operating characteristic value of the proposed plan were presented. A comparative study of proposed plan and existing plan developed by Lio et.al (2010) was also determined.

Ramaswamy and Anburajan (2012) proposed double acceptance sampling plans for truncated life tests when the life time of test items follows generalized exponential distribution. Probability of acceptance

was calculated for several consumers' confidence levels by fixing the producer's risk and were discussed with the help of tables and examples.

Rao and Kantam (2013) developed sampling plans for the Half Logistic distribution percentiles when the life test was truncated at a pre-assigned time. The minimum sample required to ensure the fixed life percentile were obtained under a given consumer's risk. Also, the operating characteristic values of the sampling plans as well as the producer's risk were discussed. Al-Nasser and Al-Omari (2013) considered exponential Frechet distribution as a model for a lifetime random variable when the life test was truncated at a pre-specified time. The operating characteristic function values of the proposed sampling plans and the associated producer's risk were acquired.

Gui and Zhang (2014) flourished an acceptance sampling plan for Gompertz distribution under a truncated life test. For various acceptance numbers, consumer's confidence levels and values of the ratio of the experimental time to the specified mean lifetime, the minimum sample size required to assert the specified mean lifetime were acquired. The operating characteristic function values and the corresponding producer's risks were also presented.

Al-Omari (2015) studied the problem of acceptance sampling with truncated test at a predetermined time. The generalized inverted exponential distribution was scheduled as a model for a life time random variable and minimum sample sizes needed to satisfy a specified mean life were acquired. The operating characteristic function values of the sampling plans were accorded and the producer's risk were also examined. Some useful tables of the ratio of

the true mean life to specified mean life that maintains acceptance with a predetermined probability were introduced. Guiand Aslam (2015) developed a time truncated acceptance sampling plan when the life time follows a Weighted Exponential distribution. For several acceptance numbers, consumer's confidence levels, values of the ratio of the experimental time to specified mean lifetime and the minimum sample size needed to ensure a definite median life were obtained. Also, the operating characteristic function values and the corresponding producer's risk were discussed. The acceptance sampling plan was illustrated with a numerical example.

Kumar and Ramyamol (2016) attempted to derive the adequate economic reliability sampling plans for accepting a lot containing identical units having exponentially distributed lifetime. The optimization problems were formulated for obtaining the average sample number. The cost involved in their plans was random expect for reliability group sampling plan under Type II censoring and their comparisons showed that reliability group sampling plan under Type II censoring has the minimum cost of testing. Rao et.al (2016) formulated the acceptance sampling plans for the exponential Frechet distribution based on percentiles when the life test was truncated at a pre-assigned time. The minimum sample size required to assert the specified life percentile was obtained under a stated consumer's risk and producer' risk at the same time and the operating characteristic values of the sampling plans were presented.

Malathi and Muthulakshmi (2017) proposed the designing of acceptance sampling plans for truncated life test assuming that the lifetime of a product follows Frechet distribution based on median. The

minimal sampling plans to meet the consumer's confidence level with optimum total cost were designed and also efficiency of the proposed plan was analyzed. Ramya and Devaarul (2017) developed reliability sampling plans for intermitted test batches based on type I censoring data. The main problem in the case of intermitted testing faced by the quality control practitioner was the process average which may vary due to occasional productions. To overcome the difficulty of ensuring the exact reliability of products while disposing the lots, minimum reliability was acquired before acceptance of the lot. In this paper, reliability sampling plans were determined for a two parameter Erlang distribution and these were formulated and designed in such a manner that they were more reliable with respect to the acceptance of the batches. Loganathan and Gunasekaran (2017) attempted to determine reliability single sampling plans under hybrid censoring scheme assuming that the life time of the product follows Exponentiated exponential distribution. Plan parameters were obtained corresponding to two specified points on the operating characteristic curve and the sampling plans protected the interest of both the producer as well as consumer.

Al-Omari et.al (2018) considered the problems of an acceptance sampling plans when lifetime of a product follows Marshall-OlkinEsscher Transformed distribution for different values of acceptance number, confidence levels and definite values to the particular mean lifetime. In the proposed sampling plan parameters including the minimum sample size, the operating characteristic function and producer's risk were calculated. They compared the efficiency of the proposed sampling plan with new sampling plans in

terms of sample size and the proposed plan provided the smaller sample size as compared to existing sampling plan. Rosaiah et. al (2018) considered exponential pareto distribution as a probability model for the life time of products. For a proposed sample size, producer's risk and truncation number, a test plan to determine waiting time to terminate the experiment was constructed for exponential pareto distribution. Senet.al (2018) considered the determination of reliability acceptance sampling plans for the Weibull distribution under generalized hybrid censoring schemes. Sample size and acceptance constant were determined for assigned producer's and consumer's risk using asymptotic normality of the maximum likelihood estimators of the model parameters. A comparative study was undertaken to verify whether the reliability acceptance sampling plans meet the specified consumer's and producer's risk for finite sample size and optimum reliability acceptance sampling plans were obtained based on variance minimization criterion subject to a cost constrain. They also proposed suitable algorithms for computation of optimum reliability acceptance sampling plans.

Rao et. al (2019) described the development of an acceptance sampling plan based on percentiles for Type II generalized log-logistic distribution assuming product having definite life time and hence life time was terminated with the end of the product lifetime. The aim of the test was to determine the minimum sample size required to attain a specific life time percentile at an acceptable level of producer's risk and consumer's risk. Obtained operating characteristic curves were presented along with the producer's risk.

Conclusion

Detailed study of the above research works should serve to provide in-depth understanding of the methodologies and techniques in the field of acceptance sampling plans. As the sampling plan bases its decision on a sample of the lot and not the entire lot, there is always a chance of making an incorrect decision. Also, different aims require different schemes for choosing the sampling plan. Acceptance sampling, as is the case with any statistical sampling is thus inherently error prone. There is always room for further research which would attempt to formulate sampling plans with higher versatility and efficiency as well as lower margins of error and cost.

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Graphene Derivatives Modified Graphitic Carbon Nitride: A Short Review

Mekha Susan Rajan, Anju John, Jesty Thomas*

Post Graduate and Research Department of Chemistry, Kuriakose

Elias College, Mannanam, Kottayam, Kerala 686561, India.

E-mail.jestyk@kecollege.ac.in

Abstract

Photocatalysis refers to the acceleration of the rate of oxidation/reduction reactions on semiconductor surfaces, with the utilization of ultraviolet or visible light radiation and being widely practiced for the eradication of organic pollutants. Graphene derivatives modified g-C₃N₄ based photocatalysts has attracted much interest during the last years due to their structures with unique features such as large specific surface area, thermal and chemical stability and enhanced visible light utilization. This review attempts to showcase the recent progress in the rational design and fabrication of graphene modified g-C₃N₄ photocatalyst for pollutant degradation.

Key words: photocatalysis, g-C₃N₄, graphene, pollutant degradation.

Introduction

Semiconductor based photocatalysis have great potential to crack energy dilemma and environmental issues. Graphitic carbon nitride is a fascinating conjugated polymer semiconductor that has received tremendous attention in the current period due to its lower band gap and higher visible light absorption ability [1]. However, its photocatalytic efficiency is limited because of the high recombination

rate of photogenerated electron-hole pairs [2]. Graphene, a new two-dimensional honeycomb-like carbon nanomaterial, has been observed as perfect support material for loading catalyst particles because of its superior thermal, mechanical, optical and electrical properties as well as large specific surface area [3]. Recently, graphene and its derivatives, graphene oxide (GO) and reduced graphene oxide (rGO), have been broadly studied for the applications in photocatalysis. One of the promising ways to enhance the photocatalytic activity of the carbon nitride is a modification with graphene and its derivatives [4]. This method is an inspiring route to achieve an improved charge separation in the electron transfer process. In this review paper we were discussed significant advancements in graphene derivatives supported g-C₃N₄ nanocomposites, including their common preparation methods, development mechanisms and their current applications such as pollutant degradation, H₂ evolution and CO₂ reduction. This study will encourage new progresses in designing C₃N₄ photocatalysts and promotes their application in environmental problems.

Graphene based g-C₃N₄

The photocatalytic behaviour and degradation mechanism of Ag₃PO₄ with nitrogen-doped graphene and g-C₃N₄ (Ag₃PO₄/NG/g-C₃N₄) was reported by Q. Zhang et.al for the degradation of tetracycline (TC). In the aforementioned catalyst, NG functions as a solid electron mediator which suppresses the recombination rate of photogenerated carriers. The degradation via Z scheme mechanism boosts the photocatalytic behaviour, photo mineralization and photostability of pure Ag₃PO₄. Ag₃PO₄/NG/g-C₃N₄ attained degradation rate of 93.6%

within 90 min of visible light irradiation and the total organic carbon (TOC) analysis establishes the mineralization rate to be 72%. The retainment of 70% degradation rate after 4 recycling runs confirms the photostability of the catalyst. The role of holes, O_2^- and *OH as reactive oxidation species for the degradation of tetracycline was extensively studied. Fig.1 illustrates the mechanism of tetracycline degradation by the catalyst. This may possibly offer novel visions to improve extremely efficient and stable g-C₃N₄- graphene based photocatalysts [5].

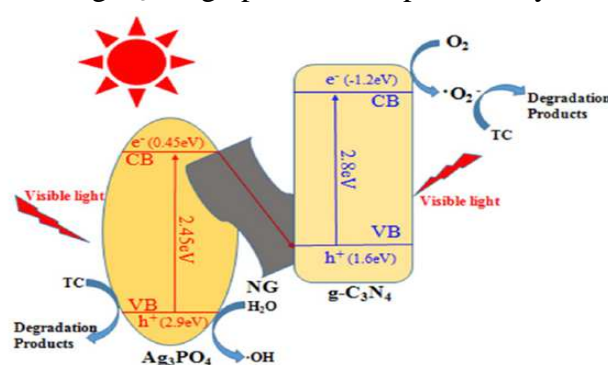


Fig.1. Mechanism of degradation of tetracycline by Ag₃PO₄/NG/g-C₃N₄

Recently, the photocatalytic degradation of methyl orange (MO) by magnetically separable Z-scheme g-C₃N₄/graphene/NiFe₂O₄ (CGN) nanocomposites was investigated by G. Gebreslassie et.al. Authors claim that the synthesized nanocomposite CGN-25% displays the highest photocatalytic activity and is about 15, 7 and 6 folds higher than pristine NiFe₂O₄, g-C₃N₄, and binary g-C₃N₄/NiFe₂O₄-25% (CN) respectively on the degradation of MO. According to the observations made from DRS and PL spectra, the enhanced photocatalytic behaviour of the CGN nanocomposites were connected to greater visible-light absorption and photogenerated electron-hole separation. The nanocomposite can effortlessly recover using external magnetic

field and displays reasonable stability after six recycling runs. Here, NiFe_2O_4 nanoparticles behaves as photosensitizer which enhances the light absorption of gC_3N_4 and graphene sheets aids as electron mediator which stimulates charge separation and visible light absorption [6].

A novel visible light driven ternary Fe (III)/graphene/ $\text{g-C}_3\text{N}_4$ (Fe/GE/CN) composite photocatalyst was constructed by X. Fang and his research group for water disinfection. By adopting simple impregnation method, they have grafted Fe (III) species on the surface of $\text{g-C}_3\text{N}_4$. Introduction of graphene to this binary composite leads to well distribution, smaller size of the Fe species and more efficient ternary Fe (III)/graphene/ $\text{g-C}_3\text{N}_4$ photocatalyst with better activity. The optimised sample, 25%-Fe/ graphene/ $\text{g-C}_3\text{N}_4$ degrades 82 % of Methyl Orange (MO) in 60 min whereas pure $\text{g-C}_3\text{N}_4$ and 1%-GE/ $\text{g-C}_3\text{N}_4$ only could degrade less than 35% of MO in equal time. Such an increased activity shown by catalyst is due to the synergistic effect between graphene and Fe (III) and interfacial charge transfer effect between Fe and $\text{g-C}_3\text{N}_4$ in the ternary composite. the removal of TOC was about 51.2% after 60 min reaction. The removal of TOC was about 51.2% after 60 min reaction i. e. after photodegradation, about 51.2% organic carbon over MO is transformed into inorganic carbon (CO_2) [7].

Graphene oxide based $\text{g-C}_3\text{N}_4$

H. Wang et.al fabricated $\text{g-C}_3\text{N}_4$ nanoparticles/graphene oxide (CNNP/GO) nanocomposites with enhanced visible-light photocatalytic activity by loading $\text{g-C}_3\text{N}_4$ nanoparticles (CNNP) on graphene oxide (GO) through electrostatic self-assembly approach. The decrease in C-OH peak intensity with an enhancement in C-O-C peak intensity

revealed from FTIR specifies the role of OH groups to tie GO and CNNP by developing C-O-C bonds which ultimately results in the band gap narrowing and enhanced visible-light absorption of the CNNP/GO nanocomposite. In the GO modified CNNP sample, CNNP performs as a photocatalyst which can create electron-hole pairs under visible light radiation and GO supports and assists the transfer of photogenerated electrons. The optimized sample (CNNP/GO mass ratio 4:1) shows enhanced degradation efficiency of 67% for methylene blue within 3 h due to its proper band gap and the enhanced separation efficiency of photo-generated carriers. The photocatalytic activity increases with CNNP content and reaches an optimum value and further addition of the same leads to decline of photocatalytic activity [8].

F. Yang et.al developed graphene oxide-based g-C₃N₄ photocatalyst for the degradation of RhB. They synthesised the ternary catalyst, primarily by integrating NaTaO₃ (hydrothermally synthesised using NaOH and Ta₂O₅) with g-C₃N₄ via in-situ calcination of urea and NaTaO₃. Graphene oxide was incorporated with precursor by photochemical reduction self-assembly methods. The TEM image of NaTaO₃/g-C₃N₄ (fig.1) illustrates more clearly that the heterojunction is successfully realized by the combination of NaTaO₃ nano cube and g-C₃N₄. Even though NaTaO₃ shows weak degradation efficiency, 0.05 wt% NaTaO₃ incorporated g-C₃N₄ shows better photo catalytic activity than g-C₃N₄ and NaTaO₃ and degrades 47% of RhB in 70 minutes. Finally, 99% of degradation of RhB was attained by 20 wt% graphene oxide combined NaTaO₃/g-C₃N₄ [9].

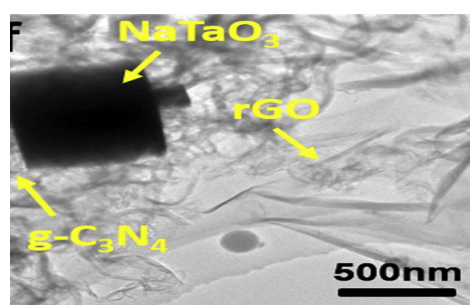


Fig. 3. TEM image of NaTaO₃/g-C₃N₄/GO

R. Zhang et.al synthesized a multifunctional g-C₃N₄/graphene oxide wrapped sponge monoliths (MS) via facile dipping squeezing process followed by frozen-drying. The obtained g-C₃N₄/GO-wrapped MS possess outstanding adsorption capacity as well as excellent photocatalytic performance towards dyes (RhB and MB) and organic solvents. GO bridges between g-C₃N₄ and MS and enhances photogenerated electron-hole separation. MS preserves its exceptional elasticity and recoverability and possess porous structure which aids the easy passage of gas molecules to reaction sites. This enhances the photooxidation of NO with a maximum removal ratio of 45.9% and photoreduction of CO₂ with CO, CH₄ and H₂ evolution rate of 42.9, 4.6 and 1.6 $\mu\text{mol g}^{-1}\text{h}^{-1}$, respectively [10].

D. Xu and his co-workers were successfully able to reduce CO₂ into methanol (CH₃OH) and methane (CH₄), photo catalytically using ternary Ag₂CrO₄/g-C₃N₄/GO composite. In this study they used silver chromate (Ag₂CrO₄) nanoparticles as photosensitizer to improve the light absorption of g-C₃N₄ and graphene oxide (GO) as cocatalyst, to serve as promotor for charge separation as well as to offer abundant active sites for photocatalytic reduction. The ternary Ag₂CrO₄/g-C₃N₄/GO composite photocatalyst forms Z-scheme heterojunction and

gives a high CO₂ reduction activity of 1.03 μmol g⁻¹ with a TOF value of 0.30 h⁻¹ under sunlight, which is 2.3 times that of pure g-C₃N₄ [11].

Reduced graphene oxide based g-C₃N₄

A facile photoreduction approach was chosen by N. Lu et al. for the synthesis of Z-scheme photocatalyst g-C₃N₄/RGO/WO₃. The visible light induced photocatalytic degradation of colourless ciprofloxacin (CIP) was investigated to assess the photocatalytic property of the prepared photocatalyst. Only holes contribute to the degradation process of CIP in the absence of RGO and thus the degradation rate by g-C₃N₄/RGO/WO₃ composite was found to be double that of g-C₃N₄/WO₃. The role of RGO as electron mediator improves the performance of photocatalyst and considerably increases the adsorption capacity of composites for CIP [12].

X. Yang et al. synthesized reduced graphene oxide/Fe-doped g-C₃N₄ (rGO/PFCN) for the removal of NO_x using visible light. The bandgap of corresponding catalyst is found to be 2.48 eV which indicates that both Fe doping and rGO recombination narrowed the band gap of g-C₃N₄ to varying degrees and extended the visible light absorption range of g-C₃N₄ for generation of exciting carriers. Authors found that for the rGO/PFCN photocatalyst, the NO removal efficiency improved first and then diminished with the rise of mass ratio of rGO to Fe, and the sample with a mass ratio of 2:3 had the largest NO removal efficiency, which was 93.44%. When rGO content increased, the contact area and interface interaction between rGO and Fe-C₃N₄ increased, and rGO performed as a high-speed channel for electrons to accelerate the transport and separation of electrons, resulting in the production of more active particles to oxidize NO to NO₃⁻. XRD and

FT-IR analysis clearly indicates that rGO/PFCN sample is relatively stable in crystal and chemical structure even after five photocatalytic cycle tests [13].

The researchers have been successfully fabricated reduced graphene oxide (RGO)-supported Cd_{0.5}Zn_{0.5}S (CZS)/g-C₃N₄ Z-scheme heterojunctions via a two-step method for improved photocatalytic hydrogen production. Photoluminescence spectra evidently attribute that photo-current density of CZS/RGO-2% is curiously improved after adding g-C₃N₄, which is 32 times and 67 times higher than that of pure CZS and g-C₃N₄. The photocatalytic hydrogen evolution reaction (PHER) of CZS/RGO/ g-C₃N₄ -40% catalyst (with CZS/RGO-2%) shows the highest rate about 39.24 mmol g⁻¹ h⁻¹, which is 8.12 times and 48.44 times higher than pure CZS and g-C₃N₄, correspondingly [14].

Y. Bao and K. Chen constructed a Z-scheme BiOBr/ reduced graphene oxide/protonated g-C₃N₄ (BiOBr/RGO/pg-C₃N₄) visible-light active photocatalyst and studied its photocatalytic performance by the degradation of Rh B and TC in aqueous solution. The degradation efficiency order for RhB removal were reported as 10%BiOBr/RGO/pg-C₃N₄> 10%BiOBr/pg-C₃N₄> pg-C₃N₄> BiOBr. The 10% BiOBr/RGO/pg-C₃N₄ composite achieved 100% degradation within 7.5 min and further loading of BiOBr decreases the active sites on pg-C₃N₄ due to its negative shading effect. The mineralization process indicates that the 10% BiOBr/RGO/pg-C₃N₄ photocatalyst has very strong mineralization ability and total organic carbon (TOC) removal ratios were found to be 88% and 59% for Rh B and TC respectively. The photocatalyst possess good stability as there is no noticeable difference

for the phase and structure of the 10% BiOBr/RGO/pg-C₃N₄ composite after five times of recycling test. The authors adopted radical quenching and ESR spin-trap experiments to confirm the Z-scheme mechanism [15].

Conclusion

Graphene and g-C₃N₄ based materials comprise a group of compounds which exhibit enhanced photocatalytic activity for environmental cleansing, water splitting, H₂ and O₂ generation and CO₂ reduction due to their sole properties such as thermal/chemical stability, large specific surface area and improved visible light utilization. These features insisted the research community to synthesize a large variety of graphene and g-C₃N₄ based composites, especially during the last decade. Besides incorporation of graphene derivatives-based g-C₃N₄ with metals or metal oxides has exhibited activities significantly around 50% or even more. The improved photocatalytic efficacies of the composites were predominantly ascribed to the development of effective 2D-2D heterojunctions at the interface of g-C₃N₄ and graphene or metal or non-metal or semiconducting components. Due to the generation of intimate heterojunctions, the nanocomposites attain novel electronic/optical/redox properties, thus the recombination rate of the photoactive species is reduced and therefore their photocatalytic activity is upgraded.

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Synthesis and Characterization of Iron Oxide Nanoparticles using Co-Precipitation Technique

Geethu Anil, Mercy Mathews

*Department of Physics, K E College, Mannanam, Kottayam,
Kerala -686 561, India*

Email: sonumathews1@gmail.com

Abstract

Iron oxide nanoparticles synthesized by co-precipitation technique were structurally, optically and morphologically analyzed using XRD, UV, FTIR and SEM techniques. From the X-ray Diffraction (XRD) analysis, we found that the prepared sample 1 contains crystalline Fe_3O_4 (Magnetite) nanoparticles of particle size 23nm having cubic symmetry and face centered lattice. But the decrease in drying temperature during the synthesis process of sample 3 shows that it contains nanoparticles of crystalline β - Fe_2O_3 phase. The particles in this sample have cubic symmetry and body centered lattice. The particle size is found to be 12.907 nm. The optical characterization of the Iron oxide nanoparticles was done by UV analysis and Fourier Transform Infrared (FTIR) spectroscopy. By UV analysis, the band gap energy of each sample is calculated. The values of both direct and indirect energy band gap of the Magnetite sample are classified sample 1 and sample 2 as a semiconductor. The FTIR analysis is helped for the identification of atomic arrangement, chemical bonds and modes of vibration of these bonds in the three samples. The morphological characteristics of Iron oxide nanoparticles were studied using Scanning Electron Microscopy (SEM).

Introduction

Nanotechnology is the science that deals with matter at the scale of 1 billionth of a meter (i.e., 10^{-9} meter = 1 nm) and is also the study of manipulating matter at the atomic and molecular scale. Nanoparticles are at the forefront of rapid development in nanotechnology. Their exclusive size-dependent properties make these materials indispensable and superior in many areas of human activities. In general, the size of a nanoparticle spans the range between 1 and 100 nm. Iron oxides are common natural compounds and can also easily be synthesized in the laboratory. Iron and oxygen chemically combine to form iron oxides (compounds). There are 16 iron oxides, including oxides, hydroxides, and oxide-hydroxides. Generally, iron oxides are prevalent, widely used as they are inexpensive, and play an imperative role in many biological and geological processes. They are also extensively used by humans; as iron ores in thermite, catalysts, durable pigments (coatings, paints, and colored concretes), and haemoglobin. The three most common forms of iron oxides in nature are magnetite (Fe_3O_4), maghemite ($\gamma\text{-Fe}_2\text{O}_3$), and hematite ($\alpha\text{-Fe}_2\text{O}_3$).

Chemical Synthesis of Iron oxide nanoparticles

Wet chemistry synthesis is widely used to fabricate nanoparticles. Under particular circumstances, well-structured crystalline clusters of nanoparticles with extremely small size (less than 10nm) can be fabricated easily by using wet chemistry synthesis. For example, the co-precipitation technique can be used. Ferrous sulphate and Ferric sulphate, both in aqueous solutions, are mixed in a particular molar ratio. Alkaline solution is slowly dropped into the mixture until the pH approaches 10 with mechanical or magnetic stirring. Black slurry

precipitation is produced immediately when alkaline solution is added. After a long period of vigorous stirring, hydrochloric acid is added to stabilize the nanoparticles. The precipitation is rinsed with acetone and D.I (de-ionized) water after fabrication.

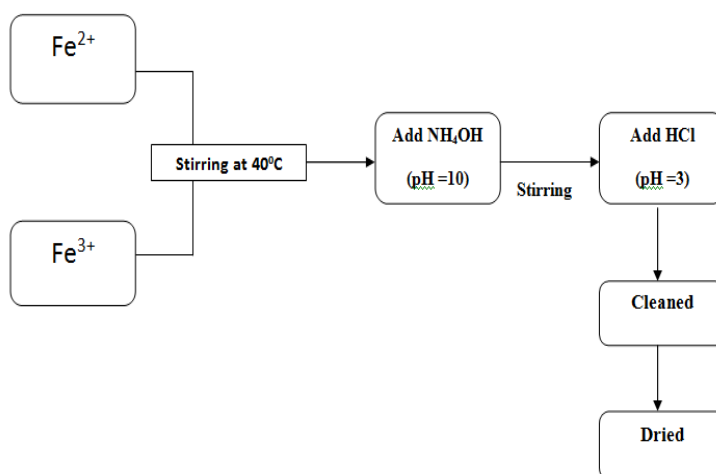


Figure (1): Synthesis process of Iron oxide Nanoparticles

Table 1: The preparation and parameter variation of different samples

Sample	Reaction Temperature	Molar Ratio (Fe ³⁺ :Fe ²⁺)	Stirrer	pH (HCl)	Drying Temperature	Separation Technique
1	40	1:1.8	Magnetic	3	150	Whatman No.41 filter paper
2	40	1.8:1	Magnetic	3	150	Whatman No.41 filter Paper
3	40	1.8:1	Magnetic	3	100	Centrifuge Method (1500 rpm)

Structural Characterization - XRD Analysis

X-Ray Diffraction (XRD) can be used to estimate the size of the particles and the crystalline structure of the sample. Line broadening from the XRD pattern is used to calculate crystal sizes, using Debye-Scherrer formula. X-ray diffraction patterns have been widely used in nanoparticles research as a primary characterization technique for obtaining features like crystal structure, crystallite size, lattice constants and strain.

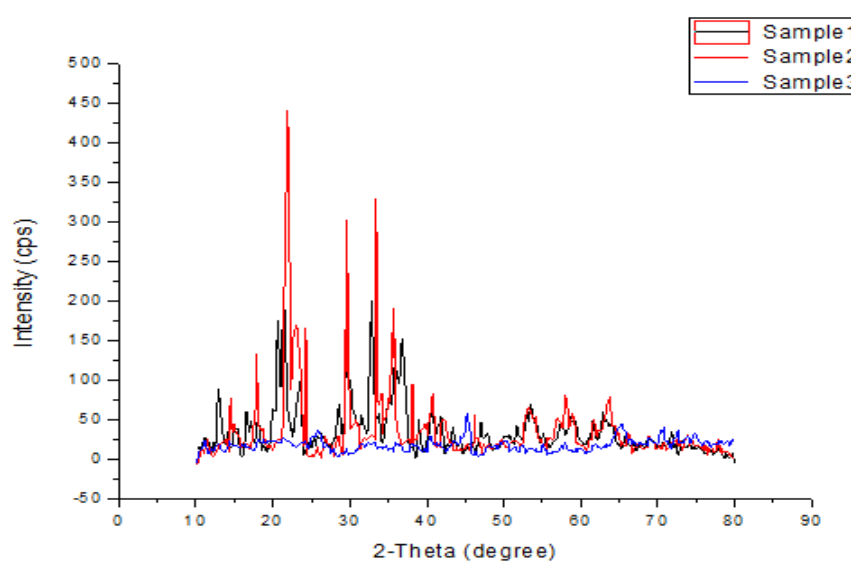


Figure (2): The XRD pattern of the three samples

Sample 1: The XRD patterns of the compound were recorded using the X-Ray diffractometer with Cu-K α radiation ($\lambda=1.5405$). The X-ray power diffraction data obtained for the sample predicts the crystalline nature of the iron oxide particles in it.

The major characteristic peak in this pattern is obtained at 21.397° which can be related with the (200) planes of Fe₃O₄. Some other strong peaks are obtained at 2Θ values 32.862° , 20.636° and

36.794⁰. This crystalline Iron oxide sample has cubic symmetry and have face centered lattice. (The result is compared with standard JCPDS data, CAS Number: 79-0416). The particle size, using the Debye-Scherrer formula is found to be 23.14 nm

Sample 2: The major characteristic peak in this pattern is obtained at 20.762⁰ which can also be related with planes of Fe₃O₄. The strong peak at 2 Θ = 29.541⁰ can be related with (220) plane. Some other strong peaks are obtained at 2 Θ values 32.950⁰ and 35.909⁰. This crystalline Iron oxide sample is similar to sample 1, which has cubic symmetry and have face centered lattice. (The result is compared with standard JCPDS data, CAS Number: 89-0951). The particle size, using the Debye-Scherrer formula is found to be 22.12 nm

Sample 3: The major characteristic peak in this pattern is obtained at 2 θ = 37.444⁰ which can be related to the (400) planes of β -Fe₂O₃ (beta phase). Some other peaks are obtained at 2 θ values 54.056⁰, 22.123⁰ and 61.930⁰. This can be related to the presence of crystalline iron oxides. Comparison of the results with standard JCPDS data (CAS Number: 39-0238) proves the presence of beta phase. This sample has cubic symmetry and body centered lattice. The particle size, using the Debye-Scherrer formula is found to be 12.907 nm.

Optical Characterization-UV & FTIR Analysis

The UV Spectroscopy helps to study the absorption and transmittance spectrum of the samples. Mainly the UV absorption spectrum was used to study the optical characteristics of iron oxide nanoparticles. This spectrum shows the relation between the wavelength and absorbance of each sample. The band gap, E_g (for a direct transition between the valance and conduction band), is obtained

by fitting the experimental absorption data with the following equation: $(\alpha h\nu)^2 = A(h\nu - E_g)$, for a direct band gap semiconductors, where $h\nu$ is the photon energy, α is the absorption coefficient, E_g is the band gap, and A is the characteristic parameter independent of photon energy. A board absorption peak is found to be around 400 nm. To measure the energy band gap from the absorption spectra, $(\alpha h\nu)^2$ versus $h\nu$ graph is plotted. The extrapolation of the linear portion of the plot to $(\alpha h\nu)^2 = 0$ gives the value of energy band gap. The band gap energy of sample 3 is less than that of its bulk Fe_2O_3 . It is seen from XRD that sample three is in β phase ($\beta\text{-Fe}_2\text{O}_3$).

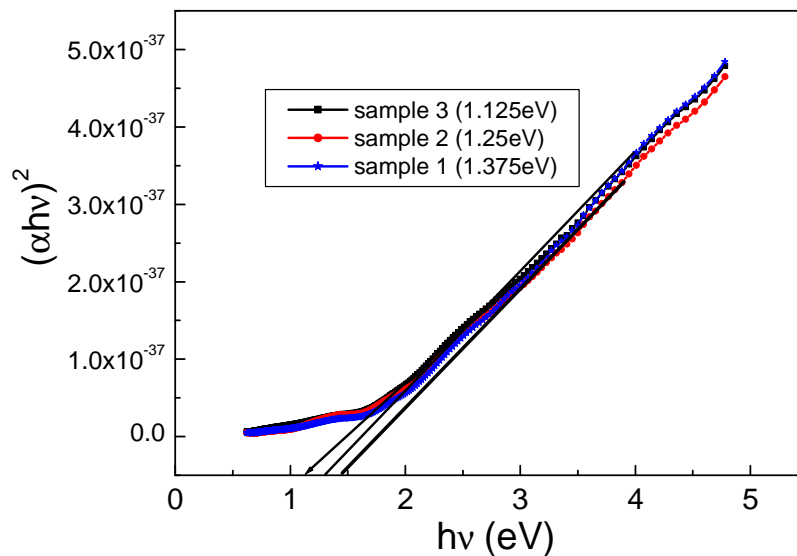


Figure (3): Variation of $(\alpha h\nu)^2$ vs. photon energy ($h\nu$), for Fe_2O_3 nanoparticles in different samples.

FTIR Analysis

FTIR analysis is used for the identification of atomic arrangement and the concentration of chemical bond present in the

samples. The spectra are analyzed in the wave range of $4500\text{-}500\text{ cm}^{-1}$.

Following figures shows the FTIR spectrum of the three samples.

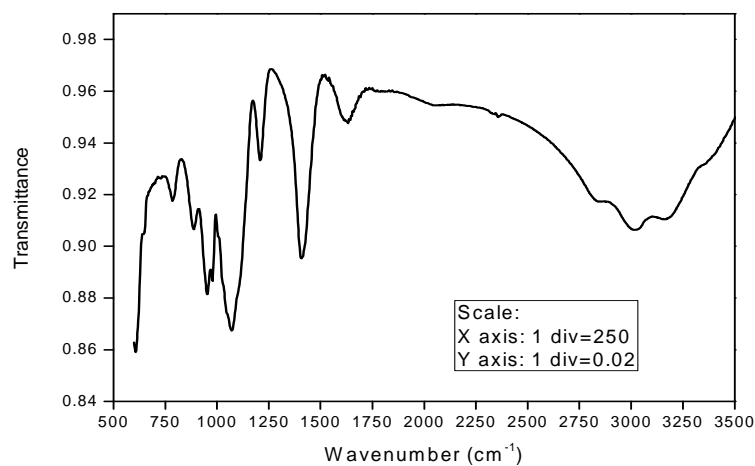


Figure (4): FTIR Spectra of Iron Oxide Nanoparticles (Sample1) synthesized via Co-precipitation

From the figure, it is clear that the peak about $3000\text{-}3400\text{ cm}^{-1}$ is due to O-H stretching vibrations. It also exhibit an intense peak about 640cm^{-1} , this is due to the stretching vibration mode associated to the Metal-Oxygen absorption band (Fe-O bonds in the crystalline lattice of Fe_3O_4).

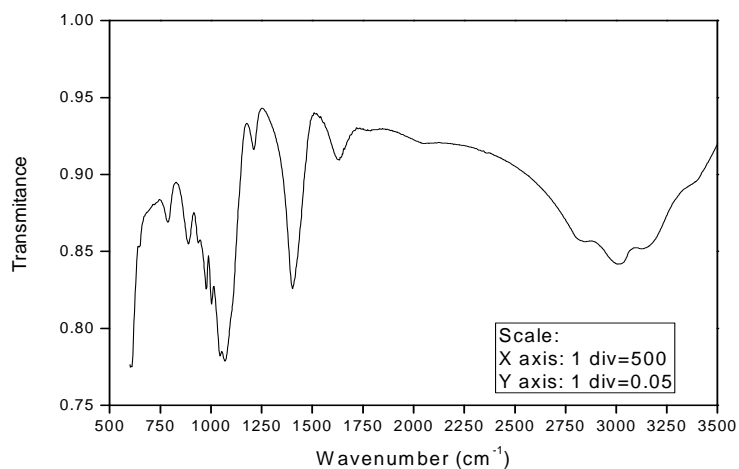


Figure (5): FTIR Spectra of Iron Oxide Nanoparticles (Sample2) synthesized via Co-precipitation

From the figure, it is clear that the sample 2 has a similar FTIR spectrum to that of sample 1. This sample shows intense absorption peaks lies at about 500-750 cm⁻¹ and 1000-1500 cm⁻¹. The peak lies around 600 cm⁻¹ is due to the stretching vibration mode of the Fe-O bonds. The O-H in plane and out of plane bonds appears at 1400-1500 cm⁻¹ and 950-800 cm⁻¹, respectively. The out plane bonds are less intense than in plane bonds.

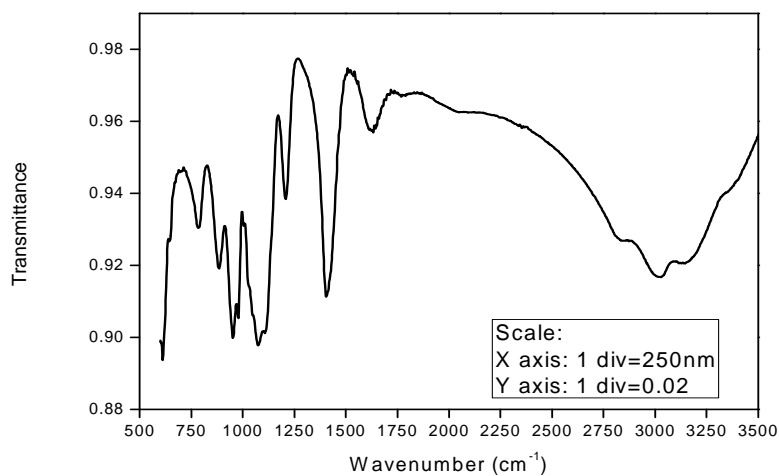


Figure (6): FTIR Spectra of Iron Oxide Nanoparticles (Sample3) synthesized via Co-precipitation

The spectrum shows intense peaks in five band ranges. The peak in the range 650cm^{-1} is due to the stretching vibration mode of Fe-O bonds. The absorption band between $900\text{-}1000\text{ cm}^{-1}$, corresponds to bending vibration associated to the O – H bond. The absorption band in the range 1400 cm^{-1} is also due to the presence of O-H in plane bonds. The peak in the range $3000\text{-}3500\text{ cm}^{-1}$ is due to O-H stretching vibrations.

FTIR spectrum of all the three samples is very helpful in determining the bonds and modes of vibrations of these bonds. The observations are matched with standard results.

Morphological Analysis

Scanning Electron Microscope is a very useful tool for looking the morphology at nanoscale range of different powder samples. Surfaces details, homogeneity and elemental composition can be

determined in one experiment on the same sample. The study of surface morphology of iron oxide nanoparticles has been carried out using Scanning Electron Microscope. Figure(7) shows the SEM micrograph of the sample 1. Nanoflakes are visible in the figure.

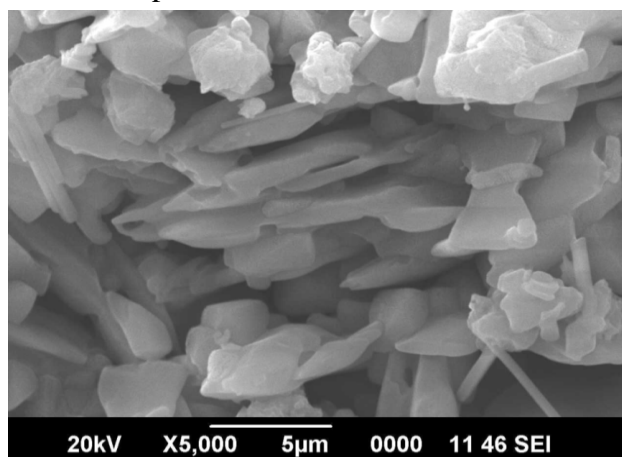


Figure (7): The SEM micrograph of sample 1 showing nanosized flakes

Conclusion

The Iron oxide nanoparticles were successfully synthesized by co-precipitation technique. The structural, optical and morphological features of three samples are studied from XRD, UV, FTIR and SEM techniques.

From the X-ray Diffraction (XRD) analysis, we found that in sample 1, there is the existence of crystalline nanoparticles of Fe_3O_4 (Magnetite) having cubic symmetry and face centered lattice. The particle size of the sample is found to be 23.14 nm using Debye-Scherrer's formula. The sample 2 is almost similar to that of sample 1. But the analysis of the sample 3 shows that it contains nanoparticles of crystalline $\beta\text{-Fe}_2\text{O}_3$ phase. The particles in this sample have cubic symmetry and body centered lattice. The particle size is found to be

12.907 nm. The optical characterization of the Iron oxide nanoparticles was done by UV analysis and Fourier Transform Infrared (FTIR) spectroscopy. By UV analysis, the band gap energy of each sample is calculated. The values of both direct and indirect energy band gap of the Magnetite sample are classified sample 1 and sample 2 as a semiconductor. The FTIR analysis is helped for the identification of atomic arrangement, chemical bonds and modes of vibration of these bonds in the three samples. The morphological characteristics of Iron oxide nanoparticles were studied using Scanning Electron Microscopy (SEM). But this SEM data is not sufficient to explain the morphology of these nanoparticles as we need magnifications below 1 μ m. The magnetic studies of these Iron oxide particles have very importance. In order to use iron oxide nanoparticles in biomedical field, we have to coat these nanoparticles with surfactants. Iron oxide nanoparticles due to their strong magnetic properties were used first in biology and then in medicine.

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Antimicrobial Resistance in Aquatic Ecosystem: Prevalence and Mechanisms

Maya Mathew¹, Sandhya C^{2*}, Linda Louis³

¹ Department of Microbiology, SreeSankara College, Kalady, Kerala

² Department of Biochemistry, K E College, Mannanam, Kottayam, Kerala

³ Department of Zoology, St.Xavier's College for Women, Aluva,
Ernakulam, Kerala

*Corresponding author. Tel: +91-9447036472,
Email:sandhyachandran2014@gmail.com

Abstract

Antimicrobial resistant (AMR) microorganisms are one of the great concerns globally as it affects millions of lives in various ecosystems. The introduction and overuse of antimicrobials in farm animals and plants, along with the unsystematic sewage and contaminated water discharge into aquatic environments, increased the amount of antibiotic resistant bacteria in aquatic ecosystems. Significant amounts of antimicrobial agents for a longer period of time in the aquatic systems offers major selective pressure for antimicrobial resistance in bacteria. The high level of antimicrobial resistant bacteria isolated from marine environments indicates a serious threat for aquatic organisms and human health. The emergence of this phenomenon has revealed multiple and complex mechanisms by which antibiotic resistance arises and spreads among bacteria of the same species or even among different species. The prevalence of these impurities in the environment indicates the necessity for better source control as well as adhering to environmental quality standards. In order to counteract the possible threats, systematic strategies are required for integrated activities of professionals and scientists from various fields of science and industry.

Key words: Antimicrobial resistance, Aquatic ecosystem, Prevalence, Consequences

Introduction

The invention and introduction of the lifesaver of infectious diseases: the antibiotics, after world war tremendously helped the healthcare systems. Apparently the overuse and misuse of these antimicrobial agents have developed the emergence of antibiotic-resistant bacteria (1). The emergence of this phenomenon has become a multifaceted threat affecting lives globally. It has been warned by the World Health Organization (WHO) that, if no controlled actions could be taken to tackle the emergence of these antibiotic resistant organisms, the death toll of the affected ones will be raised up to 10 million by 2050.

Antibiotic resistance arises and emerges among bacteria of the same species or even among different species through horizontal gene transfer mechanisms. The resistance mechanisms are of different types. They include rejection or exclusion of the antibiotic by the cell membrane, target modification or deactivation of the antibiotic, limited sensitivity of the cellular target, and extrusion from the cell (2). The horizontal gene transfer mechanisms can be reflected on various compartments of the environment which includes the aquatic environment as well. The pathways which introduce the antimicrobials to the aquatic environment are the pollution of surface water, groundwater and drinking water with antimicrobial agents or the bacteria harboring those genes (3). Wastewater treatment plants are often pointed out to be one of the main point sources of antimicrobial pollution. As the presence of antimicrobial agents in the aquatic environment become evident to be a serious threat to humans and other forms of life, it is necessary to focus on the action plan to eradicate the threat caused by these resistance mechanisms.

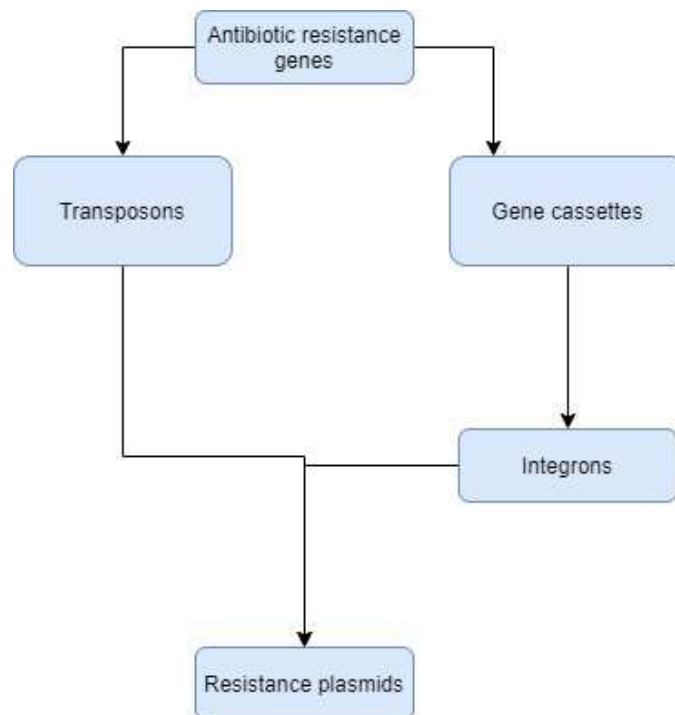
Dispersion of antimicrobial agents to the aquatic environment

The presence of antibiotic-resistant bacteria in aquatic environments has increased incidentally due to the extensive use of antibiotics by humans (4). The overuse and unwanted injection of antibiotics in various compartments of the environment have been connected to the emergence of resistance conferring bacteria (5). Subsequently, the impact of this usage covers further, resistance conferring genes such as plasmids, transposons etc which spread to nearby environment compartments and other species. There is always a possibility of consumed antibiotics to excrete unchanged and then introduced into the ecosystems either through direct contact or through indirect methods such as accumulation in drainage and waste streams (6). This type of accumulation in those sentinels can serve the purpose of acting as hotspots for the dispersal of AMR. The antibiotic residues disseminate further from the treatment plants since they are often not completely removed during the treatment (7). All these scenarios contribute towards raising multiresistant bacteria to be common within the treatment plant (8) and in nearby river sediments (9). Marine microplastic debris can also contribute towards ingestion and contamination of edible fish species (10), threatening human food security, food safety and health (11) and as potential vectors for the spread of human antibiotic resistant pathogens in the marine environment (12). In addition to antimicrobial exposure, factors such as metal pollutants and human waste contamination can also affect AMR and anthropogenic sources of pollution as well considered as a major cause of AMR in marine microorganisms (13, 14).

Dispersion Mechanisms

Dispersion of resistance conferring genes occur mainly through Horizontal Gene Transfer which results from the successful transfer of genetic material followed by vertical gene transfer throughout generations (15). Horizontal transfer may be mediated by mobile genetic elements such as plasmids, genomic islands, transposons, integrons, and insertion sequences (ISs), these are involved in bacterial acquisition of foreign genes and recombination of those DNA (fig.1). Bacteriophages can also be considered as mobile genetic elements, since they have a crucial role in genome rearrangements with the help of mobile genetic elements, gene duplications and deletions, and capture of new genes.

Figure 1. Schematic Representation of Resistance Acquisition



Plasmids

Bacterial plasmids are extrachromosomal, circular DNA molecules that replicate independently of chromosomal DNA and confer antibiotic resistance (16). The probability and rate of plasmid transfer from a donor to a recipient strain are influenced by plasmid-borne genes, which determine the type of transfer mechanism and the host range of autonomous plasmid replication (17). It has been reported that genes encoding Extended Spectrum Beta Lactamases (ESBL) may be present on plasmids. These enzymes confer resistance to penicillins, cephalosporins, monobactams, and oxyimino cephalosporins. Recent studies have shown that ESBLs have been found in other bacterial genera, such as *Acinetobacter*, *Aeromonas*, and *Pseudomonas* apart from the Enterobacteriaceae family (18).

Transposons

They are essentially jumping gene systems that incorporate a resistance gene within the element. Distinguished by structure, genetic relatedness, and mechanism of transposition there are different types of transposons. There can be composite or noncomposite forms of transposons. Composite transposons have two IS elements of the same type bracketing one or more genes. Some transposons contribute to the spread of AMR genes as part of class 1 integrons. The transposons family such as Tn3, Tn5053 family, and Tn402-like transposons are found in a diverse range of Gram-negative and Gram-positive bacteria (19).

Integrons

These are genetic systems that allow bacteria to capture and express gene cassettes and they can be found as part of plasmids,

chromosomes, and transposons. Integrons are formed by an *intI* gene, encoding an integrase which is a site-specific recombinase, an attachment site, and one or two strong promoters which drive the expression of inserted gene cassettes (20). Gene cassettes can be inserted one after the other into the integron insertion site (21) thereby producing the formation of long arrangements of ARGs that can be transferred among bacterial populations(22). This mobile genetic element can be usually found in clinical bacterial strains, possibly because most of the cassettes identified are associated with antibiotic resistance. Also in the last years, several studies have been performed in order to determine the occurrence of integrons in bacteria from aquatic environments (23).

Conclusion

The dispersal and evolution of antibiotic-resistant bacteria depends on water environments. In marine environments, bacteria from different origins such as human, animal, environmental can undergo horizontal gene transfer, and promiscuous exchange and shuffling of genes, genetic platforms, and genetic vectors occurs. Antibiotics, disinfectants, and heavy metals which are released in water may lead to ecological damage in water communities, resulting in antibiotic resistance. Management methods developed should be cheap and reliable. This should employ bacterial clones and resistance genes source tracking, detection of antibiotics in water environments, disinfection of water from antibiotic-resistant populations and the resistance gene pool, and removal of antibiotics from wastewater. There should also be prevention methodologies for mixing waste created by humans with natural streams.

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A Comparative Study on Tax Burden on People under GST and Previous Tax System

Jibin Mathew

*Department of Commerce, Kuriakose Elias College, Mannanam,
Kottayam, Kerala 686561, India.*

E.mail: jibinmathew2013@gmail.com

Abstract

Goods and Service Tax is a comprehensive, multi-stage destination based tax that is levied on every value addition. It is an indirect tax levied on the supply of goods and services. In India, GST came into force on 1st July 2017. GST has replaced many indirect taxes imposed by central and state governments. It avoids cascading effect of taxes to a larger extent. Under the previous tax system, excise duty, service tax and CST were imposed by the Union government and VAT was imposed by the state governments. Under both the system tax rates are different. This study is an attempt to find the changes in tax burden of final consumers in intra-state purchase of commodities under both the system.

Key words

VAT (Value Added Tax), CST (Central Sales Tax), Intra-state sales, Inter-state Sales, Service Tax, Excise Duty

Introduction

Goods and service tax (GST) is a destination based tax levied at a single point at the time of consumption of goods and services by the ultimate consumer. GST is based on the principle of Value Added Tax. It is a comprehensive levy and envisages tax collection on both goods and services at the same rate. GST was first introduced in France and now more than 160 countries have introduced GST.

In India GST was came in to force on 1st July 2017. India implemented dual GST model. Under this regime, all the intra-state supply of goods and services made for a consideration would attract Central GST and State GST. The CGST collected by a dealer will goes to the central government and the SGST will goes to the state government.

GST replaced all indirect taxes levied by the centre and states. Under the previous tax system, intra-state sale of goods attracted excise duty imposed by the centre on the production of those goods and VAT imposed by the states on the sale of those goods. This system suffered may problems like cascading effect of taxes, high cost of compliance and tax administration, complexity tax structure, double taxation by centre and state on the same tax event etc.

VAT was charged on selling price and the selling price includes tax on excise duty already paid. So in case of intra-state sale also there was an existence of tax on tax. VAT was a state subject. So the VAT rates imposed by different states might vary from one state to another. Here, VAT rates under Kerala Value Added Tax is taken for comparison.

Under the previous tax system, both excise duty and VAT were indirect taxes and the total of these taxes were the tax burden on final consumer. This study is an attempt to find the changes in tax burden of final consumers under GST and previous tax system.

1.2 Review of literature

Ram & Meena Sahi (2013) showed a significant progress in tax reforms in recent years and that has helped to enhance the tax-GDP ratio close to the levels that prevailed prior to reducing customs. They were of the opinion that, the tax system reform including reform in administration is a continuous exercise. The reforms will have to continue not only at the centre, but also at the state and local levels. Consumption taxes should be calibrated in a coordinated manner in the spirit of co-operative federalism. Domestic and external trade taxes should be calibrated to ensure the desired degree of protection to industry and the desired burden of consumption taxes to the community.

Ahmad, Poddar et al (2008) suggested that, harmonization of virtually all major areas of GST law and administration would be desirable. There is merit in keeping even the GST rates uniform, at least during the initial years until the infrastructure for the new system is fully developed. Harmonized laws would mean lower compliance costs for taxpayers and may also improve the efficiency of fiscal controls.

McLure (2003) outlines characteristics of a well designed indirect tax regime in the context of Canada. While consumers should be taxed at single rate sales of inputs to business should not carry any tax liability. With regards to exports the tax should be levied under the destination

principle, ie exports should be tax-free and imports should be taxed at the same rate as domestic products.

Patrick Sullivan (1992) expressed his views about the Canadian federal government's move to include facelifts, liposuction and hair transplants under the new tax regime GST. In his opinion, it was actually a bad news for the plastic surgeons, physicians and dermatologists. The inclusion of these elective procedures in GST will not only affect celebrities and millionaires but also many poor people who are in need of such treatment. GST will also increase the overhead costs that will finally pass on to the patients.

Ahmad & Stern (1991) observed that, sectoral concerns have been at the heart of the excessive differentiation of the Indian tax system. But the objectives are negated by the cascading effect of taxes. An optimal design of the consumption tax system take in to account both production efficiency and distributional concerns. It didn't mean uniformity of the overall tax structure, the desired structure can be achieved by a combination of taxes and transfers.

1.3 Objectives

1. To assess the rate of tax charged under the previous tax system in case of intra-state sale of goods.
2. To assess the rate of tax charged under the new GST system in case of intra-state sale of goods.
3. Find out the differences in tax burden of final consumers under both the systems.

1.4 Hypothesis

H1- There is a significant difference in tax burden of final consumers on purchase of goods under GST and previous tax system.

2. Method

This study is purely an analytical study. It is purely based on secondary data. For this study, data has been collected from official websites of various tax departments.

2.1 Sample

For this study, tax rates of 40 commonly used goods were collected. To select 40 commonly used goods judgement sampling method was adopted. To avoid complexities, only intra-state sale of goods were considered.

2.2 Materials and procedures

To find the difference in tax burden the taxes levied under both the systems were considered. To find the tax under the previous system, the total of excise duty and VAT was taken to compare with the GST rate. Only 40 commonly used commodities are taken as sample. The cascading effect prevailed in the previous system is also considered. To make calculation simple, it is assumed that the price of all goods taken for this study is Rs.100 before charging excise duty.

3. Results

To analyze the tax burden of final consumers under GST and previous tax system, the tax rates of 40 goods were collected. For easy calculation of tax, it is assumed that the price of all commodities before charging excise duty is Rs.100. The profit element is also excluded.

3.1 Tables

Table 1: Calculation of tax (excise duty & VAT) under previous tax system.

Sl No	Name of commodities	Excise Duty	Price after excise duty	VAT rate	VAT amount
1	Raw Rice	0	100	0	0
2	Ground nut	6	106	5	5.3
3	Tender coconut	0	100	0	0
4	Coconut oil and coconut products	0	100	5	5
5	Other edible oils	0	100	5	5
6	Fish and meat	0	100	0	0
7	Eggs	0	100	0	0
8	Matches- handmade	12.5	112.5	0	0
9	Coffee seeds	0	100	5	5
10	Coffee powder - Unbranded	0	100	5	5
11	Coffee - Branded	0	100	14.5	14.5
12	Curry Powder	0	100	5	5
13	Dry Fruits	25	125	5	6.25
14	Cattle feed	0	100	0	0
15	Candle	12.5	112.5	0	0
16	Cakes, Biscuits - Branded	6	106	5	5.3
17	Bakery Products	6	106	5	5.3
18	Synthetic Vinegar	12.5	112.5	5	5.63
19	Recharge Coupon	0	100	0	0
20	Axes, Mammatties etc	12.5	112.5	0	0
21	Fertilizers	12.5	112.5	0	0
22	Drinking glass	12.5	112.5	14.5	16.3
23	Radio	12.5	112.5	5	5.63
24	Electronic calculators and diaries	12.5	112.5	5	5.63

25	Electronic lamps or light fittings	0	100	14.5	14.5
26	Electronic motors and instruments	12.5	112.5	14.5	16.3
27	Fans , Inverter etc	12.5	112.5	14.5	16.3
28	C F Lamps	12.5	112.5	5	5.63
29	Washing Preparations, soap, laundry, detergents etc	12.5	112.5	14.5	16.3
30	CD, DVD etc	5	105	5	5.25
31	Refrigerators, Cooling appliances and its parts	12.5	112.5	14.5	16.3
32	TV , Mp3/DVD Players, Speakers	12.5	112.5	14.5	16.3
33	Perfumes and Talcum powder	12.5	112.5	14.5	16.3
34	Face Cream, Shavers	12.5	112.5	14.5	16.3
35	Cement/ White Cement, any articles of Cement or Fiber	12.5	112.5	14.5	16.3
36	Computer Systems, Peripherals and Parts	12.5	112.5	5	5.63
37	Computer Software	12.5	112.5	5	5.63
38	Wooden Furniture	12.5	112.5	14.5	16.3
39	Printed books, journals, dictionaries, periodicals etc	0	100	0	0
40	Trashing and harvesting machines and parts	0	100	5	5

Table 2: Comparison of tax under GST and previous tax system.

Sl No	Name of commodities	Tax under previous tax system (Ex D+VAT)	Tax under GST	Increase/ Decrease
1	Raw Rice	0	0	0
2	Ground nut	11.3	0	(11.3)
3	Tender coconut	0	0	0
4	Coconut oil and coconut products	5	5	0
5	Other edible oils	5	5	0
6	Fish and meat	0	0	0
7	Eggs	0	0	0
8	Matches- handmade	12.5	5	(7.5)
9	Coffee seeds	5	5	0
10	Coffee powder – Unbranded	5	5	0
11	Coffee – Branded	14.5	5	(9.5)
12	Curry Powder	5	12	7
13	Dry Fruits	31.25	12	(19.25)
14	Cattle feed	0	0	0
15	Candle	12.5	12	(.5)
16	Cakes, Biscuits– Branded	11.3	18	6.7
17	Bakery Products	11.3	18	6.7
18	Synthetic Vinegar	18.13	18	(.13)
19	Recharge Coupon	0 (attracted service tax- 14.5)	18	3.5
20	Axes, Mammatties etc	12.5	0	(12.5)
21	Fertilizers	12.5	5	(7.5)
22	Drinking glass	28.8	12	(16.8)
23	Radio	18.13	12	(6.3)

24	Electronic calculators and diaries	18.13	18	(.13)
25	Electronic lamps or light fittings	14.5	18	3.5
26	Electronic motors and instruments	28.8	18	(10.8)
27	Fans , Inverter etc	28.8	18	(10.8)
28	C F Lamps	18.13	18	(.13)
29	Washing Preparations, soap, laundry, detergents etc	28.8	18	(10.8)
30	CD, DVD etc	10.25	18	7.75
31	Refrigerators, Cooling appliances and its parts	28.8	28	(.8)
32	TV, Mp3/DVD Players, Speakers	28.8	18	(10.8)
33	Perfumes and Talcum powder	28.8	18	(10.8)
34	Face Cream, Shavers	28.8	28	(.8)
35	Cement/ White Cement, Any articles of Cement or Fiber	28.8	28	(.8)
36	Computer Systems, Peripherals and Parts	18.13	28	9.87
37	Computer Software	18.13	28	9.87
38	Wooden Furniture	28.8	12	(16.8)
39	Printed books, journals, dictionaries, periodicals etc	0	0	0
40	Trashing and harvesting machines and parts	5	12	7
				(102.85)

Average decrease in tax rate/commodity = $\frac{102.84}{40} = 2.57$.

4. Discussion

From the above table, we can find that, the total tax burden of the people reduced due to the change in tax system. From the data of 40 commodities, it is clear that, tax burden of Rs.102.85 is reduced due to the implementation of GST. The average decrease in tax rate per commodity is Rs. 2.57.

The raw food items like rice, fish, vegetable, meat and so on are exempted under both tax systems. So the implementation of GST will not make any change in the price of raw (uncooked) food items.

Most of the commodities especially the commonly used item's tax rate has reduced as compared to the previous system.

Most of the exempted items in the previous system remain exempted in the new GST system also.

The tax on items which are related to agriculture field has reduced.

The previous system suffered cascading effect of taxes because the excise duty could not be set off with VAT. The GST system is free from cascading.

4.1 Hypothesis testing

H1- There is a significant difference in tax burden of final consumers on purchase of goods under GST and previous tax system.

From the above data and analysis we can say that, there is a significant difference between tax burden on final consumers under GST and previous tax system. Under GST the tax burden on consumers has reduced.

So the positive hypothesis H1 is accepted.

4.2 Implications

1. Most of the people viewed the implementation of GST as a wrong decision taken by the government of India. They believed that all taxes are increased under GST and it is the reason for inflation. From this study, it is clear that GST will not make any price increase in case of commonly used goods. This study will be helpful to the public to understand the actual impact of GST in the price level.
2. The producers of goods increasing the prices of their products to make huge profit and arguing against GST. This study report is capable to prevent these wrong misstatements to a greater extent.

5. Conclusions

GST is the most important reform made by the central government in the field of indirect tax. It ensures uniformity in taxation all over India. It reduced cost in compliance and tax administration. It avoids cascading effect of tax.

The new GST system reduced tax burden of consumers by lowering the rates of tax on different products. When compared to the previous system, it is clear that, the exempted items remains exempted under GST also. The tax on fertilizers and other agricultural inputs and machinery has also reduced and it reduce tax burden on farmers.

The reduction in tax on commonly used commodities and the continuous setoff and carry forward will reduce the tax burden.

6. Recommendations

1. All goods including petroleum products should come under GST system. Then only the concept of ‘uniformity in tax’ will become reality.
2. Avoid tax on durable food items like groundnut. They are also food products. There is no need for such distinction in tax rates.
3. Government should execute the anti-profiteering rules to get the benefit of tax reduction to the general public. Now companies and traders are making huge profit by charging high price on their products and they are not willing to reduce the price in accordance with reduction in tax.

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Water Security as an Emerging Issue in Kerala: A Case Study in Meenachil Gramma Panchayat Second Ward

Josemon Joy

*Department of Economics,
Kuriakose Elias College, Mannanam, Kottayam, Kerala 686561,
E-mail: josevenga42@gmail.com*

Abstract

This paper entitled “Water Security as an Emerging Issue in Kerala: A Case Study in Meenachil Grama Panchayat Second Ward” seeks to analyze the current water resources and its usages can be cope with the future needs of water. This article comprised of an introduction, need and importance of water security, objectives, data sources, limitations, drinking water sector of Kerala, water security data analysis and findings from meenachilgramapanchayat, suggestions and conclusions. This article is a comprehensive study of water resources and its optimum and sustainable usages are capable enough to manage the future needs of the economy. According to the results of the study, Even if Kerala has enough and more water sources than any other states in India, the infrastructure facilities for ensuring enough and safe water supply are very poor which demonstrates our country is still remain underdeveloped.

Keywords: *water security, Jalanidhi, augmentation, monsoon*

Introduction

Water is an essential component of man’s existence. Without water every living organisms would extinct from the earth’s surface. Recent years water scarcity become severe due to the climatic change

and global warming. The term water security means that every person has adequate safe water for drinking, cooking and other domestic basic needs on a sustainable basis. Safe water should be readily and conveniently accessible at all times and in all situations.

Need and Importance of Water Security

In last August 2018, Kerala faced a severe flood along with a draught forecasted situation. This study may helps to understand the strength of water resources and its conjunctive use. Also to know that have enough and sufficient water securing facilities to meet the future water needs of Kerala. The other needs and importance of the study are listed as follows;

- Unpredicted climatic changes in monsoon
- Even though Kerala gets enough and more rain but faces the phenomenon of drought
- Increasing exploitation of water resources
- To make optimum use of water resources

Objectives

- To study the major supply projects in meenachil
- To know the coverage and efficiency of programs especially in the case of Jalanidhi projects
- Role of underground waterin water security
- Current status of underground water

Data Sources

The study is empirical and analytical in nature. It makes use of both primary and secondary data. Primary data were collected from respondents residing in MeenachilPanchayat. Thirty respondents were

selected through random sampling and were interviewed with a predesigned schedule. Secondary data were also exclusively used in this study. The sources of secondary data were books, magazines, journals and web pages etc.

Limatations of the Study

- Lack of usage of advanced research analysis tools.
- The people may not give correct information
- The information collected is very personal in character which may be biased
- Inadequacy of time

Drinking Water Sector in Kerala

Due to rapid urbanization, increased economic activity, changes in land use pattern and higher standard of living, the gap between the demand for and supply of water has been widening. To meet this demand, augmentation of existing water resources by development of additional sources of water or conservation of the existing resources through impounding more water in the existing water bodies and its conjunctive use is required. An integrated water management system is essential to ensure sufficient water in the entire system. Rain water harvesting and ground water recharge program must effectively implemented to reduce the consumption of potable water and sustainability of ground water resources.

Primary responsibility of providing drinking water facilities in the country rests with the respective state governments. However, central government formulate policies to supplement the state government initiatives through Ministry of Drinking Water and

Sanitation. National Rural Drinking Water Program (NRDWP) is the major program of government of India, which formulates guiding policy, sets standards, and provides funds and technical assistance to the set for rural water supply and sanitation.

Status of Sources

While the state receives rainfall during both South West monsoon and North East monsoon seasons, there is a large spatial and temporal variation in the rainfall. Normal rainfall in the state is around 300 cm per year. About 85 per cent of the annual rainfall is received during the monsoon period, of which 70 per cent is received during the South West monsoon [June to September] and 15 percent during the North East monsoon [October to December]. The remaining 15 per cent rain fall is received during the non-monsoon period between January and May. However, large spatial and temporal variation in the rainfall system often leads to the paradox of abundance of water resources in one season and shortage in the next season. Moreover, due to the undulating topography with steep terrain, rainwater is quickly discharged into the sea.

Based on the distance of water source available, Census of India 2011 classified water availability into three categories such as;

1. Within the premise
2. Near the premise
3. Away from premise

In Kerala 78 per cent of the people availed drinking water from their own premises, 14 per cent of the people depending upon Near the premises and 8 per cent Away from the premises. However, in Idukki

district, the situation is worse as 27 percent avail drinking water away from the premise which is worse than the all India scenario of 18 percent.

In rural Kerala, 72 percent of people are having drinking water within the premises. District wise analysis shows that Kollam has the highest access of 85 percent and Idukki has the lowest access of 39 percent. Among urban regions, Thiruvanthapuram, Kollam and Pathanamthitta have the highest levels of more than 86 percent of households having drinking water within premises and Wayanad has the lowest level of 74 percent. In Alappuzha nearly 11 percent of urban people do not have drinking water access within or nearby premises.

Rural drinking water is one of the six components of Bharat Nirman, the rural infrastructure programs of the country. Even if the existing schemes have greatly increased the coverage of safe drinking water in the rural areas of the country, the provision of drinking water to rural areas is fraught with problems. Many habitations which once came under the “covered” status have been found to slip down to the “partially” covered or even “uncovered” status. As per the Ministry of drinking water and sanitation, government of India, there are 11883 habitations in Kerala, of which 934 habitations have slipped back in 2011-12. The highest incidence is reported in Thiruvananthapuram at 19 percent, followed by Palakkad at 18 percent and Kasargod by nearly 14 percent among the total slipped back habitations of the state.

Water Security Data Analysis and Findings from Meenachil Gramma Panchayat

Profile of Meenachil Panchayat

District	:	Kottayam
Block	:	Lalam
Total Area of Meenachil Panchayat	:	30.14 Sq. km.
Number of Wards	:	13
Total Population of Meenachil Panchayat	:	16054
Population Density	:	533
Area of Second ward	:	2 Sq. km
No. of Houses in second ward	:	383
Existing water programs	:	Jalanidhi, Parappallythodu Neerathada Pathathi, Meenachil Neerthada Pathathi
Total no. Jalanidhi Connection in the 2 nd ward	:	231
Total usage of underground water for Jalanidhi per day	:	3 lakh litre
Total No. of Check Dams in 2 nd Ward under 'Parappallythodu Neerthada Pathathi'	:	3

Source: Census data 2001 & Panchayat and Jalanidhi data in 2016

4.1 FINDINGS

1. First of all the study reveals that most of the respondents are engaged in agriculture and business (67%). The fixed income category are only 27% respondents. This category consist of pensioners, govt. employees etc. Others category people are

only 6% of the total respondents. It includes daily wage category people.

2. With regard to the land holdings of the respondents, 33% of the people have below one acre land. 10% respondents have land holdings between one to three acres. 30 % respondents have three to five acre land. 27% respondents have above 5 acre land. It is found that 41% of Jalanidhi consumers have below 1 acre land.
3. A study of the monthly income of the respondents shows that majority of the respondents (60%) belong to the category of the monthly income between Rs 10,000 to 30,000. The income of the respondents depend upon acerage and job security. It is found that the majority of the consumers of Jalanidhi (59%) are from this income category.
4. Majority of the respondents (90%) have wells as their main source of drinking water. But 48% of the wells drain up during summer. It is found that all the persons with dried up well are secure with Jalanidhi services.

Composition of Water Resource Usage;

5. It is found that 23% of the households relied only on wells, 3% relayed only on bore-wells and 7% relayed only on Jalanidhi. 7% uses both well and bore-wells, 47% uses both well and Jalanidhi, while only 7% uses well and pond at a time. Only 3% people uses well, bore-well and pond .also only 3 % uses well bore-well and Jalanidhi at a time.

Efficiency and coverage of Jalanidhi

- From the sample analysis, 100% Jalanidhi subscribers would have remained unsecure without Jalanidhi connection. That is, there is a positive relationship between resource depletion and Jalanidhi subscription.
- The major problem of the Jalanidhi services are the limited water supply of water which is only up to 2 hours per day. From the secondary data, it is considered as the major problem in Kerala.
- It is also found that the Jalanidhi authorities do not measure the water usages in houses by using metre. This results in inefficiency and ineffective distribution of water usages and supply.
- It is found that there is an inverse relationship between land holding and Jalanidhi consumption. Most of the Jalanidhi consumers have below one acre land (70%).
- The Jalanidhi services run in a no profit no loss way.
- It is observed that Jalanidhi services have a monopoly power. For example, In the case of water quality and distribution system, Jalanidhi services face loss of water due to leakage of pipes. Even if the Jalanidhi services fetches in low prices, the authorities expect an increment in monthly payment soon.

Status of Underground water

- It is found that 20% of the sample households are the beneficiaries of check dams in Meenachil river. There are only 13% who get the benefits of bunds under 'Parappaythodu Neerthada Pathathi' in this locality. Most of the people did not get any advantage from check dams and bunds in this locality.

- It is also found that there is three bunds under ‘Parapplythodu Neerthada Pathathi’ which is useful for improving underground water level.
- It is also found that there are no limit for digging bore-wells for the house hold. There is no responsibilities to Panchayat authorities for digging bore-wells.
- From the primary data 17% of the total sample have bore-wells. About 60% of them dug bore-wells within 5 years.
- It is also find that the Panchayat authorities do not taken care about the rain water storage projects in each houses.

4.2 SUGGESTIONS

1. Jalanidhi authorities should connect a metre in each house for measuring the usage of water. It is helpful for making effective distribution and pricing in water supply.
2. Jalanidhi authority should ensure that there is no loss of water due to leakage of pipes.
3. The government should take active interest in Jalanidhi services and it’s pricing.
4. The panchayat should take care of the usage of underground water. If there is high price in Jalanidhi services, people may prefer bore wells.
5. Panchayat should take active interest to initiative more rain water conservation programs like Mazhapolima.

4.3 CONCLUSION

The living things solely depend upon ‘Panchabhuthas’. Water is one of ‘Panchabhuthas’. No living beings can exist without water.

Biologically every human body contains more than 65% of water. It can be seen that the demand for the water is steadily increasing day by day. Its provision has become a strategy of sustainable development. Many economists and social scientists have already predicted that the Third World War will be for drinking water. Therefore water security has become the sole objective of every government. Even if Kerala, a developed Indian state, has enough and more water sources than any other states, the infrastructure facilities for ensuring enough and safe water supply are very poor, which demonstrates our country is still remain underdeveloped.

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Marginalized Muslim Women in Kerala: Pros and Cons

Adhila

*Research and Postgraduate Department of Economics, Kuriakose
Elias College, Mannanam, Kottayam, Kerala 686561, India.*

E-mail:adhilasuneer@gmail.com

Abstract

It is generally believed that Muslim women are lagged behind the main stream, compared to their counterparts in other religious communities. Muslim women have a literacy rate of 91.98% in Kerala. These records a better position of Muslim women compared to women of their community in other parts of India. This paper explores the interplay between the high educational achievement and the comparatively low level of economic participation of Muslim women in Kerala. Focus is given on how the same factor results in the development of Muslim women on the one hand and lagging on the other hand.

Key Words: *Women Empowerment, Muslim Women, Feminism*

Introduction

The status of all women in a country cannot be expected to be the same. There may be disparities in the status enjoyed among different groups of women to differences in socio-economic conditions and tradition. There are also significant differences in women's specific status across region, cast and class, communities and religions. The minority location does qualitatively transform women's experience and perception in a very distinct way and change in their status and role is

central to understanding the development of the community. Since Muslims are minority in India, their women's position is even worse than women in general. Currently available literature on women reiterates that the status of Muslim women is somewhat inferior to that of other Indian women.

There are differences of opinion among different scholars regarding the low status of Muslim women. One opinion says that Islam and Islamic law have nothing to do with present disadvantaged status of Muslim women. This view stresses that the status of Muslim women is similar to that of in other caste women in the country, the most important reason being poverty and illiteracy. The second view is that Islam imposes many restrictions on its women and gives higher status to the men and concentrates power in the hands of men. The third view is that Islamic law treats both men and women as equals but unfortunately the Islamic scholars and religious leaders are misinterpreting the Islamic law giving the men power over the women. The scarcity of empirical data in this regard prompts to stereotyped judgment on the issue because it is linked to their religion. In this regard it is most important to talk briefly about legislative guiding principles of Islam on the status of women.

Status of women in Islam

There has always been confusion about Muslim women's status and rights. The confusion arises due to the significant differences about the status and rights of Muslim women in textual Islam, in Islamic history and tradition, and Islam as practiced at present. However, there is nothing in the Islamic texts which lead to the low status of Muslim women; rather Islam prescribes equality between men and women.

Islam emphasizes both that women differ from men and that they are equal to men. In Quran and in the Hadith literature, there are various statements concerning women in particular which makes clear pronouncement in favor of equal rights for both sexes.

The Quranic version of woman's rights is very much in tune with the modern philosophy of human rights. In the Quran, of particular interest is the verse which says that man and woman have been created out of one single soul.

“O mankind! Verily we have created you from a single pair of a male and a female, and made you into nations and tribes that you may know each other...”

(Quran, 49:13)

Following words depicted in the Quran give clear commandment that both men and women will be subjected to equal treatment for their deeds.

“We shall reward the steadfast according to their noblest deeds. Be thy men or women, those that embrace the faith and do what is right we shall surely grant a happy life: We shall reward them according to their noblest actions.”

(Quran, 16: 97)

It is evident from the above verses that women are equal to men and both will be rewarded equally for their good deeds and no distinction whatsoever would be made between them. Thus, holy Quran has been fair to woman's status. It confirms that role of woman is not less vital than man; she is equal to him in bearing personal and common

responsibilities and in receiving rewards for her deeds. The rights of woman are equal to that of man in all respects. Women had high status granted by Islam during the early Islamic period.

Early Islamic history is replete with examples which tell us about the immense contribution of women to the Islamic community. They had important roles outside family life and were actively involved in all aspects of social life and communal affairs. Women were also engaged in the commerce, wars, religious debates and social work. In addition Muslim women were involved in the political issues of the time and their opinions in political affairs were highly respected. They were identified as active participants and fully involved partners in historical events (Yadav, 2003). Islam encouraged religious education of Muslim women. According to a Hadith attributed to Muhammad, he praised the women of 'Ansar' because shame did not prevent them from learning Islam.

While it was not common for women to enroll as students in formal religious schools, it was common for women to attend informal lectures and study sessions at mosques, *madrasas* and other public places. For example, the attendance of women at the Fatimid Caliphate's "sessions of wisdom" (*majālis al-ḥikma*) was noted by various historians, including Ibn al-Tuwayr, al-Muḥabbi and Imam. Historically, some Muslim women played an important role in the foundation of many religious educational institutions, such as Fatima al-Fihri's founding of the University of al-Karaouine in 859 CE. According to the 12th century Sunni scholar Ibn 'Asakir, there were various opportunities for female education in what is known as the Islamic Golden Age. He writes that women could study, earn *ijazahs*

(religious degrees) and qualify as *ulama* and Islamic teachers. Similarly, al-Sakhawi devotes one of the twelve volumes of his biographical dictionary *Daw al-Lami* to female religious scholars between 700 and 1800 CE, giving information on 1,075 of them.

During the colonial era, until the early 20th century, there was a gender struggle among Muslims in the British Empire; women were viewed as a prelude to social chaos, a threat to the moral order, and man's world began to be viewed as a source of Muslim identity. Muslim women in British India, nevertheless, pressed for their rights independent of men; by the 1930s, 2.5 million girls had entered schools of which 0.5 million were Muslims

Women in Islam had given certain rights and privileges which are marked as positive indicators of status of woman in Islam. Firstly, in Islam, the woman has the right to hold property in her own as well as the right to inherit property along with her male relatives. Secondly, her consent is mandatory for marriage. Thirdly, she enjoys the freedom to seek divorce. She has also the security in the form of 'mehr'. It guarantees her some fixed amount against divorce by husband without valid grounds. Fourthly, she is allowed to hold public positions.

As time passed women in Islam were stripped of many of the roles they were allegedly assigned in the early Islamic eras. The feudal traditions were embedded into the Muslim culture and, the teachings of Quran were interpreted by the Muslim law makers in such a way so as to suit the rulers and their culture. Thus, the status of women was reduced to a lower level (Khan, 1990). While Islam confers equal rights to men and women, the status of Muslim women must be considered in relation to the interjection between gender, family and community.

Status of Muslim women in India

Like other women, Muslim women too are not a monolithic community. There are women belonging to different sects, social groups, occupations, regional, lingui-cultural groups, educational levels, etc. Their lives are similarly at the intersection of gender, family and community within the dynamic context of Indian society, polity and economy. Thus, Muslim women in India tend to suffer not just the disabilities attached to the female status, but also to the Muslim community's impoverished minority status in the country. Muslims form the largest minority community and the second largest religious group in India. They constitute about 14 per cent of the India's total population according to the census 2001. However, the available literature on the condition of Muslims in India reveals that they are generally backward community. They are educationally most backward, economically poor and politically a powerless sections in India. This fact of minority status of Muslims in India has been conclusively established in several reports and surveys of government and also by individual researchers.

A High Power Panel under the chairmanship of Dr. Gopal Singh was set up by the Ministry of Home Affairs in the early 1980s to enquire into the condition of religious minorities, Schedule Castes (SCs) and Schedule Tribes (STs). The committee's findings revealed that Muslims and Neo-Buddhists were the most educationally backward communities at the national level (Government of India, 1983). It was found that their economic condition was worse than those of Schedule Castes (SCs) and Schedule Tribes (STs). They were deprived of the benefits of developmental schemes and were under

represented in governmental services and decision making bodies (Zakaria, 1995). Even after the submission of the report of Dr. Gopal Singh's Committee, there has been no significant improvement in the socio-economic conditions of Muslims which is evident from the census 2001. An analysis of census 2001 reveals that Muslims are behind other religious communities in the areas of literacy, industrial promotion and economic pursuits. They lack technical and vocational education as well as training in the trades in demand.

In March 2005, Prime Minister Manmohan Singh appointed a High level committee headed by Justice Rajinder Sachar to prepare a report on the social, economic and educational status of Indian Muslims. The report highlighted the deplorable socio-economic plight of the Muslim community in India. It notes that the community exhibits "deficits and deprivation" in practically all dimensions of development. "In fact by and large, Muslims rank somewhat above SCs/STs but below Hindu OBCs, other Minorities and Hindu General (mostly upper castes) in almost all indicators considered" (Government of India 2006). The poor representation of Muslims in the employment market was also highlighted. A significantly large proportion of, Muslim workers are engaged in the informal sector of the economy with little or no social security and their participation in the formal sector employment is significantly less than the national average. In no state does the representation of Muslims in the government departments match their population share. Muslims' presence in the private sector was found to be even more dismal. The committee also found that the large proportion of community is with poor civic amenities and infrastructure facilities. On the whole Muslims face

fairly high levels of poverty and their condition is only slightly better than that of SCs and STs (Government of India, 2006).

The educational backwardness and lack of modern attitudes among Muslim women is the result of the pressures of feudal society, religious orthodoxy and social prejudices and not due to Islamic principles. If we look at the Islamic principles with regard to woman and its present applicability we find that the rights given to woman in Islam are not actually observed in practice. There is a wide disparity between the status of woman in Islam and her actual condition in the Muslim society. Thus, illiteracy of Muslim woman became a widespread phenomenon. This situation continued up to recent times until efforts were made to improve female education. There is a dearth of studies on Muslim women based on primary data both in quality as well as in quantity. Haniff (1983) remarks, “Even though there has been a great rise in the study of women in India, the Muslim women have been grossly neglected in this process.”

Kidwai (1976) on the basis of a content analysis of religious scriptures, historical accounts and other relevant materials presented a comparative analysis of the role and status of women in different religious communities. As regards the role and status of Muslim women he has drawn a conclusion that the condition of Muslim women is not universally uniform, but a trend of decline in their status is found everywhere.

Roy (1979) analysed the status of Muslim women in north-India. The study mainly centers around two cities of Delhi and Lucknow believed to having Islamic background. In total 300 families of Sayyad, Shaikh, Mughal and Pathans belonging to the middle income

group were investigated. The study reveals that every educated woman though not employed seemed to achieve certain degree of economic independence. Education among women has led to a great degree of self-assurance because of economic independence that follows concomitantly if not invariably. In view of the fact that Muslim educated males tend to prefer educated females as their spouses, it was found that there has been a spontaneous increase in literacy among north Indian Muslim families. This phenomenon in turn has led to an increase in the age of marriage of Muslim girls. After studying and analysing the facts gathered, the author concludes that education has played very significant role in raising the status of Muslim women.

Brijbhushan (1980) undertook a descriptive anthropological study to present a realistic picture of status of Muslim women and the data was collected through interviews with women in and around Delhi representing all religions of the country and belonging to all levels of society. The study reveals changes in all important aspects of women's life in Muslim society like marriage, purdah, polygamy, adoption of family planning measures etc. However, the author concludes that Muslims are lagging far behind in educational pursuit. According to her, various factors are responsible for the low response of education among Muslims like, the lack of curiosity, lack of means to acquire education, lack of interest on the part of parents in the education of their children and the lack of conviction that education can provide a better future for everyone.

Jain (1986) assessed the degree of modernization among Muslims in Jaipur. For the study four wards were selected which had Muslim population of ten thousand or more and three per cent

households were taken from each of the four wards. The total number of cases to be studied from each ward was based on random sampling but the head of the family household was selected as the respondent from each ward and women head from each household was also been contacted in order to analyze the position of women in the society. The study reveals that in the sphere of education, employment, household authority and in the family economy women were at the lower rungs of the social status.

However, some changes have occurred as a result of exposure to education. She tried to find out whether the process of modernization in India has brought a change in the status of Muslim women. The trends show that Muslim women are favorably disposed towards economic independence. It was observed that 66.7 per cent women were of the opinion that employment of women is good in present day situation. This particular opinion gradually increased in frequency in the young age category respondents. The author found that educated and working women showed a high degree of political consciousness, freedom in maintaining independent bank accounts and confidence in their domestic dealings. She noted that only education of Muslim women can be instrumental in ameliorating their economic and socio-political condition.

Azim (1997) in her study of Muslim women in Mangalore city, Karnataka seeks to observe degree and direction of changes that have taken place in the role and status of Muslim women and the factors associated with the causation of such changes. The study focuses on the role of education, employment, modernization and overseas migration in bringing about changes in the position of Muslim women.

It reveals that education has been one of the most potent instruments of change in the role and status of Muslim women.

Shafi (2002) in her study of Muslim married working women in Srinagar district of Jammu and Kashmir state reveals that change has taken place in the status-role set of working women consequently she has attained greater decision making power in the family. Some of the roles which are exclusively the domain of the male members of the family are now being shared with the housewife. The author concludes that in spite of traditional roles and statuses gainful employment constitutes an important source to raise the socio-economic status of women in the family.

Hasan and Menon (2004) in an attempt to study Muslim women in India carried out a survey in 40 districts spread across 12 States of the country with large Muslim population. A purposive sampling of the Muslim community was done and the universe of the study constituted Muslim and Hindu female population (aged 18+ years). A total of 9541 households were interviewed and within each area 80 per cent of the sample constituted Muslims and 20 percent Hindu households. The proportion of urban-rural households selected was 60:40. The data confirms the disadvantaged educational status of Muslim women. It was found that roughly 60 per cent of Muslim women reported themselves to be illiterate while the school enrolment rate for Muslim girls was 40-66 per cent. The proportion of illiterate Muslim women was substantially higher for the rural north than it was for the rest of India where more than 85 per cent women in the rural North reported themselves to be illiterate. The proportion of Muslim women in higher

education was only 3.56 per cent, lower even than that of the SCs, which was 4.25 per cent.

The overwhelming majority of women reported themselves as not working. The average work participation rate for Muslim women was 14 per cent, which was lower than for Hindus. Few Muslim women were employed in the formal sector. The survey also found that Muslim women had very little awareness of government schemes, and like many of their Hindu sisters, had little power of decision-making in their homes. The survey presents a glaring picture of inequalities—social, economic and political that consistently define and circumscribe women's lives in general and Muslim women's in particular.

Yet another study by Hasan and Menon (2005), look at the conditions of Muslim women's education in five cities in India: Delhi, Agra, Hyderabad, Kolkata and Calicut (Kozhikode). The authors reveal, Muslim girls' school enrolment rates continue to be low: 40.6 per cent as compared to 63.2 per cent in the case of 'upper' caste Hindus. In rural north India it was only 13.5 per cent, in urban north India 23.1 per cent and in rural and urban south India, above 70%, which is above the all-India average of all girls. Only 16.1 per cent of Muslim girls from, poor families attend schools, while 70 per cent of Muslim girls from economically better-off families do so, thus clearly suggesting that low levels of education of Muslim girls owes not to religion but to poverty. 98 per cent of Muslim girls were studying in government or private schools and only 2 per cent in Madrasas, the majority being from poor families. The average number of years that Muslim girls study was found a dismal 2.7 years, as compared to 3.8 years in the case of Hindu girls. The number of years that Muslim girls

study in north India is half that of her south Indian counterpart. The study observed that there is a noticeable increase in demand for formal education from Muslim parents. Although Muslims were accepting co-educational institutions, there was a definite preference for single sex government schools for girls.

Another study by Intekhab Hossain (2013) on the socio-economic and educational status of Muslim women in West Bengal reflects the situation of Muslim women in comparison to the women in other religious communities in West Bengal. The study has been observed that the situations are very pitiable almost in every facet of development. In respect of socio-economic, educational and political empowerment women in Muslim society in West Bengal are most marginalized, secluded, deprived and are in a state of impoverishment and backwardness which have retarded in their normal progress in the field of economy, political empowerment, education, knowledge and culture. All these characteristics had kept these people immobilized and slow down from the normal progress in social ladder since long time starving from social change and upward mobility both vertical and horizontal.

Status of Muslim women in Kerala

Kerala is noticed for its paradoxical nature development with high level of achievements in the social sectors despite its relatively low per capita income. These achievements in terms of better demographic outcomes such as low fertility rate, infant and maternal mortality rates have largely been attributed to the high levels of educational attainment of women. Nevertheless, Kerala has low levels of female work participation rate compared to the rest of the states in

India. Muslim women in Kerala does not have a different story here even when the state of Kerala do well in some of the basic gender indications pretty well as compared to the other states in the country. The table given below shows the literacy rate of Muslim women for one century in India and Kerala.

Table: 1.1 *Muslim women literacy rate in India and Kerala (%)*

YEAR	INDIA	KERALA
1901	0.60	3.15
1911	1.05	4.43
1921	1.81	10.26
1931	2.93	11.00
1941	7.30	NA
1951	7.90	31.5
1961	13.0	38.9
1971	18.4	53.9
1981	25.44	75.4
1991	39.19	86.17
2001	54.20	87.64
2011	65.94	91.98

Source: 1. Government of India, Selected Educational and Related Statistics at a Glance, (Education Division) Planning Commission, New Delhi, 1969, p.89.

2. Census of India, 1971, 1981, 1991, 2001 and 2011.

Studies reveal that more than 90 percent of the Muslim women in Kerala were educated; therefore Muslim women are likely to have substantially high rate of education compared to other states in India. But they have substantially less level of education compared to other religions in Kerala (Census, 2011).

The following table (Table2.2) shows the female literacy level among the major religious communities in Kerala and at the all India level.

Table 1.2 *Female literacy rates among major religious communities, 2007-08 (%)*

Religion	Kerala		All India	
	Rural	Urban	Rural	Urban
Hindus	89.3	94.3	56.2	79.3
Muslims	92.6	91.6	55.0	68.8
Christians	94.5	97.4	78.0	89.0

Source: Calculated from NSS 64th round

The religious minorities are faced with various kinds of social disparities. Muslim women in Kerala and Malabar does not have a different story here even when the state of Kerala do well in some of the basic gender indications pretty well as compared to the other states in the country. According to census 2001, in Kerala the least women work participation was reported in Thirurungadi in the Malappuram district which is one of the most predominant Muslim areas of the state. Another study notes that Muslim women have the least work participation among all the women of the state. While there is 24.8 and

20.9 per cent of the work participation subsequently among the Hindus and Christians in the state, it is merely 7.1 per cent among the Muslim women. This has to be given very serious attention to see the deal that women among the Muslims are getting here in the state. However, in the post Gulf migration era Muslim women of Malabar are seen as the carriers of fashion and the category that have achieved high socio-economic mobility. Here, one has to find very strong reasons to argue that Muslims of Kerala and the region has got a fair deal in the post Gulf migration era.

Beena (2014) in her study, the role of education influencing the status of Muslim women in Trivandrum district of Kerala, examined that modernity has not brought a great change in the Muslim women. They are; by and large tradition bound and highly religious and the age old customs and practices like the practice of early marriage prevented Muslim women from continuing their education after marriage. The traditional value system of subordination of women is still enforced by men. They do not participate in decision making process with regards to family budget acquisition and disposal of property. Lack of education is a stumbling block for status mobility. Better education and economic conditions have indeed raised the status of Muslim women, but not to the desired extent.

Another study conducted by Shanuga Cherayi (2014) in Calicut district of Kerala found that the Muslim women were relatively better empowered on personal autonomy, participation and decision making in the day to day lives. But they were backward in terms of social participation, access to basic rights, problems in normative integration and increased material deprivation.

Some studies have identified rapid social and economic changes among the Muslims in Kerala in the recent years as a result of their migration to Gulf. This has considerable impact upon the economic participation of Muslim women. Better economic position encouraged women to be home makers. Additionally, women whose husbands are away from home may be compelled by circumstances to opt out of the work force. In some part of the state, there are families which still stick to the identity of religion, who believes that women should not go out for job. The status of Muslim women in Kerala is gradually improving but at a snail's pace. Against the general belief of lack of awareness and desire to cope up with the changing realities, our assumption is that, Muslim women are not immune to these changes. Muslim women are aware of the changes and the demands of the time, and that they want to cope up

With the progress and development achieved by their counterparts in other religious groups. They aspire to achieve equal status and empowerment by utilizing the opportunities of education and employment made available to them. They are struggling to overcome a number of socio-economic, cultural and religious constraints hampering their march towards progress and development.

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Environmental Sustainability through Green Banking

Bijo Joseph

*Department of Economics, Kuriakose Elias College, Mannanam,
Kottayam, Kerala 686561, India.*

E-mail. bjoanathil1@gmail.com

Abstract

Green banking like a normal bank, which considers all the social and environmental/ ecological factors with an aim to protect the environment and conserve natural resources. It is also called as an ethical bank or a sustainable bank. They are controlled by the same authorities but with additional addenda toward taking care of the Earth's environment/habitats/resources. Green banking aims at improving the operations and technology along with making the client's habits environment friendly in the banking business. It is like normal banking along with the consideration for social as well as environmental factors for protecting the environment. It is the way of conducting the banking business along with considering the social and environmental impacts of its activities.

Key Words: *Green banking, Card Based Transactions, Green Finance, Green Infrastructure, Green Loans, Carbon Credit Business (CBS)*

Introduction

Green banking is comparatively a new development in the financial world. The activities of the banks are associated with environmental protection and sustainable development. As responsible institutes, banks and financial institutions can play an important role for protecting the environmental degradation through financing environment friendly projects and adopting environment friendly products and services. Basically Green banking refers to the banking business managed in such a manner that helps for overall reduction of external carbon emission and internal carbon footprint. Banks can reduce external carbon emissions through green finance which includes concessional finance for green technologies and pollutant free projects. On the other side bank reduces internal carbon footprint through product innovations. Technology oriented banks help to reduce the usage of natural resources and for environmental protection. It will also ensure to less use of paper, water and energy consumption. Banks are actively engage in green process, strategies, green infrastructure and introducing a variety of green products and services and ensure the environmental protection.

Green Banking, as defined by Institute for Development and Research Technology, is an umbrella term referring to practices and guidelines that make banks sustainable in economic, environment, and social dimensions. It aims to make banking processes and the use of IT and physical infrastructure as efficient and effective as possible, with zero or minimal impact on the environment.

Considering the nature of banking processes and infrastructures, IDRBT offers guidelines for green banking in two levels.

1. Making day-to-day business operations, banking products and services greener by following simple practices and making them environment friendly.
2. Making IT infrastructure (including data center) and physical infrastructure (including buildings) greener and taking initiatives so that a bank could itself generate electricity for its own consumption.

Green Banking Products are Green Loans, Green Mortgages, Green Credit Cards, Green Saving Accounts and Mobile Banking and Online Banking.

Benefits of Green Banking

Go online: - Online banking includes internet banking, mobile banking, tab banking, phone banking, RTGS and NEFT transactions etc. The functions involved are pay bills online, online deposits, fund transfer, account statements etc. Through these banking activities banks are ultimately consume less paper, less energy and less expenditure on natural resources.

Card Based Transactions: - Banks have introduced a variety of card based transactions by launching green channel counters (GCC). GCC promotes card based transactions to their customers not only to reduce the consumption of paper and energy but also to save the time of customers. A variety of cards such as ATM, Credit and Debit cards, green remit cards, Foreign Travel Card, eZ Pay Card, Gift Card, Smart Payout Card etc. are available for customers.

Green Finance: - Bank should finance environment friendly projects and environment friendly products such as solar equipments, recycled furniture, vehicle finance for low carbon emissions vehicles, home

finance for green buildings etc. with giving some concessions in processing fee and concessional rate of interest.

Green Infrastructure: - Green infrastructure includes IT infrastructure (Data Centers), green buildings with sufficient natural lightening and air, generate electricity for their own use and waste recycling plants for recycle their own waste. Green infrastructure may also be considered Self Service Passbook Printers, Kiosks (Multi Function Kiosks and Self Service Kiosks), Cash Deposit Machines and Contact Centre etc. It facilitates to reduce banks internal carbon footprint.

Use of Power Saving Equipments: - Use of solar powered UPS, GSL/LED bulbs, rain water harvesting by banks, establishing solar powered ATMs etc.

Basically ethical banking avoids as much paper work as possible and rely on online/ electronic transactions for processing. so that you get green credit cards and green mortgages. Less paper work means less cutting of trees.

Creating awareness to business people about environmental and social responsibility enabling them to do a environmental friendly business practice.

Green banks adopts and implement environmental standards for lending, which is really a proactive idea that would enable eco-friendly business practices which would benefit our future generation.

When you are awarded with a loan, the interest of that loan is comparatively less with normal banks because ethical banks give more importance to environmental friendly factors- ecological gains. Natural resources conservation is also one of the underlying principles in a

green bank while assessing capital/operating loans to extracting/ industrial business sector.

Green Banking Coverage

1. Sustainable banking
2. Ethical banking
3. Green Mortgage
4. Green loan
5. Green credit cards
6. Green saving accounts
7. Green money market accounts
8. Green checking accounts
9. Mobile banking
10. Online banking
11. Remote deposit (RDC)

Steps in Green Banking

Following are some of the steps that can be taken for going green in banking:-

A. Going Online:- Online banking is a new and fast-developing concept in young and corporate India. It helps in conservation of energy and natural resources. Online Banking incorporates:

1. Paying bills online,
2. Remote deposit,
3. Online fund transfers
4. Online statements.

Online savings account and mobile banking is the easiest way to do your bit to bank green and help the environment. Online banking creates savings from less paper, less energy, and less expenditure of natural resources from banking activities. Customers can save money by avoiding late payments of fees and save time by avoiding standing in queues and paying the bill from home online. These are also highly effective ways to keep track of your finances and to avoid late payment fees. Paying bills online is something of a lifestyle change, but it can be done. Telephone bills, cable bills, utility bills, credit card payments and mortgage payments can all be paid electronically.

B. Using Green Checking Accounts:- Customers can check their accounts on ATM or special touch screens in the banks. This can be called as green checking of account. Using a green checking account helps the environment by utilizing more online banking services including online bill payment, debit cards, and online statements. Banks should promote green checking by giving some incentives to customers by giving higher rate of interests, waiver or discount in fees etc.

C. Green Loans for Home Improvements:- The Ministry of Non-renewable Resource in association with some nationalized and scheduled banks undertook an initiative to go green by paying low interest loans to those customers interested in buying solar equipment. Before you undertake a major home improvement project, study if the project can be done in an eco-friendly manner and if you might qualify for a green loan from a bank. Green loans are perfect for energy-saving projects around the house. For example, the new Green Home Loan Scheme from SBI will support environmentally-friendly residential projects and offer various concessions. These loans will be sanctioned

for projects rated by the Indian Green Building Council (IGBC) and offer several financial benefits – a 5 percent concession in margin, 0.25 percent concession in interest rate and processing fee waiver.

D. Power Saving Equipment:- Banks can directly contribute to controlling climate change and as an initial step they intend to start a campaign to replace all fused GSL bulbs, in all owned premises offices and residential areas. Banks can also make a feasibility study to make rain water harvesting mandatory in all the Bank's owned premises. In December 2009 IndusInd Bank inaugurated Mumbai's first solar-powered ATM as part of its „Green Office Project“ campaign titled “Hum aur Hariyali”.

E. Saving Paper:- Bank should purchase recycled paper products with the highest post-consumer waste content possible. This includes monthly statements, brochures, ATM receipts, annual reports, newsletters, copy paper, envelopes etc. Whenever available, vegetable-based inks are used instead of less environment friendly oil based inks.

F. Green Credit Cards:- Some of the banks introduced Green Credit Card. The benefit of using a green credit card is that banks will donate funds to an environment-friendly non-profit organization from every rupee you spend on your credit card to a worthwhile cause of environment protection.

G. Use of Solar and Wind Energy:- Using solar and wind energy is one of the noble cause for going green. State Bank of India (SBI) has become the first bank in the country to venture into generation of green power by installing windmills for captive use. As part of its green banking initiative, SBI has installed 10 windmills with an aggregate

capacity of 15 MW in the states of Tamil Nadu, Maharashtra and Gujarat.

H. Mobile Banking:- Mobile banking is tricky. On the one hand, it is great to have the ability to check balances, transfer funds or pay bills from your phone. On the other hand, it saves time and energy of the customers. It also helps in reducing use of energy and paper of the bank. Most of the Indian banks introduced this paper-less facility.

Environmental Risks for Banks

Green banking is very important in mitigating the following risks involving in banks.

Credit Risk

Due to climate change and global warming there will be direct as well as indirect costs to banks. It has been observed that due to global warming there had been extreme weather condition which affects the economic assets financed by the banks thus leading to high incidence of credit default. Credit risk can also arise indirectly when banks lend to companies whose businesses were affected due to changes in environmental regulation.

Legal Risk

Banks like other business entities face legal risk if they do not comply with relevant environmental regulation. They also face risk of direct lender liability for cleanup cost for damages in case they actually take possession of pollution causing assets.

Reputation Risk

Due to increasing environmental awareness banks are prone for reputation risk if their direct or indirect actions are viewed as socially

and environmentally damaging. Reputation risks emerge from the financing of environmentally objectionable projects.

Strategies

Indian Banks can adopt green banking as business model for sustainable banking. Some of following strategies little reflected in their banking business or must be adopted by banks.

Carbon Credit Business (CBS)

All Nations must reduce greenhouse gases emission and reduce carbon to protect our environment. These emissions must be certified by Certified Emission Reductions commonly known as carbon credit.

Green Banking Financial Products

Banks can develop innovative green based products or may offer green loans on low rate of interest. As Housing and Car loan segments constitute the main portfolio of all banks so they adopt green loans facility.

Paperless Banking

All banks are shifting on CBS or ATM platform providing electronic banking products and services. So there is a scope for banks to adopt paperless banking. Private and foreign banks are using electronics for their office but in PSU banks are still using huge paper quantity.

Energy Consciousness

Banks have to install energy efficient equipments in their office. Banks have to transform this green banking in hardware, waste management, energy efficient technology products etc. Banks can donate energy saving equipment to schools and hospitals.

Mass Transportation System

Banks have to provide common transport for groups of officials posted at one office.

Social Responsibility Services

Indian banks can initiate various social responsibility services like tree plantation camps, maintenance of parks and pollution checkup camps.

The Financial Times and International Finance Corporation (IFC) is a member of World Bank Group launched Sustainable Finance Awards for institutions that are integrating social, environmental and corporate governance into their business operations. Their awards highlight the partnership between financial and non-financial companies in finding commercially viable and innovative solutions to sustainability challenges. The five categories of Sustainable Finance awards as per Financial Times are as follows

- Sustainable Bank of the Year
- Technology in Sustainable Finance
- Sustainable Investment of the Year
- Sustainable Investor of the Year
- Achievement in Inclusive Business

When global warming and environment issues are being talked about in every country, be it a developing or a developed nation Green Banking has become the top priorities for many. The concept of Green Banking has developed in western countries. Not only developed countries but developing countries like Bangladesh which is one of the

most vulnerable country for climatic change has successfully replicated the concept of green banking.

The government of India has issued guidelines / instructions to banks on Green Initiatives. In order to implement the green initiatives of the government, all public sector banks and all regional rural banks were asked to:-

1. Increase use of Electronic payment
2. Increase use of Core Banking System (CBS)
3. Increase use of video conferencing
4. Offer centralized payment system

Conclusion

Green banking refers to the initiatives taken by banks to encourage environment-friendly investment. Green banking as a concept is a proactive and smart way of thinking towards future sustainability. It is very important for the banks to be pro-active and accelerate the rate of the growth of the economy. As there is a continuous change in the environmental factors leading the banks face intense competition in the global market. Banks needs to apply morality of sustainability and responsibility to their business model, strategy and formulation for products and services, operations and financing activities and become stronger. By adopting the environmental factors in their lending activities banks can recover the return from their investments and make the polluting industries become environment-friendly. These are the major information about Green Banking in India.

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A Study on Green Banking and Environmental Sustainability Initiatives by Selected Public and Private Sector Banks in India

Gincy Lukose V, Mettilda George*

Department of Economics,

Kuriakose Elias College, Mannanam, Kottayam, Kerala 686561

Email mettildageorge@gmail.com

Abstract

Sustainable development has appeared as a new paradigm of development in connection with the current discourse of development that over- exploits natural environment for economic prosperity. One of the major economic negotiator influencing overall industrial activity and economic growth is the monetary institutions such as banking. Banking sector can perform a crucial role in promoting environmentally sustainable and socially responsible environment. If a shift to a green and sustainable industry should become a serious attempt, the financial industry cannot be neglected. The incorporation of sustainability prospects in to financial regulation could be a powerful driver for realising a transition to a sustainable economy in both developed and developing countries. A. Kern advocates that an integration of environmental and sustainability criteria into banking regulations. Thus there is a crucial need to create awareness and follow green banking in today's business world of modern technologies so as to make our environment human friendly. From this background we intend to understand the concept of 'Green Banking' and to make a comparative study on the green banking and environment sustainability. Research methodology used in this study is descriptive

in nature. This work reviews the literature on the basis of secondary data. The study reveals that even though public sector banks have taken more sustainability initiatives than private sector banks it is not sufficient to achieve the desired goal. Therefore possible measures should be adopted to promote green banking in India.

Keywords: *Environmental Sustainability, Green Banking, Public Sector Banks and Private Sector Banks*

I. Introduction

Change is the need of hour for the existence in all spheres .The world has seen much attention on economic progress and mankind has made giant steps in its journey through time. The side effects of the development process have been the massive loss of biodiversity, climatic change, environmental damage, etc. Recently, there has been a growing curiosity in the development of sustainable and green financial control globally. The interest is based on the increasing climate change risks for the financial sector on the one hand and on the other, a need to incorporate the financial sector into a transition to a green economy. If a transition to a green and sustainable industry should become a serious attempt, the financial industry cannot be neglected. Instead, the incorporation of sustainability aspects into financial regulations, domestically and internationally, could be a strong driver for achieving a transition to a sustainable economy in both developed and developing countries.

Banks have not shown a big attention in proactive strategies with regard to the environment and sustainability because they consider themselves to be in a more environmentally friendly industry, remarkably equate concerning emissions and pollution, when compared

to the other sectors such as oil and gas and energy. But the last financial crisis from 2008 to 2011 exhibited the importance of sustainability to the financial sector and thereby shifted the “Single Bottom Analysis to Triple Bottom Analysis” i.e. analysing the environmental and social performances as well.

The connection between the financial sector and sustainable development is what implanting sustainability into financial system aims to achieve. Environmental sustainability is about making accountable decisions that will reduce your business' negative pressure on the environment. It is not simply about lowering the amount of waste you create or using less energy, but is concerned with developing processes that will lead to businesses becoming totally sustainable in the future. Environmental Sustainability is ‘the ability to maintain the things that are valued in the physical environment (natural and biological environments)’. Environmental sustainability could be defined as “a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity”. Due to the ever increasing effect of industrialization, urbanization, increasing population density and poor environment management system in India the environmental problems have become serious issues.

Green Banking is comparatively a new development in the financial world. It is a type of banking taking into account the social and environmental impacts and its main aim is to protect and preserve environment. Green banking refers to the banking business that

supports the overall reduction of external carbon emission and internal carbon footprint. To help the reduction of external carbon emission, banks should finance green technology and pollution controlling projects. Although, banking is never treated as a polluting industry, the present scale of banking activities have considerably increased the carbon footprint of banks because of their massive use of energy, high paper wastage, absence of green buildings, etc. Therefore, banks should endorse technology, process and products which result in substantial reduction of their carbon footprint as well as develop a sustainable business.

II. Review of literature

Jha & Bhome (2013) in their paper entitled A Study of Green Banking Trends in India, studied the green banking initiatives taken by the public sector bank in India and the way of go green by green banking. The main objective of the paper is to understand green banking sector and checks the awareness of employees, associates and the public about the green banking concept. Further the study suggested that interest on loan should be less for green project than normal rate of interest and companies can raise their profitability by recycling of waste generated. They should stress upon green mortgage loan, green credit card and online banking.

Singhal, Singhal & Arya (June 2014) studied, how bank can go greener. According to study banking industries and financial institution plays a crucial role in the growth of an earth. Green banking saves the energy and environment both. Now a days many bank offering green product like ATM, Green credit cards, green CDs, electronic fund transfer, use of solar and wind energy etc. but still it's not completed.

We have to make more attempts so we can save environment and green banking is one of the best way to start this.

Khedekar (2014) studied the various technology used by the banking industries to make the environment green. According to study bank should give basic + premium internet banking product such as opening bank account, Demat holding, standing instruction, investment etc. This Study suggests that bank should organise seminar and conference to educate the public regarding the uses of internet banking as well as security issue. She suggests “Virtual Banking” where customer can’t deal in cash to those branches which are far from the main branch.

Sreesha ch (2014) focused on environment sustainability initiatives adopted by various private and public sector banks in India. According to the study, bank has not taking much interest in green banking completely. Public sector banks are more interested in green banking as compare to private sector bank. For maintaining sustainability, bank should extend the use of environmental information in the banking operation, lending and investment decision. This will help them to advance environment sustainability and create long term value for the business.

Sahitya & Lalwani (2014) [made an attempt to understand and appreciate the importance of green banking initiative for the attainment of goal of sustainable banking and determine the various attempt that have been made by the top public and private sector bank in India. The study has exhibited that the banking sector has become extremely conscious of the need of go green. Both public and private sector bank are involved in this process. It can be possible by the paperless banking

like ATM, mobile and internet banking. The adoption of green banking not only improves the image of green banking but also contribute in the sustainable growth of economy

Ragupathi. M and Sujatha .S (2015) studied the way to go green through green banking. According to this paper, earlier bank was not bothered about the concept green banking. But now a day's banks are playing very important role in environment sustainability program. By the green banking practice people is getting more aware about the global warming and each business man's contributing in environment sustainability to make this earth a better place to live in. Green banking is not only greening the industries but it will also help in improving the assets quality of the bank in future

III. Need of the study

As environmental sustainability is a crucial issue and green banking is a step in this regard. Hence, there is a need to study the green banking initiative taken by the banking sectors and also to analyse the role of green banking in environment sustainability.

IV. Objectives of the study

- To understand the concept and role of 'Green Banking'
- To identify the initiatives taken by public and private sector banks to promote environmental sustainability.

V. Research methodology

This study reviews the literature on the basis of secondary data collected from various sources such as articles, research papers, annual reports, sustainability report etc. For analyzing the green banking

initiatives taken in India four top performing banks from public and private sector (on the basis of net profit in year 2016) are selected.

VI. Green Banking

Institute for Development and Research in Banking Technology defines Green Banking as ‘Green Banking is an umbrella term referring to practices and guidelines that make banks sustainable in economic, environmental, and social dimensions. It aims to make banking processes and the use of IT and physical infrastructure as efficient and effective as possible, with zero or minimal impact on the environment’.

In India, green banking is in its initial phase. Banks can employ green banking as an opportunity to receive advantage in the market by creating a difference in their strategy making process. It was seemed that green banking consciousness is more in the higher levels of management in the banks and this consciousness decreases with the lower levels of management and least with the employees who are in day to day direct touch with the customers. Thus, the banks must focus on upgrading the consciousness and benefits of the green banking to the employees who are in direct touch with the customers. Green banking is a pro-active way of energy preservation and environment protection. The prime advantage of the green banking approach is the protection of the natural resources and the environment.

Green banking reduces paper work to the optimum level and concentrates on electronic transactions like use of ATM, mobile banking, online banking etc for various banking transactions by the customers. Electronic transaction not only helps towards sustainability but also gives convenience to the customers as well as to the banks.

Less paperwork means less cutting of trees. For adopting eco friendly business, banks should adopt environmental standards of lending as it increases the asset quality of the banks. This activity of the bank also has an important influence on the environmental performance of its clients. This encourages the clients to perform in an environment friendly way. This not only increases the reputation of the bank but also helps them to meet the environmental regulations in successful way and thus leading to better legal risk management by the banks. The banks normally provide loan to the clients on a low rate of interest. This encourages more and more entrepreneurs to start with environment friendly projects and thus leads to more and more awareness on the environment preservation activities in the economy as a whole. It is thus a win-win approach by the banks as it not only helpful to the environment but also the banks and its customers as a whole.

Origin

The concept of Green Banking is associated to Triodos bank (established in 1980) from Dutch origin which started the environmental sustainability in the banking sector from the very first day. In the year 1990 the bank begins “Green fund” for funding environment friendly projects and all other projects follow later. Taking example from this bank the banks all over the world launches green initiatives in the banking sector. First Green Bank is a commercial bank based in Mt. Dora, Florida, United States commenced its activities in 2009. The company is known for its attention on environmentally friendly banking practices. The Bank

staffed with employees who have obtained the LEED accredited professional designation

VII. Green Banking Initiatives across the Globe

The concept of environmental sustainability started in 1969 with the establishment of the National Environmental Policy Act (NEPA, 2014) in the United States whose objective is to maintain productive unanimity between man and nature. After that an independent agency was established in 1970 ‘Environmental Protection Agency’ (EPA) with the aim to preserve the natural resources, human health and to maintain the quality of the environment. In 2002, a global coalition of NGOs set up a network named “Bank Tract” to promote sustainable finance in the commercial sector. Since then, several other system□ introduced by organizations are created which are working towards environmental management like US Green Building Council (USGBC), IFC (International Finance Corporation)etc. to speed up the sustainable growth. In the early 1992 United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty which was linked by countries to limit the average increase in global temperature. Then United Nations Environment Programme (UNEP) started what is known as the UNEP finance initiative (UNEPFI) and 200 financial institutions around the globe are signatories of this initiative statement to attain sustainable development. It will be noteworthy to point out that Netherland based ABN-AMRO bank has developed certain Reputational Risk Management (RRM) policies to identify, assess and manage non-financial present within its business engagements.

All over the globe several voluntary guidelines have been set up for the categorization, assessment and management of environmental risk in project financing like Equators Principles (EPs) which are adopted by financial institutions (currently 79 institutions in 35 countries) for assessing, determining and managing social and environmental risk in projects (Equator Principles Association, 2014).

VIII. Green Banking Initiatives in India

In India Centre for Environmental Research and Education (CERE), Centre for Environmental Education (CEE) and Indian Green Banking Council are the major organizations to promote environment sustainability. Other initiatives like S&P BSE-GREENEX and Green Coin Rating RBI are playing a significant role in the promotion of sustainable development in India.

IX. Green Banking Initiatives by Indian Banks

Green banking initiatives by Indian banks include both public sector banks and private sector banks. In this study, the researchers have taken top two public and two private sector banks selected on the basis of their net profits.

Top Performing Public and Private Sector Banks

Table -1

Public Sector Banks		Private Sector Banks	
Banks	Net profit (Rs crore)	Banks	Net profit (Rs crore)
State Bank of India	9950.65	HDFC Bank	12296.21
Union Bank	1351.60	ICICI Bank	9726.29

Source: money control (2015)

X. Public Sector Banks

X. a. State Bank of India (SBI)

- On the occasion of State Bank Day, the bank had started 'Green Channel Counter' (GCC) facility on 1st July 2010 at 57 select branches spread across the country and the same was extended to more than 14,981 branches in 2014 This is a pioneering concept which is eco-friendly and convenient.
- SBI became the first bank in the country to venture into the creation of green power by installing windmills for captive use in 2010. As part of its green banking initiative, SBI established 10 windmills with an aggregate capacity of 15 MW in the states of Tamil Nadu, Maharashtra and Gujarat.
- Provides project loans at concessionary rate of interest to encourage reduction of greenhouse gases by using efficient manufacturing practices.
- SBI started the carbon disclosure projects in the financial sector in India, for the sake of environmental concern and safety by becoming a signatory to the Carbon Disclosure Project of World Wide Fund (WWF)
- The Bank has started in place SMART i.e. Specific, Measurable, Achievable, Realistic and Time bound Green Banking Goals.
- SBI and Export- Import Bank of India (EXIM Bank) both jointly grant a long term loan (up to 14 years) to a Spain Based Companies Group- Solar Global SA and Aston Field Renewable Resources for building solar plant in India. Most of

the financial institutions deny giving long term loans to such projects due to their uncertainty and technological changes.

X. b. Union Bank

Union Bank has a strong commitment to environmental conservation and takes pride in developing programs that encourage our customers and communities to adopt sustainable practices. There are a number of ways to bank green with Union Bank, whether you have a Consumer or Commercial Account.

Consumer Accounts

- Online Banking and Online Bill Pay: Save time, stamps, and hassle with online banking and bill pay. Enroll instantly with your ATM/debit card and PIN.¹
- Online Statements: Sign up today to receive your statements online and save paper, save trees.
- Telephone Banking: Enjoy round-the-clock telephone access to your accounts with an automated, password-protected service that lets you bank by phone.
- Mobile Banking: Do your banking wherever you are, as long as you have a mobile phone with a web browser and internet access.² There are so many ways you can bank with just your smart phone: access your accounts on the go, deposit checks directly from your Smart Phone or tablet with Mobile Check Deposit², send money from your mobile device using only your recipient's email address or phone number with Send Money³, and perform various banking tasks with Union Bank Text Banking.

Commercial Accounts

- **Mobile Banking Payroll Direct Deposit:** Save paper and deposit payroll directly into your employees' bank accounts without writing checks. Your employees have timely access to funds, and your business benefits from reduced check-related fraud and costs.
- **Remote Deposit:** Save a trip to the bank and deposit checks from your desk. You can reduce your carbon footprint and save paper because you have check images and electronic records for easy sorting and archiving, no more photocopies.
- **Mobile banking services for small business** lets you do business on the go with the Mobile Business Centre and Mobile Check Deposit.

XI. Private Sector banks

XI. a. ICICI Bank Ltd

- **Eco-Friendly Vehicle Finance** - As an initiative towards more eco-friendly way of life, ICICI Bank offers 50% waiver on Auto Loans" processing fee on car models which use alternate way of energy.
- **ICICI Home Finance** gives reduced processing fees to customers who purchase homes in Leadership in Energy and Environmental Design (LEED) certified buildings
- **ICICI Bank** has initiated a programme to encourage corporate bodies, institutions, banks and government agencies involved in project planning on issues like biodiversity, wildlife habitats and environmental laws.

- As part of the Bank's Go Green initiative, about 294 rural low cost branches have been fitted with solar panels, with a plan to extend the same to 122 more branches by July 2015.
- Bank has Mumbai and Hyderabad towers have water treatment plants for recycling sewage water in Mumbai and Hyderabad.
- Instabanking' - It is the platform that brings together all the alternate channels under one umbrella and provides customers the convenience of banking anytime anywhere through Internet banking, i-Mobile banking, Tab banking and IVR banking. This decreases the carbon footprint of the customers by ensuring they do not have to resort to physical statements or travel to their branches.
- 'Electronic Branches'- Fully electronic branches have also been set up where customers can practice all their banking transactions.
- 'E- Drive'- The bank sent around 200 thousand annual reports in electronic form. In the last quarter and saved more than 60 tonnes of paper by sending e-statements to over 6.5 million Bank accounts and 300 thousand credit card customers.
- Green Engagements: (i) During Diwali 2013, the organization had organised an environmental awareness program for employees and customers in which money plant was presented to all the people present there as a token of collective responsibility to preserve the environment. (ii) It has also become partners with the Green theme CNBC – overdrive auto awards. (iii) The bank is celebrating World Environment Day every year.

- Green Communications: The bank always insists their customers for online bill payment, online funds transfer and subscription to statements which encourage ‘paperless’ and ‘commute free’ modes of banking transactions.

XI. b. HDFC Bank Ltd

- HDFC bank has added environment friendly features in to their infrastructure which involve water management, energy conservation, air quality management etc.
- Phase-out policy – Replacing inefficient lighting options with LED lights in big offices
- Use of Central Pollution Control Board (CPCB) compliant diesel gen-sets server and desktop virtualization reducing power consumption.
- Establishment of multiple alternate service points to enhance transactions in a paperless environment.
- Employee awareness campaigns to encourage environment friendly practices.
- HDFC bank is using Social and Environmental Risk Management System (SEMS) that help in screening projects negative social and/or environmental impacts before an approval is given.
- Renewable Energy initiatives like Project of 20 Solar ATMs set up in Bihar.

XII. Findings

The current study has revealed that the banking sector has become extremely conscious of the need to go green.

- The Private Banks are much involved in the green banking approach as the Public Sector Banks
- All the banks are making efforts to make banking paperless. This has been fully supported by technology in terms of electronic fund transfers, ATMs, internet and mobile banking.
- When a loan is granted, the interest of that loan is comparatively less with normal banks because green banks give more importance to environmental friendly factors - ecological gains.
- Green Ethical banks adopt and implement environmental standards for lending, which is really a proactive idea that would enable eco-friendly business practices which would benefit our future generations.
- Green banking as a concept is a proactive and smart way of thinking with a vision for future sustainability

Conclusion

Even though the Indian banks are introduced the urge for greening their activities, they are running behind their counterparts from developed economies. They have started adopting green practices, but still a lot of channels are unutilized by the Indian banks for greening their activities. Moreover they could accept the green practices only in selected branches. For maintaining environmental sustainability, banks should extend the use of environmental information in their business operations, credit expansion and investment decisions. The attempt will help them to improve their environmental performance and creating long term values for their business.

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Belonging to the Entity: Tracking down the adherence of the Knanaya community in Kerala to their social identity as *Knanaya*

Anupriya P. B

Department of English, St. Pius X College Rajapuram, Kasaragod, Kerala, India-671532.

E-mail.anupriyapbo@gmail.com

Abstract

This paper aims to trace the aspects of social identity theory in the Saint Thomas Christian community Of Kerala, referred to as Knanaya. It tries to delineate how this community establishes itself as a social group and also addresses the challenges it face in persisting its identity. Knanaya identity is a concept that the people belonging to this group internalise and this becomes central to their self concept.

Keywords: In Group, Out Group, Social Categorization, Social Identification, Social Comparison, Knanaya Identity

Introduction

Social identity theory was formulated by the British Social Psychologists Henri Tajfel and John Turner in 1979. This theory proposes that "a person's sense of who they are depends on the group to which they belong" (Turner, Tajfel). The social identity becomes more important than the individual identity of the person. Some of the key terms associated with this theory are social categorization, social identification and social comparison. Knanaya is a community belonging to the Saint Thomas Christians of Kerala. According to the history of this community, it is believed that their ancestors migrated

from the present day Iraq to India in fourth century AD. The Knanites still exists as a group with their own identity.

“Knanaya” as a social identity

Researches done by dividing people into different groups have proved that people automatically develops an in-group favoritism even though they do not get any personal benefits from their membership in the group. Similarly at the same time they develop an estrangement towards groups other than their own.

Social Categorization is one of the major aspects of social identity theory. It is “the process by which people categorize themselves and others into differentiated groups. Categorization simplifies perception and cognition related to the social world by detecting inherent similarity relationships or by imposing structure on it”(Kruger). Knanaya community organizes themselves into a social group different from other Saint Thomas Christians. They are said to have their own history, traditions and culture.

In the book titled *Syro Malabar Patriarchate*, Mar Paul Chittilappally describes that the Church in India had an affiliation and dependence on the oriental KaldhiteChurch. When the historical evidences of the trade relationship between Malabar coast and foreign nations is read along with the evidences of migration of Christians from Persia to other nations through trade routes, it can be connected to the act of Knanaya migration that is said to have occurred in AD 345. This migration was under the leadership of Thomas of Kana. The categorization of the Saint Thomas Christians as the Southists and the Northists have been started since the settlement of the Knanaya migrants in the southern part of Kodungallur. The southists or the

Knanites maintained their heredity and ethnicity by following endogamy and established a social self different from the other social groups.

Another important aspect of the social identity theory is social identification. "Participation in group action is a process of social identification, involving transformations in self-conceptualization from individual to group, as well as establishing social relations with others who share the social identity". This concept is evidently visible among the Knanites. Its members adopt Knanaya identity and follows the unique customs and rituals and confirm within the group by practicing endogamy.

Social identification leads to social comparison. The comparison occurs between the in- groups and the out- groups. People compare the prestige and status of their group with that of the out - groups. The in-groups usually take care to establish their prestige over the out- groups. Knanaya community as a social group compares its identity with other groups, especially the Northist Saint Thomas Christians. It makes a favourable comparison with the other groups and maintains its self esteem and positive social identity.

The Knanites also has a rich folkloristic tradition of *Purathanapattukal* which is another important aspect that is a source of emotional attachment within the ingroup. One of the major threats that this social group faces is individuals' movement out of the group. This is the result of strict adherence to endogamy. Those who marry outside the community loose their membership in the group. But as endogamy is the core of the uniqueness of this group, its members oppose the proposals of accepting exogamy.

Conclusion

In spite of the challenges that it faces, Knanaya community persists as a social group upholding its knanaya identity; and the members of this group define their identity with respect to this social group.

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കവിതയും വികാരപ്രതിരൂപങ്ങളും

രാജു വള്ളിക്കുന്ന്

കെ. ഇ. കോളേജ്, മാനാനം

എന്താണ് കവിത എന്ന ഏറെ പഴയ ചോദ്യം, ഒരുപക്ഷേ കവിത ഉറപ്പായ കാലം മുതൽക്കുള്ളത്, എന്തല്ല കവിത എന്ന ഉത്തര സമാനമായ ചോദ്യവുമായി ഇടയാൻ തുടങ്ങിയിട്ട് ഏറെക്കാലമായി. ഇതിനെല്ലാമിടയിൽ കവിതയുടെ ഘടനയാണ് കവിതയെ സംബന്ധിച്ചിടത്തോളം സവിശേഷമായി നിൽക്കുന്നതെന്ന് കാണാം. ഇനി ഘടനാ സങ്കല്പം തന്നെ പഴയതുപോലെ വൃത്തത്തിലും പ്രാസത്തിലും അലങ്കാരത്തിലും ശൈലിയിലും കുരുങ്ങിക്കിടക്കുന്ന ഒന്നല്ല, മറിച്ച് കവിതയുടെ സവിശേഷത തന്നെ കാവ്യഘടനയായി മാറുകയാണ്. കാവ്യഘടനയെക്കുറിച്ചുള്ള നിലപാടുകളിലാവട്ടെ കവിതയുടെ ഭാഷയാണ് പ്രധാനമായും ഉന്നയിക്കപ്പെടുന്നത്.

ഒരർത്ഥത്തിൽ കവിത പോലെ തന്നെ കാവ്യഭാഷയും പ്രശ്നബദ്ധമായ ഒരു തലമാണ് ഉന്നയിക്കുന്നത്. കവിത മറ്റൊന്നിനുമുള്ളതല്ല, മറിച്ച് അതിന്റെതായ ഭാഷയിലാണ് അതിന്റെ നിലനിൽപ്പിന് ഡബ്ല്യു. എച്ച്. ഓഡൻ പറഞ്ഞത് അതുകൊണ്ട് (ഓഡൻ). ഒരു ഭാഷാസമൂഹത്തിന്റെ പൊതുആഖ്യാന രൂപങ്ങളിൽ കവിത വ്യത്യസ്ത ആഖ്യാന രൂപം കൈക്കൊള്ളുന്നത് ഇത്തരത്തിൽ ഭാഷാ സവിശേഷമാകുന്നതുകൊണ്ട്. പക്ഷേ, ഈ ഭാഷാസവിശേഷത, ഭാഷയെന്ന ഘടനയിൽ നിന്നുകൊണ്ട് ഭാഷ നേരിടുന്ന പരിവർത്തനക്രമത്തെ വിവരിക്കുന്നതിലൂടെയാണ് സായത്തമാകുന്നത്. മിക്കപ്പോഴും ഭാവനയും ചരിത്രവും രാഷ്ട്രീയവും ഒക്കെ പരിഗണനാവിഷയമാകുന്നു. അപ്പോഴും പ്രധാന വിഷയം ഭാഷയാണെന്ന് വ്യക്തം.

കവിതയെ സവിശേഷമായ ഒരു ഭാഷാഘടനയായി ആദ്യം വിവരിച്ചത് റോമാൻ യക്കോബ്സൺ എന്ന ഘടനാവാദിയാണ്. ഒരു

ഫോർമലിസ്റ്റായി തുടങ്ങിയ യക്കോബ്സന്റെ എന്താണ് കവിതയെന്ന ലേഖനം പ്രസിദ്ധമാണ് (യക്കോബ്സൺ 190). എന്നാൽ ഈ ഭാഷാഘടന, ഭാഷയെപ്പോലെ വാസ്തവികതയാണ് ഉന്നയിക്കുന്നത്. പിന്നീട് വന്ന ഭാഷാശാസ്ത്രജ്ഞനായ ഫെർഡിനാൻഡ് ഡി സൊസൂർ, ഭാഷയാണ് യാഥാർത്ഥ്യമെന്ന് (സൊസൂർ) പറഞ്ഞപ്പോൾ കവിത യാഥാർത്ഥ്യവുമായി ചേർന്ന് നിൽക്കുന്നതായി വിവരിക്കാവുന്നതാണ്. അതാകട്ടെ, കാവ്യഘടനയിൽ അന്തർലീനമായതായാണ് കാണേ ത്. കാലവസ്തുതകളെ അത് നിഗൂഢനം ചെയ്യുകയാണ്, അല്ലാതെ വസ്തുതാപരമെന്ന് പറഞ്ഞ് പുറമെ പ്രതിഫലിപ്പിക്കുകയല്ല. അർത്ഥവും ഇത്തരത്തിൽ ഉള്ളടക്കത്തിൽ വിലയിച്ചാണ് വരേ ത്. യക്കോബ്സൺ തന്റെ നിലപാടുകൾക്ക് ഉപോൽബലകമായി നിരവധി ചെക്-പോളിഷ് കവിതകൾ ഈ ലേഖനത്തിൽ ഉദാഹരിക്കുന്നു . എന്നാൽ ഉത്തരാധുനികതയിൽ വാസ്തവികതയും, വസ്തുതാപരതയും പുതിയ പ്രത്യയങ്ങളായാണ് നിലകൊള്ളുന്നത്.

ആധുനികതയിലെ പ്രതിഫലനം, ഉത്തരാധുനികതയിൽ പ്രതിനിധീകരണത്തിന് വഴിമാറുന്നു. ഇവിടെ പ്രതിനിധീകരണം ഉപബോധത്തിന്റെ പ്രത്യയമായാണ് ഉന്നയിക്കുന്നത്. ഉപബോധത്തിന് ഭാഷയുടെ ഘടനയാണ് എന്ന് ഴാങ് ലക്കാൻ (ലക്കാൻ 90) സമർത്ഥിച്ചപ്പോൾ നേരത്തെ സൂചിപ്പിച്ച വാസ്തവികത ഏത് വിധമാണ് ഭാഷാ ഘടനയായും അതുവഴി കാവ്യഘടനയായും മാറുന്നതെന്ന് കാണാവുന്നതാണ്. അനേകം അടരുകളായി സംക്ഷേപിതമാകുന്ന വസ്തുതാപരത ഒരു ഭാഷാഘടനപോലെ രൂപം പ്രാപിക്കുമ്പോൾ കവിത ഒരു സംവേദന സ്വരൂപമായി പരിവർത്തിക്കുകയാണ്. അപ്പോൾ പ്രത്യക്ഷത്തിൽ ഭാഷാരുപമായി ഭവിക്കുന്ന കവിത അതിന്റെ ആന്തരികതയിൽ സാംശീകരണ ഘടകങ്ങളെ വിന്യസിച്ചിരിക്കുന്നത് സുശിക്ഷിതമായ ഒരു ക്രമത്തിലാണെന്ന് സാരം; പ്രത്യക്ഷത്തിൽ അയഞ്ഞതായി തോന്നുന്ന കവിതകൾപോലും ഇത്തരത്തിൽ ആന്തരികമായ പിരിമുറുക്കം സിദ്ധി

ചുവയാണെന്ന് സാരം. ഇവിടെ കവിത ഒരു വസ്തുതാവിശകലനത്തിനു മപ്പുറം സംവേദന പ്രക്രിയയുമായി താദാത്മ്യം പ്രാപിക്കുന്നതാകുന്നു. ചുരുക്കത്തിൽ, കവിതയും അർത്ഥവും വിശകലനവുമെല്ലാം കവിതയുടെ ധ്യാനാത്മക സ്വരൂപത്തെ (Meditative value) ചൂഴ്ന്നു നിൽക്കുന്നവയാകുന്നു. ഇതാകട്ടെ വസ്തുതാപരമെന്ന് വിവക്ഷിക്കപ്പെടുന്ന ഭാഷയിലും അന്തസ്സനിവേശപരമെന്ന് കരുതപ്പെടുന്ന (Interiorization) (പണിക്കർ 17) കാവ്യാത്മകതയിലും ഒരേ സമയം വിലയിക്കുന്ന അനന്യമാതൃകയാകുന്നു. അപ്പോൾ കവി തന്നെയും അപ്രസക്തമാകുന്നു.

എഴുത്തുകാരന്റെ മരണം നിരീക്ഷിക്കുന്ന റൊളാങ് ബാർത്ത് അനുപേക്ഷണീയ തലത്തിൽ അതിവാസ്തവികതയെ (Surrealism) (ബാർത്ത് 60) പരിഗണിക്കുന്നു ⁵. ബോധാബോധങ്ങളുടെ നിമ്നോന്നതങ്ങളിലൂടെ കടന്നുപോകുന്ന ഒരു മാനസികത, ഒരർത്ഥത്തിൽ എഴുത്തിന്റെ പ്രേരകമാണ്. കാവ്യനിർമ്മിതിയിൽ ഈ തലം അതീവ നിർണ്ണായകമാകുന്നുമു ⁶. ആശയങ്ങളെക്കാൾ അധികം വാക്കുകൾക്കും, എന്തിന് വാക്കുകൾക്കിടയിൽ വിന്യസിക്കുന്ന നിശബ്ദതകൾക്കുംവേ ⁷ ഏറെ വ്യാകുലപ്പെടുന്ന കവികളുടെ മനോഘടന ഇത്തരത്തിൽ വ്യവസ്ഥാപിത ഘടനകളെയെല്ലാം നിരാകരിക്കുന്നു. അതുകൊ ⁸ ണ് കവിതയെപ്പോഴും ആശയപദ്ധതിക്കുപരിയായി കാവ്യപദ്ധതിയായി പരിണമിക്കുന്നത്. ഇത് മനസ്സിലാക്കാതെയാണ് കവിതയിലെ ചില ആശയങ്ങൾ ഉയർത്തിക്കാട്ടി കവിതയുടെ മികവ് ഉദ്ഘോഷിക്കുന്ന ഒരു ക്രമം സമകാലിക മലയാള കവിതയിൽ കാണാനാവുന്നത്. ലോകകവിതയുടെ ചരിത്രം പരിശോധിച്ചാൽ അത് വ്യക്തമാകും. വിപ്ലവാവബോധവും രാഷ്ട്രീയപ്രത്യയങ്ങളും ഏറെ ഉന്നയിച്ച നെരൂദക്കവിത (Pablo Neruda) തന്നെ അവ കാവ്യാത്മകമായി നിബന്ധിക്കുന്നതിലാണ് ശ്രദ്ധിച്ചിട്ടുള്ളതെന്ന് മനസ്സിലാക്കാം. കവിത അതിന്റെ രാഷ്ട്രീയം ഉന്നയിക്കേ ⁹ ത് ഭാഷയിലെ നില

പാടുകളിലൂടെ തന്നെയാണ്. അതിനാകട്ടെ വികാരപരതയും വസ്തുതാപരതയും സന്നിവേശിപ്പിക്കാവുന്നതാണുതാനും. വികാരം ചോർത്തിക്കളഞ്ഞ ഒരു ഭാഷയെക്കുറിച്ചുള്ള എലിയറ്റിന്റെ (T.S Eliot) നിലപാടുകളെ (എലിയറ്റ് 36) ഡിലാൻ തോമസിനെ (Dylan Thomas) പ്ലോലുള്ള പിന്തുരക്കവികൾ ചോദ്യം ചെയ്തത് നമുക്ക് പരിശോധിക്കാവുന്നതാണ്. പക്ഷേ, വികാരപരത കവിതയിൽ വിന്യസിക്കുന്നതും വസ്തുതാപരത സന്നിവേശിപ്പിക്കുന്നതും സങ്കീർണ്ണമായ ഒരു പദ്ധതി തന്നെയാണ്.

വികാരവും വസ്തുതയും ഒരേ സമയം ഘടനയിൽ വിലയിക്കുന്നത് മുൻപ് നിരാകരിക്കപ്പെട്ടിരുന്നതിന്റെ കാരണം വികാരം വൈയക്തികവും (Subjective) വസ്തുതകൾ വസ്തുനിഷ്ഠപരവുമാണെന്നതാണ് (Objective). എന്നാൽ ഇവിടെ സൂചിപ്പിച്ച കവിതയുടെ ഘടനയിൽ ഇവ വിലയിക്കുന്നു. പക്ഷേ ഭാഷയുടെതായ ഒരു പ്രവർത്തനമാണ് അവിടെ പ്രസക്തമാകുന്നതെന്ന് അപ്പോഴും വ്യക്തം. ഒരർത്ഥത്തിൽ ഭാഷ ഉപയോഗിക്കുമ്പോൾ തന്നെ വസ്തുതാപരമായ തലം നിർവ്വഹിക്കപ്പെടുന്നുവെന്ന് കരുതാമെങ്കിലും ഒരു നിർമ്മിതിയെ കവിയായി തിരിച്ചറിയുന്നതിൽ ഈ ഭാഷാഘടനയിൽ വൈകാരികത വിലയിക്കേ തുടങ്ങി സാരം. വികാരം വസ്തുതാപരമായി വിലയിക്കുന്നുവെന്ന് അനുമാനം; പക്ഷേ അതിന് വികാരത്തിന്റെ ഘടനാസവിശേഷതകൾ ആരായേ തുടങ്ങി. പ്രാഥമികമായും വികാരം മാനസികമായ അനുഭവതലമാണ് പ്രദാനം ചെയ്യുന്നതെന്ന് നിസ്തർക്കമാണ്. അപ്പോഴും ഈ മാനസികത വികാരത്തിന്റെ സാമൂഹിക ചരിത്രത്തിൽ നിന്നും ഉരുത്തിരിയുന്നതാണ്. വൈയക്തിക തലത്തിൽ അനുഭവിക്കുന്ന വികാരത്തെ അതിന്റെ സാമൂഹിക നിർവ്വഹണങ്ങളിൽ പരിശോധിക്കുമ്പോൾ ചരിത്രപരതയും രാഷ്ട്രീയ മാനങ്ങളും ഇടകലരും. കാലത്തിന്റെ ചേരുവകളിൽനിന്നുകൂടി ഉരുത്തിരിയുന്ന ഒന്നായി വികാരം മാറുന്നുവെന്ന് സാരം. “ചരിത്രം കവിതയല്ല, പക്ഷേ ചരിത്രമി

ല്ലാതെ കവിതയില്ല” എന്ന് ഒക്ടോവിയോ പാസ് (പാസ് 31) പറഞ്ഞത് ഇതുമായി നമുക്ക് ചേർത്ത് വായിക്കാം. എന്നാൽ ഇതിന്റെ നിർദ്ധാരണത്തിന് പ്രതിരൂപാത്മക തലത്തെക്കുറിച്ചുള്ള വിശകലനം ആവശ്യമായി വരുന്നു. കുറെക്കൂടി വ്യക്തമായി പറഞ്ഞാൽ വികാര പ്രതിരൂപങ്ങളുടെ (Emotional Paradigm) വിശകലനം.

ഭ്രാന്തിന്റെയും അധികാരത്തിന്റെയും ചരിത്രത്തെക്കുറിച്ചുള്ള അന്വേഷണങ്ങൾ സാമൂഹിക ചരിത്രത്തിന്റെ പരിപ്രേഷ്യങ്ങളായി വിവക്ഷിക്കുന്ന മിഷേയൽ ഫൂക്കോയുടെ (Michel Foucault) നിരീക്ഷണങ്ങൾ ഇവിടെ പ്രസക്തമാകുന്നു. (ഫൂക്കോ) പ്രതിരൂപാത്മകതയിലുള്ള വലിയ വ്യതിയാനം കാലഗണനയിൽ നിരീക്ഷിക്കുന്ന ഈ രീതി കവിതയുടെ വികാരത്തെക്കുറിച്ചുള്ള നിലപാടുകളെ സാധൂകരിക്കുന്നു. പകർന്നെടുക്കുന്ന വികാരമോ, പകർത്തിവെയ്ക്കുന്ന വികാരമോ, പ്രവാഹമാകുന്ന വികാരമോ മറിച്ച് വികാരത്തിൽ നിന്നുള്ള മോചനമോ എന്ന തലത്തിൽ ഇത് ചർച്ച ചെയ്യുന്നത് എളുപ്പമാണെങ്കിലും പ്രതിരൂപാത്മകമായി നിബന്ധിച്ച ഒന്നായി അതിനെ കെട്ടുന്നത്. കവിതയിലേക്കുള്ള കൺതുറക്കലാകും. ചുരുക്കത്തിൽ വികാരം കവിതയെ അനുഭവിപ്പിക്കുകയോ അനുഭവം കവിതയെ വികാരഭരിതമാക്കുകയോ അല്ല, മറിച്ച് ഭാഷപോലെ അത് നിർവ്വഹിക്കപ്പെടുകയാണ്; ഭാഷയിൽതന്നെ രൂപപ്പെടുന്ന ഒരു ഘടനയായി വികാരത്തെ പ്രത്യേകം കുത്തിനിറക്കാതെ തന്നെ സൂക്ഷ്മരൂപങ്ങളിൽനിന്ന് അത് പ്രകാശമാനമാകുന്നു. ഉദാഹരണത്തിന് ജാപ്പനീസ് ഹൈക്കു കവിതയിൽ മൂന്നാമത്തെ വരി പ്രത്യക്ഷത്തിൽ മറ്റുള്ളവയിൽനിന്ന് വിച്ഛേദനം നേരിടുന്നതായി തോന്നുമ്പോഴും വിദൂരമായി അവ ആദ്യവരികളുടെ തുടർച്ചയോ പുരണമോ വിശകലനമോ ഉത്തരമോ ആയി കൂടുതൽ വിവൃതമാകുന്നു. ഹൈക്കുവിൽ ഈ മൂന്നാമത്തെ വരി നക്ഷത്രംപോലെ ജ്വലിക്കണമെന്നാണ് പറയുക. അതായത്, കവിതയിൽ ഭാഷയെന്ന ഘടനയിൽ നിന്നുതന്നെ വികാരം

അനുഭവവേദ്യമാകുന്ന ഒരു തലം. കവിയുടെ പ്രതിഭാഘടനയെക്കുറിച്ച് ഉള്ള നിരീക്ഷണങ്ങളും ഈ ദിശയിലാണ് വിവരിക്കപ്പെടുന്നത്.

വികാരത്തെ ഇത്തരത്തിൽ വസ്തുതാപരമായി നിർണ്ണയിക്കുമ്പോൾ അതിന്റെ സന്നിവേശം പ്രത്യേകം ശ്രദ്ധിക്കേ തായ്. ഭാഷാഘടന വസ്തുതാപരമാകുമ്പോൾ തന്നെ വികാരം വസ്തുനിഷ്ഠാപരമാകുന്നു. ബാഹ്യ യാഥാർത്ഥ്യങ്ങളെ ആന്തരികവൽകരിക്കുന്ന ഒരുതരം രസതന്ത്രം ഈ ഘടനാ സവിശേഷതയാകുന്നു. അതുകൊണ്ട് കവിതയിൽ വാക്കുകൾ അവയുടെ നിയന്താർത്ഥങ്ങളിൽ നിന്ന് അനുഭവതലത്തിലേക്ക് സംക്രമിക്കുന്നുവെന്ന് പറയുന്നത്. കാവ്യഘടനയുടെ ഈ സൂക്ഷ്മത ഗ്രഹിക്കാത്ത എഴുത്തുകാർ തങ്ങൾ അനുഭവം അവതരിപ്പിക്കുകയാണെന്നും, തങ്ങളുടേത് മാത്രമായ അനുഭവമാണെന്നും യാഥാർത്ഥ്യം പറയുകയാണെന്നും മറ്റും വിളിച്ചുകൂവുന്നത് അപഹാസ്യമാകുന്നത് ഈ തലത്തിലാണ്. ഭാവവ്യഞ്ജകത്വം നേടാത്ത വസ്തുവ്യഞ്ജകത്വം കാവ്യാത്മകമല്ലെന്ന് സാരം. വികാരവും യാഥാർത്ഥ്യവും ഇത്തരത്തിൽ നിബന്ധിക്കപ്പെടുന്നത് ഒരു വൈരുദ്ധ്യമായി പ്രത്യക്ഷത്തിൽ തോന്നാമെങ്കിലും യഥാർത്ഥത്തിൽ അവ പ്രതിരൂപാകരമകമായി നിബന്ധിക്കപ്പെടുക വഴി കാവ്യാത്മകമാകുകയാണ്. പ്രതീകങ്ങൾക്കും (Symbols) ബിംബങ്ങൾക്കും (Image) രൂപകങ്ങൾക്കും (Metaphor) കഴിയാത്തത് പ്രതിരൂപങ്ങൾക്ക് (Paradigms) കഴിയുന്നത് ഭാഷയുടെ ആന്തരിക മാനങ്ങളിലൂടെയാണ്. (വളളിക്കുന്നു) അതുകൊണ്ട് എല്ലാവരുടെയും വാക്കുകളും അനുഭവങ്ങളും പ്രായോഗിക ക്രമമായി തന്നെ നില്ക്കുമ്പോൾ അവ കവിതയുടെ സവിശേഷ ഘടനയായി രൂപപ്പെടുമ്പോൾ അർത്ഥങ്ങൾക്കപ്പുറത്തേക്ക് അനുഭവ ക്രമമായി ഭവിക്കുന്നത്. പകർത്തിവെച്ച അനുഭവമല്ല കവിതയെന്നത് പകർന്നുവെച്ച വികാരമല്ല കവിത എന്നുപറയുന്നപോലെ തന്നെ. മറിച്ച് അനുഭവം നിർദ്ധാരണം

ചെയ്യപ്പെടുകയാണ്, പകർന്ന് ലഭിക്കുകയാണ്. അപ്പോൾ നിബന്ധനം പ്രതിരൂപാത്മകമായേ മതിയാവൂ എന്ന് സാരം.

അഭിനയപ്രകരണത്തെക്കുറിച്ചുള്ള ചിഹ്നവിജ്ഞാനീയ (Semiotics) വിശകലനത്തിൽ സാധാരണ ജീവിതത്തിലെ പ്രവർത്തനങ്ങൾ പ്രായോഗികമായി മാത്രം നിൽക്കുമ്പോൾ രംഗത്ത് അവ അർത്ഥോല്പാദനത്തിനുള്ള സവിശേഷ രൂപങ്ങളായി പരിണമിക്കുന്നത് സൂചിപ്പിക്കാറുണ്ട്. (കൊസ്വാൻ 67) ഏതാ അതിന് സമാനമായ ഒരു പ്രക്രിയയാണിത്. ഉത്തരാധുനികതയിലെ പ്രതിനിധീകരണ ക്രമങ്ങൾ ഇതുമായി ചേർന്ന് പോകുന്നവയാണെന്ന് കാണുക പ്രയാസമല്ല. ബഹുസ്വരത കവിതയുടെ മുഖമുദ്രയാകുന്ന ഒരു തലംകൂടിയാണ് ഇവിടെ അനാവരണം ചെയ്യപ്പെടുന്നത്.

കവിതയുടെ വായനയാണ് അനുഭവ നിർദ്ധാരണം സാധ്യമാക്കുന്നതെന്ന് വാദിക്കുമ്പോൾ ഇതിന് കവിതയുടെ സംഗീതം സംബന്ധിച്ച ചില വിലയിരുത്തലുകൾ ആവശ്യമായി വരുന്നു. ഒരുപക്ഷേ, കവിതയുടെ നിർവചനം പോലെ പ്രശ്നബദ്ധമാണ് കവിതയുടെ സംഗീതവും. സംഗീതോപകരണങ്ങളുടെ സഹായത്തോടെ അവതരിപ്പിക്കുന്നതോ സംഗീതത്തിൽ ചാലിച്ച് അവതരിപ്പിക്കുന്നതോ അല്ല മറിച്ച്, കാവ്യഘടനയുടെ നിർദ്ധാരണത്തിൽ അത് അനുഭവവേദ്യമാകുകയാണ് വേർതിൽ. സംഗീത സൂചനയോ സംഗീതാത്മകതയോ അല്ല മറിച്ച് സംഗീതമെന്ന വേറിട്ട ഘടനയിലേക്ക് ഭാഷാ ഘടന വിലയിക്കുകയും രൂപപ്പെടുന്ന രൂപകമോ ബിംബമോ എന്തായാലും അത് അനുഭവ വേദ്യതയിൽ ഇഴചേരുകയുമാണ്. “മഴയുടെ ദൂരത്തായമ്പക എന്ന കെ.ജി ശങ്കരപ്പിള്ള” (ശങ്കരപ്പിള്ള) യുടെ ഒരു വാക്യം ഇതിന് മികച്ച ഉദാഹരണമാണ്. മഴയുടെ സംഗീതം വിദൂരതയിൽ നേർത്ത് കേൾക്കുന്ന തായമ്പകയുടെ അനിർവചനീയതയിലേക്ക് വിലയിക്കപ്പെടുക മാത്രമല്ല ഉയർന്നും താണും കേൾക്കുന്ന തായമ്പകയുടെ താളക്കെട്ടുകളെ മഴയുടെ അതേ അവസ്ഥയിലേക്ക് പകർന്നെടുക്കുക

കൂടിയാണ്. കാവ്യഘടനയിലെ അനുഭവവേദ്യത ഇതാണ്. വേദനയ്ക്കിടെ ഒരുവിധം കണ്ണടയ്ക്കാൻ കഴിയുന്ന സ്വസ്ഥസാന്ദ്രത സംഗീതമല്ലാതെ മറ്റൊന്നുമല്ല പ്രദാനം ചെയ്യുന്നതെന്ന് വള്ളത്തോളിന്റെ (വള്ളത്തോൾ) “ഒടുവിലൊരുവിധം ഒന്നുകണ്ണടച്ചപ്പോൾ” എന്ന വാക്യം ദ്യോതിപ്പിക്കുന്നു. ‘Will smell as sweet’ എന്ന ഷേക്സ്പിയർ വാക്യവും ഇവിടെ ഓർക്കാം.

കവിതയെക്കുറിച്ചുള്ള അന്വേഷണങ്ങൾ പ്രതിരൂപാത്മകതയിൽ മാത്രം ഉരുവംകൊള്ളുന്നതാണോ എന്ന സംശയം ഒരുതരത്തിൽ പ്രസക്തമാണ്. അതിന് കവിതയുടെ വിശകലനത്തിൽനിന്ന് ഇതുവരെ അവലംബിച്ച രീതികൾ പരിശോധിക്കുന്നത് ഉചിതമായിരിക്കും. ക്ലാസിക്കൽ കവിത പകർന്നു നൽകിയത് ദർശനമായിരുന്നെങ്കിൽ കാല്പനികത വികാരത്തിന്റെ കുത്തൊഴുക്കായിരുന്നു. ആധുനികത വികാരത്തിൽനിന്നുള്ള മോചനത്തിനായി ശ്രമിച്ചപ്പോൾ തുടർന്നുള്ള കവിത കൂടുതൽ ബഹുസ്വരമായി ഭവിക്കുകയായിരുന്നു. ഉത്തരാധുനികതയിൽ എത്തുമ്പോൾ വികാരമെന്നോ വസ്തുതയെന്നോ വ്യവചേദിച്ചറിയാനാകാത്തവിധം പ്രതിരൂപാത്മക നിബന്ധനം പ്രധാനമായി. എന്നാൽ വികാരത്തിന്റെ സാമൂഹിക ചരിത്രം പരിശോധിച്ചാൽ അത് എല്ലായ്പ്പോഴും ഘടനാപരമായി പ്രതിരൂപാത്മക നിബന്ധനമാണ് കവിതയിലും മറ്റ് സാഹിത്യ-കലാ രൂപങ്ങളിലും നിർവ്വഹിച്ചതെന്ന് കാണാം. കവിതയുടെ നിർദ്ധാരണ സവിശേഷത ഉന്നത നൽകുന്നത് അനുഭവ വേദ്യതയുടെ അപൂർവ്വതയാണെന്ന് വരുമ്പോൾ ഈ ക്രമങ്ങളെ ചൂഴ്ന്നാണെന്ന് പ്രത്യേകം പറയേ തീർന്നു. ബഹുവചനമാണ് സമകാലിക കവിതയുടെ മുഖമുദ്ര.

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