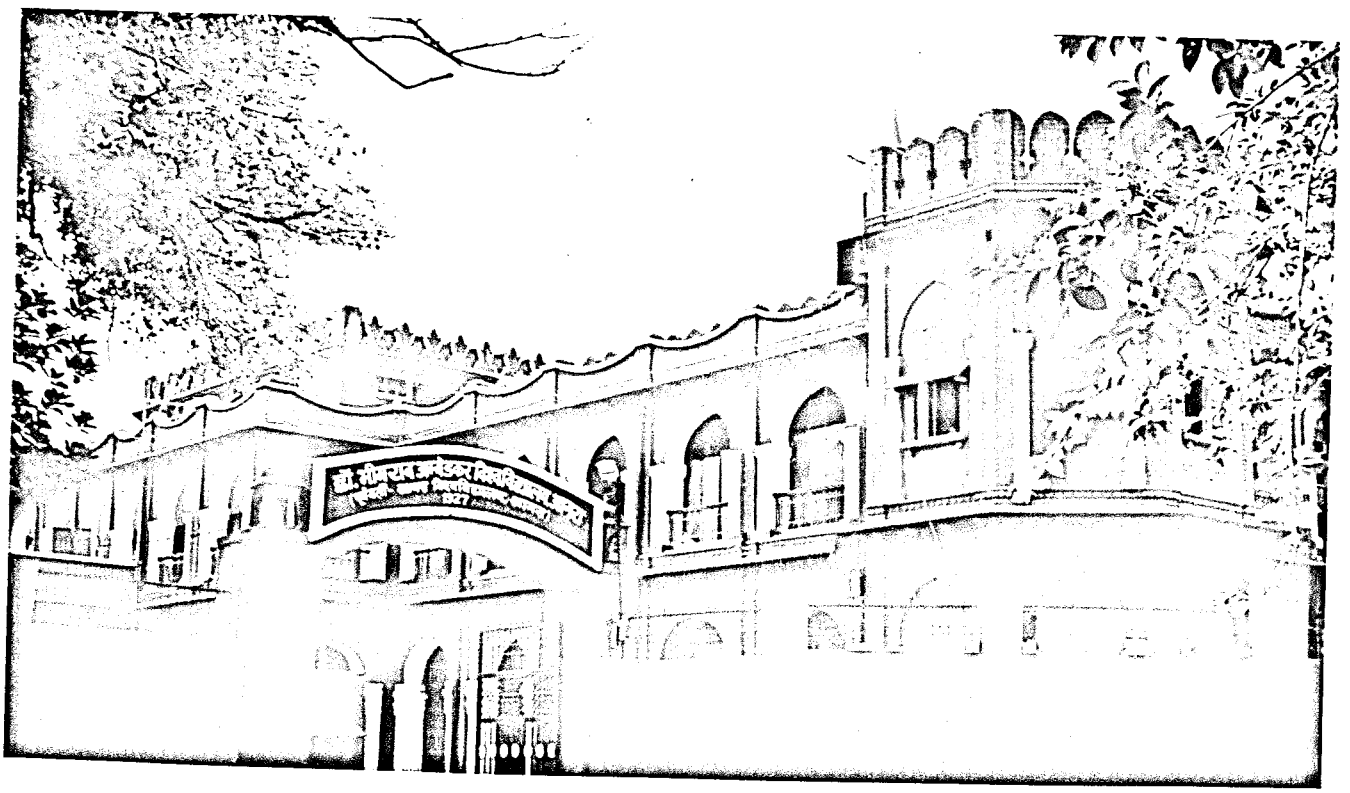
Volume 1 Issue 2 May - August, 2017

Agra University Journal of Research Science



Dr. Bhimrao Ambedkar University, Agra (U.P.)

www.dbrau.org.in

AUJRS

Board

Published by : The Registrar, Dr. Bhimrao Ambedkar University, Agra - 282004 (U.P.) [INDIA]

Postal Address:
Managing Editor
Agra University Journal of Research-Science
Central Library
Dr. Bhimrao Ambedkar University,
Paliwal Park, Agra-282004

E-MAIL:
sunilkup562@gmail.com

Web Site:
www.dbrau.org.in.
www.dbraulibrary.org.in

Publisher:
Registrar,
Dr. B. R. Ambedkar University,
Agra-U.P.-India - 282004

Printer:
Rashtra Bhasha Offset Press
26/470, Balka Basti, Rajamandi, Agra

डॉ. अरविन्द कुमार दीक्षित
कुलपति
Dr. Arvind Kumar Dixit
Vice - Chancellor

डॉ. भीमराव अम्बेडकर विश्वविद्यालय
(पूर्ववर्ती आगरा विश्वविद्यालय)
आगरा - 282 004 (उ.प्र.)
Dr. BHIMRAO AMBEDKAR UNIVERSITY
(Formerly : Agra University)
AGRA - 282 004 (U.P.) India
Tel : (O) + 91-562-2858668
Fax : + 91-562-2858669

PATRON

MESSAGE

Its give me immense pleasure, that Central Library, Dr. Bhimrao Ambedkar University, Agra (Formerly Agra University) is Publishing Journal entitled, "Agra University Journal of Research-Science", for the latest researches and developments in the world of Science and Technology for our young scientists and research scholars.

I would like to thank on behalf of entire Editorial Board, our Contributors and Referees for their cooperation and help.

I extend all my good wishes for success of this journal.

(Arvind Kumar Dixit)

Prof. Prabhu N. Saxena
Editor-in-Chief
Agra University Journal of Research-Science
(AUJR-S)

Off 0562-2850175
Resi. 0562-2522034
Mobile,9837068940
E-mail. dr_pnsaxena@yahoo.co.in

Editor-in-Chief

MESSAGE

It is a matter of happiness that Central Library is publishing "Agra University Journal of Research-Science".

My greeting and best wishes are extended to all our Authors, Referees, Readers, Members of Editorial Board and Advisor for making the journal of world standard.

The scientific aspects will continue to be the responsibility of Editorial Board. The journal has on-line submission, referring and further processing of the manuscripts resulting in quicker publication and availability to a larger segment of scientific community. The contributors would be able to monitor continuously the progress fo their manuscripts. It should lead to improved impact of published Articles.

I shall welcome the valuable suggestions given by the Editorial Board Members for improvement in the quality of the Journal.

(Prof. P. N. Saxena)

Official Address :
Honorary Librarian, Central Library, Dr. Bhimrao Ambedkar University, Paliwal Park, Agra (U.P._, India - 282 004

AGRA UNIVERSITY JOURNAL OF RESEARCH: SCIENCE

Volume 1, Issue 2, May–August, 2017

CONTENTS

Research Articles		Page No.
1.	A FUZZY LOGIC APPROACH TO CALCULATE THE RISK OF CANCELLATION OF POLICIES **Sanjeev Kumar, Sanjay Chaudhary and Gaurav Sharma**	01-08
2.	A STUDY OF HIV/AIDS AWARENESS AND EFFECTIVE SOURCES OF INFORMATION AMONG RURAL WOMEN OF VARANSASI DISTRICT OF UTTAR PRADESH **Bharti Singh & Dolly Rani**	09-16
3.	MODELING OF MIXED CONTROL ALGORITHMS FOR ENHANCHING THE PERFORMANCE OF SEMI-ACTIVE SUSPENSION SYSTEM **Shreyansh Upadhyaya & Sharad Chandra Upadhyay**	17-24
4.	BIOLOGICAL SYNTHESIS OF NANOPARTICLES AND THEIR APPLICATION : A REVIEW **Hari Madhav, Neetika Singh, Paramjit Singh, Gautam Jaiswar**	25-30
5.	HEAVY METALS ESTIMATION IN MEDICINAL PLANTS PRESENT AT DIFFERENT LOCATION OF AGRA CITY **Kavita Chaudhary, Sarita Kaushik, Geetha Singh and B.S. Singh**	31-34
6.	SYNTHESIS OF SUBSTITUTED IMIDAZOLE DERIVATIVES AS POTENTIAL ANTIBACTERIAL AND ANTICANCER ACTIVITY **Pooja Sharma and Ravi Shekhar**	35-42
7.	IMPLEMENTATION OF QUANTUM GATES USING MATLAB FOR QUANTUM NEURAL NETWORK **Kishori Radhey & Manu Pratap Singh**	43-47
8.	PROBOTICS : TRANSFORMING HUMAN HEALTH AND WELLBEING **Jagriti Sharma**	48-52
9.	HEALTH STATUS AND NUTRIENT INTAKE OF YOUTH USING HERBAL GREEN TEA **Archana Singh, Trapti Sen**	53-57

10. NANOTECHNOLOGICAL REMEDIATION FOR AGRA WATTER SUPPLY 58-60
Ashish Kumar and Azad Kumar

11. A COMPRATIVE STUDY OF FORECASTING TECHNIQUES IN ELECTRICITY DEMAND 61-69
Keerti Jain, Smita Sood, Vineeta Singh

12. AN ASSESSMENT OF THE KNOWLEDGE LEVEL REGARDING HIV/AIDS AMONG SCHOOL GOING ADOLESCENTS OF DISTT. AGRA OF UTTAR PRADESH 70-74
Dinesh Kumar Verma, P P Mathur, Surendra Singh

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 1–8

A FUZZY LOGIC APPROACH TO CALCULATE THE RISK OF CANCELLATION OF POLICIES

SANJEEV KUMAR, SANJAY CHAUDHARY AND GAURAV SHARMA

Abstract : The preventive avoidance of cancellation is a key problem facing insurance companies. A conversation with the client held prior to latter's decision to cancel a contract increases the likelihood of contract continuity. So companies are in need of reliable expert system that can help them to evaluate the risk of cancellation of the policies in future. With the help of fuzzy system, it is possible to identify clients who may potentially cancel and take timely measure to safeguard the portfolio. Here a model is presented, which is designed by using fuzzy mathematics and expert system to provide indicative results on the risk of cancellation of the policies in future.

Keywords: *Fuzzy logic, insurance, risk classification, inference system, index of vagueness.*

Introduction to problem and significance:

In recent years, the cancellation of insurance policies and refusal to renew policies has become widespread. Liberalization and Globalization have allowed the entry of foreign players in the Insurance sector. With the entry of private and foreign players in the insurance business, people have got a lot of options to choose from. Radical changes are taking place in customer profile due to the changing life style and- social perception, resulting in erosion of brand loyalty. It is believed that the situation regarding cancellations and refusal to renew policies has reached to a point where it is necessary that insurance companies should know the risk of cancellation in advance to save our self from huge loss. Initially **Buckley (1987)** develops fuzzy analogues of the elementary compound interest problems in the mathematics of finance. He found the fuzzy present value and fuzzy future value of fuzzy cash amounts, using fuzzy interest rates, over n periods where n may be crisp or fuzzy. He also develops a method of comparing fuzzy net cash flows in order to rank fuzzy investment alternatives from best to worst. After Buckley some other authors develop several models in this direction like, Beekman and Fuelling (1990) developed a model for the interest and mortality randomness in some annuities, and Horgby (1998) designed a model for the risk classification by fuzzy inference, while Dewit (2003) worked for Underwriting and Uncertainty. Kumar and Pathak (2009) developed a model for premium allocation- fuzzy approach in insurance business, again Kumar and Pathak (2010) worked on the fuzzy based bonus-malus system for premium decision in car insurance. Kumar and Jain (2011) developed a model for the indicative results on the risk of cancellation of policies; A fuzzy approach.

According to **Arora et al (2014)**, some important factors to be considered at the time of selecting the term of premium payment of insurance. The intention in his work, was to extend the study to a method which can machinate and assist users in deciding the term and amount of premium payment. Their aim was twin-fold; one, to evoke a novel way to policy holder to decide the least premiums to be paid and second, to devise a manner for insurance provider to collect maximum premiums. With this twofold aim, they propose a hybrid soft computing optimization model using Neuro-Fuzzy approach and Particle Swarm Optimization. Here a model (based on Kumar and Pathak (2009)) is discussed, using fuzzy mathematics and expert system that will help to insurance companies to calculate the risk of cancellation of policies.

The factors associated with the risk of cancellation:

Sanjeev Kumar
Sanjay Chaudhary and
Gaurav Sharma
Dept. of Mathematics, Inst. of Basic Science
Dr. B.R. Ambedkar University, Agra
sanjeevibs@yahoo.co.in

(a) Client Factors:

(i) Economic condition: Since the premium paid to the insurance company is the part of savings, therefore there exist a direct relationship between savings and risk of cancellation of policy. Further as the savings increases the risk of cancellation decreases. So, for knowing the risk of cancellation of policy it is important to know the income and stability of the business of the client. The risk of cancellation can tend to go lower if the person has a high position in the company and has a sizeable income.

(ii) Need for insurance: Life is full of uncertainty and unfortunate events in life cannot be prevented. Suppose you have worked hard to build a solid financial footing for you and your family, so you want to be sure that everything is protected. Then there is need for insurance to protect your life, your ability to earn income, and to keep a roof over your head. The risk of cancellation is directly related to the need for insurance. If you are an earning member of your family, and there are members of your family who are financially dependent on you, then there exists low risk of cancellation of policy.

(iii) Habits of client: In this factor we consider the habits of the client such as drinking, gambling, etc. If the client drinks at an above level and a gambler, then there is a high risk to cancel or refuse to renew the policy.

There may be some other factors which can affect our model but we are considering only three of them. Further as far as the company factors are concerned it may be as follows:

(b) Company Factors:

(i) Shortcoming when the contract was concluded or during claim settlement: It is more important factors because it directly affects the client decision. At the time of claim if company is not showing interest to the claim as soon as possible or shortcoming when the contract was concluded then client feels cheated and unsatisfied with company and risk of cancellation increases.

(ii) Poaching by banks/other insurers: Poaching has long been endemic in the fiercely competitive insurance industry. If the client is not satisfied with the insurance company due to any reasons like slow claim settlement processes, high premium, not understanding the need then it increases the risk that client may be attract to any other company, so risk of cancellation or refusal to renew policy increases.

Now as far as the contract factors are concerned there may be more than these two but we considering only these two.

(c) Contract Factors:

(i) Duration of contract: It depends on the time and type of insurance.

(ii) Relationship between client and company: Effective communication is positively related to client satisfaction and negatively related to client conflict. Effective communication arises when communication is frequent, bi-directional, and when more important issues are discussed. If there is an effective communication between client and insurance company, then it reduces the risk of cancellation of policy.

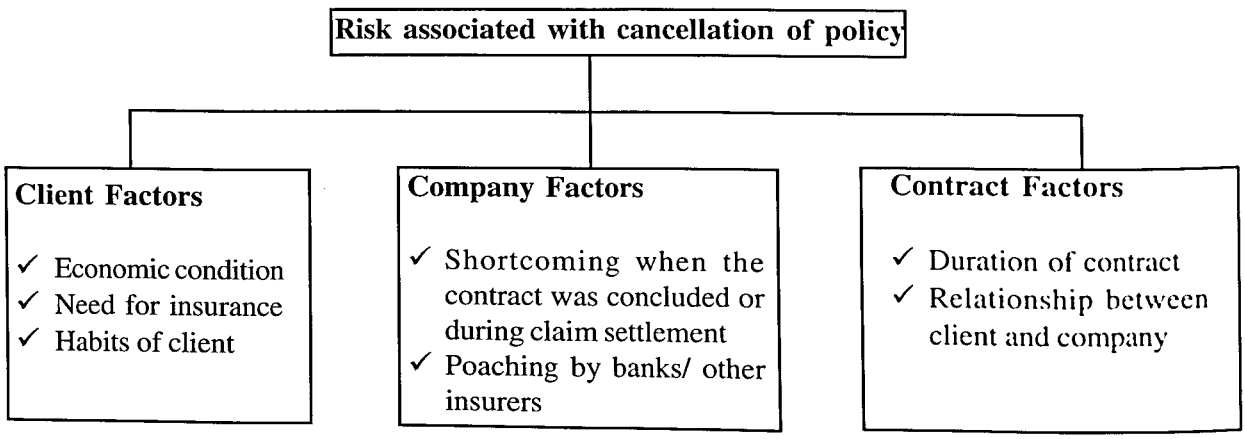


Fig 1 : Factors affecting the risk cancellation or refusal to renew policy

Methodology : In this methodology the model is divided into four parts :

1. Fuzzification : The process of translating the measured numerical value into fuzzy linguistic values is called fuzzification. In another words, fuzzification is the process of changing a real scalar value into a fuzzy value (or into a degree of belongingness).

2. Fuzzy Inference Engine : Once all crisp input has been fuzzified into their respective linguistic values, the inference engine will access the fuzzy expert system to device linguistic values for the intermediate as well as the output linguistic variables. It has a number of rules that transform a number of variables into a fuzzy result, *i.e.* the result is described in terms of membership in fuzzy sets.

3. Rule Base : The fuzzy rule base is characterized by constructing a set of linguistic rules based on expert knowledge. The expert knowledge is usually in the form of *if-then* rules. These are two steps in the rule base process, *viz:* aggregation which is the process of computing for the values of the *if* (antecedent) part of the rules while composition is the process of computing for the values of *then* (consequent) part of the rules.

4. Defuzzification : This is the last stage of fuzzy inference system, which is used to convert the fuzzy output set to a crisp number. The method we often use is the Centre of gravity defuzzification method (COG method). It is the basic general defuzzification method that computes the gravity of the area under the membership function.

Algorithm (Using fuzzy approach) : The steps of expert system are summarized below:

1. Input functions: The crisp value of the client factors, company factors, contract factors are obtained by various sources such as form filled by insurant,etc.

2. Evaluate the inputs: Determine the client factorsη_1, company factors η_2, and contract factorsη_3.

(a) Client Factors(η_1): First input variable is taken as the client factors on the basis of economic condition of client, and need for insurance for client (as taken by insurance company).

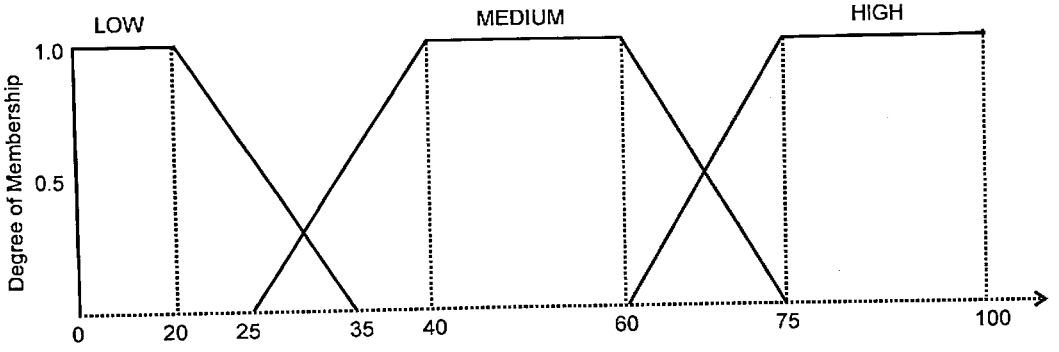


Fig 2 : Client factors (η_1)

Table 1: Linguistic Rating conversion table for client factors

Linguistic rating	Trapezoidal crisp value (a,b,c,d)
Low (L)	(0,20,25,35)
Medium (M)	(25,40,60,75)
High (H)	(60,75,100,100)

$$\mu(\eta_1)=\begin{cases}\max\left\{0,\dfrac{\eta_1-a}{c-a}\right\} if\,\eta_1<c\\ 1 \qquad\quad if\,c\le\eta_1<d\\ \max\left\{0,\dfrac{b-\eta_1}{b-d}\right\} if d<\eta_1\end{cases}$$

The fuzzy set related to the client factors is characterized by a trapezoidal membership function, that is- ... (1)

(b) Company Factors (η_2) : Here we take second input variable as company factors. For this we take trapezoidal membership function as given below :

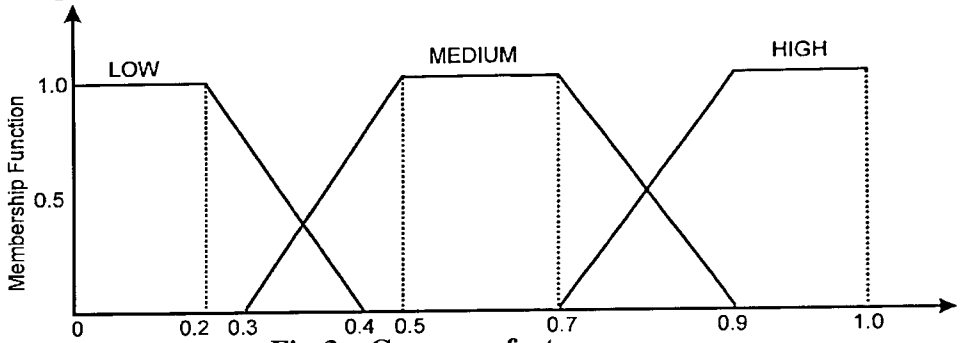


Fig 3 : Company factors

Table 2 : Linguistic Rating Conversion Table for Company factors

Linguistic rating	Trapezoidal crisp value (a,b,c,d)
Low (L)	(0,0.2.0.3,0.4)
Medium (M)	(0.3,0.5,0.7,0.9)
High (H)	(0.7,0.9,1.0,1.0)

The fuzzy set related company factors characterized by trapezoidal membership function such that-

$$\mu(\eta_2)=\begin{cases}\max\left\{0,\dfrac{\eta_2-a}{c-a}\right\} if\,\eta_2<c\\ 1 \qquad\quad if\,c\le\eta_2<d\\ \max\left\{0,\dfrac{b-\eta_2}{b-d}\right\} if d<\eta_1\end{cases}$$ ... (2)

(c) Contract Factors (η_3) : Here we take the third input variable as contract factors. For this we take trapezoidal membership function as given below :

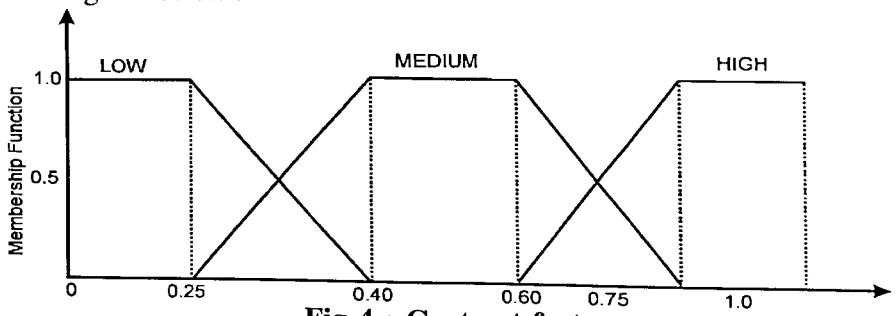


Fig 4 : Contract factors

Table 3 Linguistic rating conversion Table for contract factors

Linguistic rating	Trapezoidal crisp value (a,b,c,d)
Low (L)	(0,0,0.25,0.40)
Medium (M)	(0.25,0.40,0.60,0.75)
High (H)	(0.60,0.75,1.0,1.0)

The fuzzy set related to the contract factors is characterized by a trapezoidal membership function such that :

$$\mu(\eta_3) = \begin{cases} \max\left\{0, \dfrac{\eta_3 - a}{c - a}\right\} & if\ \eta_3 < c \\ 1 & if\ c \le \eta_3 < d \\ \max\left\{0, \dfrac{b - \eta_3}{b - d}\right\} & if\ d < \eta_3 \end{cases} \quad \ldots (3)$$

5. Fuzzify the crisp values of inputs:

Through the use of the membership functions defined above for each fuzzy set for each linguistic variable, determine the degree of membership of a crisp value in each fuzzy set.

6. Fire the rule bases that correspond to these inputs:

All expert systems which are based on fuzzy logic uses *if-then* rules. Since all the three inputs have three fuzzy sets (LOW-L, MEDIUM-M and HIGH-H) therefore 27 (3×3×3) fuzzy decisions are to be fired. There are three outputs: LOW RISK-LR, MODERATE RISK-MR and HIGH RISK-HR.

Table 4 : Sample rule base for the fuzzy logic based expert system

Rule	INPUT			OUTPUT
	η_1 (Client factors)	η_2 (Company factors)	η_3 (Contract factors)	
1	L	L	L	HR
2	L	L	M	HR
3	L	L	H	HR
4	L	M	L	HR
5	L	M	M	MR
6	L	M	H	MR
7	L	H	L	HR
8	L	H	M	MR
9	L	H	H	MR
10	M	L	L	HR
11	M	L	M	MR
12	M	L	H	MR
13	M	M	L	MR
14	M	M	M	LR
15	M	M	H	LR
16	M	H	L	MR
17	M	H	M	LR
18	M	H	H	MR
19	H	L	L	HR

20	H	L	M	MR
21	H	L	H	MR
22	H	M	L	LR
23	H	M	M	LR
24	H	M	H	LR
25	H	H	L	MR
26	H	H	M	LR
27	H	H	H	LR

7. Execute the inference engine :

Once all crisp input values have been fuzzified into their respective linguistic values, the inference engine will access the fuzzy rule base of the fuzzy expert system to drive linguistic values for the intermediate as well as output linguistic variables. The two main steps in the inference process are the aggregation and composition. Aggregation is the process of computing the values of the *if* (antecedent) part of the rules while composition is the process of computing the values of *then* (conclusion) part of the rules. During aggregation, each condition in the *if* part of a rule is assigned a degree of truth based on the degree of membership of the corresponding linguistic term.

8. Defuzzification:

Defuzzification is interpreting the membership degrees of the fuzzy sets into a specific decision or real value. A common and useful defuzzification technique is Centre of gravity. The Centre of gravity (CoG) is the most popular defuzzification technique and is widely utilized in most of the applications. The defuzzification of the data into a crisp output is accomplished by combining the result of the inference process and then computing the "fuzzy centroid" of the area. The weighted strengths of each output member function are multiplied by their respective output membership function center points and summed. Final output, this area is divided by the sum of the weighted membership function strength and the result is taken as the crisp output.

9. Output of the decision of the expert system:

In our case, the types of the outputs are: LR, MR and HR. The specific features of each controller depend on the model and performance measure. However, in principle, in all the fuzzy logic based expert system, we explore the implicit and explicit relationship within the system by mimicking human thinking and subsequently develop the optimal fuzzy control rules as well as knowledge base.

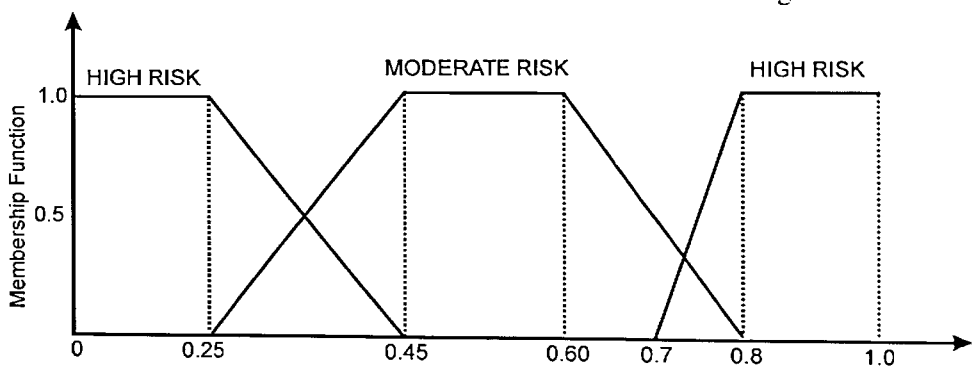


Fig 5 : Output of the decision of the expert system

10. Case study:

For the purpose of illustration, we consider that the insurance company uses three inputsclient factors η_1, company factors η_2 and contract factors η_3

1. The values of the input of the insured person have to be evaluated, $\eta_1 = 0.70$; $\eta_2 = 0.60$; and $\eta_3 = 0.35$

2. Fuzzification of the crisp values of inputs: Through the use of membership functions defined for each fuzzy set for each linguistic variable, the degree of membership of a crisp value in each fuzzy set is determined as follows:

$\mu_l(\eta_1) = 0\mu_M(\eta_1) = 0.33\mu_H(\eta_1) = 0.66$

$\mu_l(\eta_2) = 0\mu_M(\eta_2) = 1\mu_H(\eta_2) = 0\mu_l(\eta_3) = 0.33\mu_M(\eta_3) = 0.66\mu_H(\eta_3) = 0$

3. Fire the rule bases that correspond to these inputs, based on the value of the fuzzy membership function.

For the example under consideration, the following rules apply:

Rule 13: *If η_1 is MEDIUM, η_2 is MEDIUM, and η_3 is LOW, then Y is MODERATE RISK (MR).*

Rule 14: *If η_1 is MEDIUM, η_2 is MEDIUM, and η_3 is MEDIUM, then Y is LOW RISK (LR).*

Rule 22: *If η_1 is HIGH, η_2 is MEDIUM, and η_3 is LOW, then Y is LOW RISK (LR).*

Rule 23: *If η_1 is HIGH, η_2 is MEDIUM, and η_3 is MEDIUM, then Y is LOW RISK (LR).*

4. Execute the inference engine:

We use the *"root sum square"* (RSS) method to combine the effects of all applicable rules. The respective output membership function strengths(range: 0-1) from the possible rules (R1-R27) are:

"HIGH RISK" = $\sqrt{\sum i \in HR(\mu R_1)^2} = 0$

"MODERATE RISK"

$$= \sqrt{\sum i \in MR(\mu R_i)^2} = \sqrt{(0.33)^2} = 0.33$$

"LOW RISK" = $\sqrt{\sum i \in MR(\mu R_i)^2}$

$$= \sqrt{(0.33) + (0.33)^2 + (0.66)^2}$$

$$= 0.8083$$

5. Defuzzification:

We use the *"fuzzy centroid algorithm"* for defuzzification. The defuzzification of the data into crisp output is accomplished by combining the result of the inference process and then computing the *"fuzzy centroid"* of the area. The weighted strengths of each output member function are multiplied by their respective output membership function center points and summed. Finally, this area is divided by the *sum f* the weighted member function strengths and the result is taken as the crisp output.

The crisp output is 0.75. The crisp output belongs to the set of LR more than the set of MR or HR (as evident from its membership function), which shows that the risk of cancellation of policy is low, and it is 0.75, which indicate how low the risk is.

6. Output of the decision of the expert system :

The output of the decision of the expert system is given below:

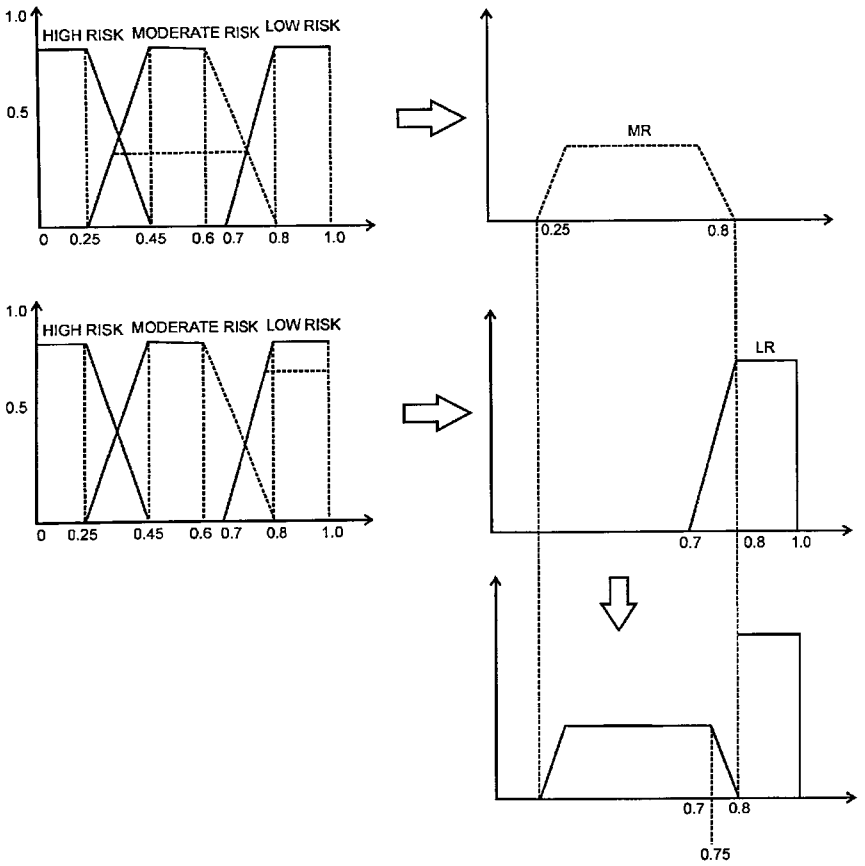


Fig 6 : Output of the expert system

11. Conclusion:

The development of a fuzzy logic based expert system for indicative results on risk of cancellation of policy is reported through this work. Identifying and quantifying risks will increasingly be viewed as the best way to control costs in insurance programs. By this fuzzy based expert system insurance companies can determine the risk of cancellation of policy in future and can take action to reduce loss or save the profitable costumers and improve their profits. Our future efforts will be on the improvement of the performance of the system by adjusting the membership function of the inputs.

References:

Arora, N. and Arora, P. (2014): "Insurance Premium optimization: Perspective of Insurance Seeker and insurance provider" Journal of management and Science, 4(1), 43-53

Beekman, J.A. and Fuelling, C.P. (1990): "Interest and mortality randomness in some annuities", *Insurance: Mathematics and Economics, 9, 185-196.*

Berkan, R.C. and Trubatch, S.L. (1997): "Fuzzy System Design Principles: Building Fuzzy *if-then Rule Bases",* Wiley-IEEE Press, 496

Boissonnade AC (1984): Earthquake damage and insurance risk. Ph.D. Dissertation, Stanford University.

Buckley, J.J. (1987): "The fuzzy mathematics of finance", Fuzzy Sets and System", 21, 257-273.

Dewit, G.W.(2003): " Underwriting and Uncertainty", Insurance Mathematics and Economics, 1, 277-285.

Horgby, P. J. (1998): "Risk classification by fuzzy inference", The Geneva Paper on Risk and Insurance Theory, 23, 63-82.

Kumar, S. and Jain, H. (2011): "Indicative results on the risk of cancellation of policies; A fuzzy approach", Workshop on Opt. and Info. Theory with their Appl; 24th -26th March, 60-66.

Kumar, S. and Pathak, P. (2009): "Premium allocation- fuzzy approach in insurance business", Proceeding of the 3rd National Conference; INDIACom, 703-705.

Kumar, S. and Pathak, P. (2010): "Fuzzy based bonus-malus system for premium decision in car insurance", Int. Rev. of Pure & Applied Math, 1, 77-81.

Yagar, R.R. (1982): "Fuzzy prediction based on regression models", Information Sciences, 26, 45-63.

Zadeh, L.A. (1965): "Fuzzy sets", Information and Control, 8(3), 338-353.

Zimmermann, H. J. and Zysno, P. (1980): "Latent connectives in human decision making", Fuzzy Sets and Systems, 4, 37-51.

Zhang, X (2016): "Multicriteria Pythagorean fuzzy decision analysis" Inf. Sc. 330, 104-124.

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 9–16

A STUDY OF HIV/AIDS AWARENESS AND EFFECTIVE SOURCES OF INFORMATION AMONG RURAL WOMEN OF VARANASI DISTRICT OF UTTAR PRADESH

BHARTI SINGH & DOLLY RANI

Abstract : Acquired Immune Deficiency Syndrome or AIDS, is a pandemic and now at the beginning of its third decade, it is one of the most devastating diseases.The situation regarding HIV/AIDS in the world is dramatic. Today HIV/AIDS is an unexpected kind of global crisis and has brought serious concerns. The number of HIV infected patients is quite large and there is no continent on world map where, there are not a large number of HIV victims. Ignorance and low level of awareness about the disease gave rise to the problem. In the absence of a vaccine or cure, information sources stressing prevention is most effective options to impart social education and develop awareness.Creating awareness of AIDS has been an important 'Information Education Communication' (IEC) agenda of the World Health Organization (WHO).

Keeping the extent of the problem in mind the present study was conducted by the researcher to find out the effective information sources which were being used by the rural women of Varanasi district to get awareness about HIV/AIDS.

It is concluded from the study that respondents had some basic awareness regarding causes and precaution about HIV/AIDS but they did not have clear understanding about HIV/AIDS.

The study further showed that out of all mass media sources television played a most important role in dissemination of information. Chart, poster, wallpaper, mobile and radio etc. were also important sources for creating awareness regarding HIV/AIDS. But in spite of mass media sources other personal cosmopolite sources (Doctor, Nurse/ANM/Asha, Social Worker,BDOs/ADOs, NGOs Worker, Worker of Gov.Org., Ext., Worker and Researcher) and personal localite sources (Friends, Family Members, Relative, Neighbour and Local leader) were not playing any role in creating awareness regarding HIV/AIDS among rural women of Varanasi district.

Keywords: HIV/AIDS, Information sources, Awareness.

Introduction : The HIV/AIDS epidemic earlier widespread in only a few countries and only among some selected groups of people, but today HIV/AIDS is an unexpected kind of global crisis and has brought serious concerns. Today the AIDS epidemic has become a pandemic disease that is threatening the world population and the number of HIV positive individuals is increasing significantly all across the world. The number of people living with HIV rose from around 8 million in 1990 to 36.7 million by the end of 2015 in all over the world (UNAIDS,2016).

According to UNAIDS (2017) India has the third largest HIV epidemic in the world. India fails within the high-risk region of South Asia and South-East Asia, which is just next to Sub-Sahara African region as regards the number of HIV infected cases, are concerned.

In 2016, HIV prevalence in India was an estimated 0.3% and the total number of People Living with HIV (PLHIV) was estimated 21.17 lakhs. In the same year, an estimated 62,000 people died from AIDS-related illnesses.

Acquired Immune Deficiency Syndrome (AIDS) is a viral disease caused by a virus named Human Immunodeficiency virus (HIV) that is usually found in body fluids like blood, semen, vagina fluid and

Bharti Singh
Institute of Home Science
Dr. B. R. Ambedkar University, Agra
Email : director.ihscagra@gmail.com
Dr. Dolly Rani
UGC/PDF, Institute of Home Science
Dr. B. R. Ambedkar University, Agra,
Email : savidoll12@yahoo.com

breast milk of an infected persons. The virus can be transferred from one infected person to another through sexual intercourse, sharing of unsterilized body piercing instruments like blades, needles, knives etc which has once been used by infected person, transfusion of blood/blood product of an infected person to another person and infected mother to her unborn child. But there some Antiretroviral Treatments are available to prevent the transfusion of infection from mother to her unborn child.

AIDS is killing the most productive population, widening the level of development between developed and developing nations. It is also taking toll on the health sector since a lot of fund is channeled towards HIV/AIDS prevention and control. It has been observed that despite the many programmes organized to prevent people about the problem of HIV/AIDS, the rate of it infection continues to be on the increase (Omoniyi and Tayo–Olajubu, 2006).

Providing appropriate Information and creating awareness is a powerful weapon and has been recognized worldwide as being effective in changing behaviour and attitudes—essential in health situations such as HIV/AIDS where there is no known cure available as yet. Therefore, the future trend of the HIV/AIDS pandemic to a large extent depends on the level of HIV/AIDS awareness possessed by the people. Awareness of HIV/AIDS is necessary for people to protect themselves from HIV infection.

Creating awareness of AIDS has been an important 'Information Education Communication' (IEC) agenda of the World Health Organization (WHO).

The role of media in educating individuals on HIV/AIDS issues is very important. Media sources such as newspapers, radio and television constantly attempt to increase HIV/AIDS knowledge through advertisements, shows, and movies. Several government programs and AIDS organizations utilize media to convey AIDS information to citizens. Several researcher studies were also conducted by the various researchers to find out the role of communication and media for creating awareness regarding HIV/AIDS.

Shira et al. (2016) conducted a study entitled "Knowledge and Awareness Regarding HIV/AIDS in School Children of Guwahati City of India" among one thousand students of five selected school of Guwahati, India. The study reported that the main source of information about HIV/AIDS to the vast majority of respondents was mainly electronic media (internet and television).

Bhalge et al. (2012) conducted a study on "Awareness regarding HIV/AIDS in ANC client in tribal district of Central India".The study reported that only 42% of the respondent's main sources of information about HIV/AIDS were television, while 44.66% and 29.34% of the respondent's main sources of information were radio and teachers & doctors respectively.

Malleshappa et al. (2012) conducted a study on "Awareness and attitude of youth toward HIV/AIDS in rural Southern India". The study revealed that 80% of respondent's main sources of information about HIV/AIDS were television.

Williams E. Nwagwu (2008) conducted a study entitled "Effectiveness of sources of HIV/AIDS awareness in a rural community in Imo State, Nigeria". In this study 434 women and 734 girls surveyed expressed awareness about HIV/AIDS. The percentages of awareness of AIDS by sources among the respondents are shown that thirty-five per cent of the women have heard of AIDS from radio, 24.1% from television and 17.8% from friends and relatives.

Different media sources have varying effects. Thus the impact of mass media in communicating AIDS-related knowledge is not completely understood. Sources like newspapers and radios are minimally used but television is used by majority of Indians. According to Pallikadavath, Sreedharan, and Stones (2006) television broadcasts might be an effective medium to disseminate AIDS awareness. However, the vague and incomplete AIDS information presented on television and other media sources due to the numerous political and social barriers has limited the quality of AIDS knowledge in the Indian population. The inadequacy of media's role in providing quality AIDS knowledge also stems from the indirect and non-verbal communication about sex and sex-related issues among peers and family members in India (Lambert and Wood, 2005).

Information in the modern era is linked to technology, in that a poor electric power supply and lack of paved roads, for example, will affect even the use of transistor radios and television systems. The absence of information infrastructures results in insufficient knowledge about the disease, a situation that has large

implications both on the management and provision of care for the people who are infected, as well as exposing the healthy persons to the risk of contracting the disease.

Therefore, even though media has potential to educate people on HIV issues, the current impact of communication sources and mediaon HIV knowledge is indeterminate.

Thus the current paper contributes to this discussion by investigating the level of awareness regarding HIV/AIDS and effective sources of information regarding HIV/AIDS among rural women of Varanasi District.

RESEARCH METHODOLOGY

The design adopted for the study entitled **"A Study of HIV/AIDS Awareness and Effective Sources of information among rural Women of Varanasi District of Uttar Pradesh"** was **"Exploratory Research Design".**

For the selection of sample three rural areas of Varanasi district of Uttar Pradesh were selected randomly. Out of these three selected rural areas 40 families from each selected rural area were selected on random basis. Thus the present study was conducted on total 120 families of Varanasi district of Uttar Pradesh. From each selected family, woman head was selected for collection of data. Thus the present study was conducted on 120 women heads belonged to the age group of18 to 45 years.

The data was collected from primary as well as secondary sources. Secondary data was collected from different libraries, organization, agencies and Internet etc.

Primary data was collected with the help of self-made questionnaire under two heads :-

- Awareness of respondents regarding HIV/AIDS
- Effective sources of information regarding HIV/AIDS

After the collection of data, it was tabulated and was subjected to statistical analysis *i.e.,* percentage.

RESULT AND DISCUSSION

The results obtained were thoroughly examined, interpreted and discussed with all care. After statistical analysis the results have been presented under the following heads :-

- Level of awareness regarding HIV/AIDS
- Effective sources of information regarding HIV/AIDS

Level of awareness regarding HIV/AIDS

For accessing the levelof awareness regarding HIV/AIDS total 120 respondents were selected. The first question asked with the selected respondents was 'Have you ever heard about HIV/AIDS'. The obtained result regarding to the above question shows that out of the total 120 respondents 17 (14.2 percent) respondents said that they never heard the term or anything about HIV/AIDS. Thus further the rest of the questions were not asked with those 17 (14.2 percent) respondents. Therefore, the level of awareness regarding HIV/AIDS and effective sources of information regarding HIV/AIDS were assessed on total 103 respondents.

Level of awareness regarding HIV/AIDS has been presented under the following heads:-

- Level of awareness regarding different aspects of HIV/AIDS
- Total level of awareness regarding HIV/AIDS

The following table gives a clear picture regarding awareness about different aspects of HIV/AIDS.

Level of awareness regarding different aspects of HIV/AIDS: Level of awareness regarding different aspects of HIV/AIDS has been presented in Table no.1.

Table 1: Awareness regarding different aspects of HIV/AIDSN = 103

Different aspects of HIV/AIDS	Level of Awareness	Number	Percentage
Basic facts about HIV/AIDS	High (7-9)	0	0
	Medium(4-6)	09	8.7
	Low (0-3)	94	91.3
	Total	**103**	**100**
Causes of HIV Infection	High (10-14)	70	68.0
	Medium (5-9)	6	5.8

	Low (0-4)	27	26.2
	Total	**103**	**100**
Symptoms of HIV/AIDS	High (7-9)	31	30.1
	Medium (4-6)	0	0
	Low (0-3)	72	69.9
	Total	**103**	**100**
Progression Stages of HIV/AIDS	High (7-9)	0	0
	Medium (4-6)	0	0
	Low (0-3)	103	100
	Total	**103**	**100**
Prevention against HIV Infection	High (12-16)	76	73.8
	Medium (6-11)	8	7.8
	Low (0-5)	19	18.4
	Total	**103**	**100**
Medical Tests and Treatment for HIV/AIDS	High (9-12)	0	0
	Medium (5-8)	0	0
	Low (0-4)	103	100
	Total	**103**	**100**
Government Programme and Policies against HIV/AIDS	High (12-16)	22	21.4
	Medium (6-11)	15	14.5
	Low (0-5)	66	64.1
	Total	**103**	**100**

Table 1. reveals the awareness regarding different aspects of HIV/AIDS. In the section of basic facts about HIV/AIDS, total nine questions were asked with the respondents related with the terms of 'HIV, AIDS, Immunity system and the difference between HIV and AIDS'.The results show that most of the respondents (91.3 percent) had low level of awareness regarding basic facts about HIV/AIDS, while rest of the respondents (8.7 percent) had medium level of awareness.

Regarding awareness about causes of HIV infection, most of the respondents (68 percent) had high level of awareness, while 26.2 percent and 5.8 percent of the respondents had medium level and low level of awareness respectively.

Regarding awareness about symptoms of HIV/AIDS maximum number of the respondents (69.9 percent) had low level of awareness, while remaining respondents(30.1 percent) had high level of awareness.

Related to the progression stages of HIV/AIDS and medical tests and treatment for HIV/AIDS,all the respondents (100 percent) had low level of awareness.

Regarding to the prevention against HIV infection, the findings show that high level of awareness reported by majority of the respondents (73.8 percent), while only 18.4 percent and 7.8 percent of the respondents had low level and medium level of awareness respectively.

As regards to the awareness about government programme and policies against HIV/AIDS the result indicates that 64.1 percent of the respondents had low level of awareness, while only 21.4 percent and 14.5 percent of the respondents had high level and medium level of awareness respectively.

After analyzing the data regarding to all the above aspects it has been clearly indicated that the respondent's awareness regarding causes of HIV infection and prevention against HIV infection was high. While regarding to the Basic facts about HIV/AIDS, symptoms of HIV/AIDS, progression stages

of HIV/AIDS, medical tests and treatment for HIV/AIDS and government programme and policy for HIV/AIDS, the awareness level in most cases was low. It was observed by the researcher that for creating AIDS awareness several media like television, radio, newspapers and various types of other electronic and print media etc. have been presenting various messages through shows, advertisement and articles relating to this topic. These messages were basically related with causes and prevention of HIV/AIDS. The respondents did not listen/seeing any message through any other communication sources and media about symptoms, progression stages and medical tests and treatment for HIV/AIDS. So due to the above reasons their awareness scores were vary on various aspects of HIV/AIDS.

Total Level of Awareness Regarding HIV/AIDS

Till now the researcher has discussed the awareness regarding various aspects of HIV AIDS. The following table shows the total level of awareness (all aspects included) on the bases of the total scores obtained by summed up the scores of each respondent in reference to the various aspects of HIV/AIDS.

Table 2: Total level of awareness regarding HIV/AIDS N=103

Level of Awareness	Number	Percentage
High (58-85)	0	0
Medium (29-57)	76	73.8
Low (0-28)	27	26.2
Total	**103**	**100**

The analysis carried out with the data obtained by respondents on total level of awareness regarding different aspects of HIV/AIDS presented in Table 2. appears to be quite interesting.

Results reveal that 73.8 percent of the respondents possessed medium level of awareness, while remaining 26.2 percent of the respondents possessed low level of awareness

In this section level of awareness was obtained by summed up the scores of each respondent in reference to the various aspects of HIV/AIDS. According to these obtained scores majority of the respondents (73.8 percent) were scored medium level of awareness score as they were aware about basic concept, causes, precautions and government programme and policies for HIV/AIDS. But these respondents also had some misconceptions about HIV/AIDS and not aware about major and minor symptoms, medical test and treatment, antiretroviral therapy and progression stages of HIV/AIDS.

Effective sources of information for creating awareness regarding HIV/AIDS

The results obtained regarding to the effective sources of information regarding HIV/AIDS are presented inTable no.3:

Table 3: Effective sources of information for creating awareness regarding HIV/AIDS

S. No.	Communication Sources	Categories	Response(N¾103)		Effectiveness			*N	Weighted mean
			Yes	No	Most Effective	effective	Least effective		
			Number (Percent)	Number (Percent)	Number (Percent)	Number (Percent)	Number (Percent)		
1.	Mass Media Sources	Television	103 (100)	0 (0)	79 (76.70)	0 (0)	24 (23.30)	103	261
		Radio	13 (12.62)	90 (87.38)	7 (53.85)	6 (46.15)	0 (0)	13	23
		Newspaper	35 (33.98)	68 (66.02)	0 (0)	35 (100)	0 (0)	35	70
		Wallpaper/Poster /Chart	61 (59.22)	42 (40.78)	0 (0)	37 (60.66)	24 (39.34)	61	98
		Boards/Hoarding	66 (64.08)	37 (35.92)	0 (100)	24 (36.36)	42 (63.34)	66	90

		Mobile	32 (31.07)	71 (68.93)	24 (75.0)	8 (25.0)	0 (0)	32	79
		Leaflets/Folder	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Magazine/Book	0 (0)	103 (103)	0 (0)	0 (0)	0 (0)	=	=
2.	**Personal Cosmopolite Sources**	Doctor	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Nurse/ANM/Asha	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Social Worker	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		BDOs/ADOs	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		NGOs Worker	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Worker of Gov.Org.	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Ext. Worker	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Researcher	0	103	0	0	0	=	=
3.	**Personal Localite Sources**	Husband	28 (27.18)	75 (72.82)	28 (100)	0 (0)	0 (0)	28	84
		Friends	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Family Members	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Relative	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Neighbours	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=
		Local leader	0 (0)	103 (100)	0 (0)	0 (0)	0 (0)	=	=

* N¾Number of those respondents who gave their response as 'YES' in respective category.

The analysis carried out with the data obtained by respondents on effective sources of information for creating awareness regarding HIV/AIDS presented in Table 2. The result reveals that among mass media sources all of the 103 respondents got information regarding HIV/AIDS from television. The data further shows that 64.08 percent and 59.22 percent of the respondents mentioned boards/hoarding and wallpaper/chart/poster respectively as their sources of information regarding HIV/AIDS. Newspaper and mobile were mentioned by 33.98 percent and 31.07 percent of the respondents respectively as sources of information regarding HIV/AIDS. Only 12.62 percent of the respondents reported that they got information from radio, while none of the 103 respondents got information regarding HIV/AIDS from leaflet/folder and magazine/book.

Data regarding to the personal cosmopolite sources

of information regarding HIV/AIDS shows that None of the respondents mentioned any source among the category of personal cosmopolite sources (Doctor, Nurse/ANM/Asha, Social Worker,BDOs/ADOs, NGOs Worker, Worker of Gov.Org., Ext., Worker andResearcher) as a source of information regarding HIV/AIDS.

Among the personal localite sources only 27.18 percent of the respondents reported that they got information regarding HIV/AIDS from their husband, while all the respondents (100 percent) said that they did not get any information regarding HIV/AIDS from any source among the category of personal localite sources (Friends, Family Members, Relative, Neighbour and Local leader).

Weighted mean was calculated to see the effectiveness of information sources of HIV/ AIDS.Based on the weighted mean score the data regarding to the mass media sources for creating awareness regarding HIV/AIDS showsthat television secured first place (WMS=261), Wallpaper/Poster/ Chart secured second place (WMS=98) and Boards/ Hoardingwas given the third place (WMS=90). While flash card was the least preferred medium (WM=48.67).

Thus the above obtained result clearly showed that respondents had some basic awareness regarding causes and precaution about HIV/AIDS but they did not have clear understanding about HIV/AIDS. Their main sources of information were television, chart, poster, wallpaper, mobile and radio etc. But these types of media sources are one-way communication medium and have some limitations which create lots of misconceptions and stigma among the people. The absence of information infrastructures in rural areas is also a barrier for creating awareness about the disease.

According to Pallikadavath, Sreedharan, and Stones (2006) television broadcasts might be an effective medium to disseminate AIDS awareness. However, the vague and incomplete AIDS information presented on television and other media sources due to the numerous political and social barriers has limited the quality of AIDS knowledge in the Indian population. The inadequacy of media's role in providing quality AIDS knowledge also stems from the indirect and non-verbal communication about sex and sex-related issues among peers and family members in India (Lambert and Wood, 2005).

On the other hand, personal cosmopolite sources can be used for disseminating the information regarding HIV/AIDS for receiving healthier outcome. Doctor, health workers, and workers of GOs and NGOs can disseminate accurate information, understand people outlook and remove their misconception and stigma through direct contact.

SUMMARY AND CONCLUSION

It is concluded from the study that majority of the respondent's awareness regarding causes of HIV infection and prevention against HIV infection was high. While regarding to the basic facts about HIV/ AIDS, symptoms of HIV/ AIDS, progression stages of HIV/AIDS and medical tests, treatment for HIV/ AIDS and government programme and policy against HIV/ AIDS the awareness level in most cases was low. Overall level of awareness regarding HIV/AIDS of the most of the respondents was at medium level.

Regarding to the effective sources of information it was concluded from the study out of all mass media sources, television played a most important role in dissemination of information. Boards/ Hoarding,Wallpaper/Poster/Chart, Newspapers, mobile and radio were also important sources for creating awareness regarding HIV/AIDS. But in spite of mass media sources other personal cosmopolite sources (Doctor, Nurse/ANM/Asha, Social Worker,BDOs/ADOs, NGOs Worker, Worker of Gov.Org., Ext., Worker and Researcher) and personal localite sources (Friends, Family Members, Relative, Neighbour and Local leader) were not play any role for creating awareness regarding HIV/AIDS among rural women of Varanasi district.

REFERENCES

Bhalge, U. U., Khakse, G. M., Brahmapurkar, K. P., Thorat, R. and Shrote, V.K. (2012):Awatreness regarding HIV/AIDS in ANC client in tribal district of Central India. IOSR Journal of Dental and Medical Sciences (JDMS); 2 (4): 44-49 *http://www.iosrjournals.org*

Lambert, H.&Wood, K. (2005):A comparative

analysis of communication about sex, health and sexual health in India and South Africa: Implications for HIV prevention. Cult. Health Sex; 7: 527–541.

Malleshappa, K., Krishna, S. & Shashikumar.(2012): Awareness and attitude of youth towards HIV/AIDS in rural Southern India *Biomedical Research; 23(2): 241-246*

Pallikadavath, S., Sreedharan, C.&Stones, R.W. (2006): Sources of AIDS awareness among women in India. AIDS Care; 18: 44–48

Shira, C. D., Deka, A., Das, H. & Deori, P.(2016): Knowledge and Awareness Regarding HIV/AIDS in School Children of Guwahati City of India.IOSR Journal of Dental and Medical Sciences (IOSR-JDMS); 15 (5),IV: 55-59. *http://www.iosrjournals.org*

Williams E. Nwagwu.(2008): Effectiveness of sources of HIV/AIDS awareness in a rural community in Imo State, Nigeria. Health information and libraries journal; 25 (1): 38-45.

http://onlinelibrary.wiley.com/doi/10.1111/j.1471-1842.2007.00729.x/full

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 17–24

MODELING OF MIXED CONTROL ALGORITHMS FOR ENHANCING THE PERFORMANCE OF SEMI-ACTIVE SUSPENSION SYSTEM

SHREYANSH UPADHYAYA & SHARAD CHANDRA UPADHYAYA

Abstract : The suspension system of a vehicle is the most important element which enhances the ride comfort and safety. This paper presents three mixed control strategies i.e. Skyhook-Groundhook, Skyhook-Balance and Groundhook-Balance. After developing the mathematical model of suspension and controller, the simulation of these controllers are demonstrated on MATLAB. The 2-DOF quarter car model is subjected to random road profile to demonstrate the effectiveness of the controllers. The result shows that it can provide better vibration control performance than its conventional counterparts.

Keywords : Semi Active Suspension, Mixed Control, MATLAB.

1. Introduction : The vehicle suspension system design is an active research area where some of the goals is to alleviate the passenger's comfort through the vibration reduction and enhance the safety measures during harsh conditions. Suspension systems can be classified into three basic classes i.e. passive suspensions, semi-active suspensions and active suspensions.In the semi-active suspension system, the conventional spring element is kept, but the damper is substituted with a controllable damper.A semi-active system uses the external power only to regulate the damping levels, and operate an embedded controller and a group of sensors (Harris,1987;Guglielmino,2008). The controller decides the damping level on the basis of a control strategy, and accordingly adjusts the damper to attain that dampingparameters (Guglielmino,2008).

Shreyansh Upadhyaya,
Electrical Engineering Department
Dayalbagh Educational Institute, Agra
Sharad Chandra Upadhyaya
Dau Dayal Institute of Vocational Education
Dr. B.R. Ambedkar University, Agra

Many researchers have suggested various control strategies for improving a performance level of suspension as compared to a passive suspension system (Karnopp,1974;1990). Alanoly and Sankar [Alanoly,1987;1998] have evaluated the balance logic for vibration and shock isolation.Liu et al. (Liu,2005) have studied the "on-off" and "continuous" forms of both skyhook and balance logic and compared it to an adaptive passive damping control system.Shamsiet al. (Shamsi,2008) have presented the on-off and continuous skyhook control for half car roll plane model and compared the frequency and transient responses with that of a passive system.Strecker et al. (Strecker,2015) have presented the comparison between three semi-active control algorithms viz. groundhook, skyhook and modified groundhook and passive system.Amin (2015) have formulated the skyhook logic for a 7-DOF ride model of an armored vehicle. The skyhook controller proposed by them consists of an outer loop and an inner loop.

Zhang (2013) have examined the skyhook based semi-active control of the full vehicle suspension system incorporated with MR damper. They developed 7-DOF full vehicle dynamic model using the modified Bouc-wen hysteretic model of MR damper, and a modified skyhook control is proposed to individually control the four MR quarter vehicle sub-systems of the full vehicle.The skyhook control provides reduced vehicle body motion, thus improving ride comfort at the expense of un-sprung mass motion (Raj,2015).

In a further development, Strydom et al. (Strydom,2014) investigated the applicability of hybrid control to a small off-road vehicle. The suspension system consists of controllable dampers and passive spring-damper units.Kashem et al. (Kashem,2015) have introduced a modified continuous skyhook strategy along with adaptive gain that directs the semi-active vehicle suspension. They have scrutinized 11

sets of suspension parameters and considered a set of parameters that demonstrated better performance in terms of peak amplitude and settling time.Ride comfort has been found to be enhanced by 38.4% for the modified skyhook logic by Kashem, et al.(Kashem,2015) as compared to a passive system, whereas improvements of 27.3% for optimal skyhook control by Nguyen, et al.; 2.8% for modified skyhook control by Bessinger, et al.(Bessinger,1995) and 5.9% for continuous skyhook control by Karnopp et al. (Karnopp,1974) have been observed. Moreover, the proposed modified skyhook control system provides superior ride comfort as compared to passive or any of the skyhook control considered.

Phu et al.(Phu,2016) have proposed a hybrid adaptive controller and applied to vibration control of a vehicle driver seat suspension system. They had demonstrated a effectiveness of proposed controller on subjected to a single bump and random input type road irregularities.

This work focuses on to incorporatevarious kinds of mixed control strategiesto the quarter car model, which demonstrates a comparison of performance of the different control strategies for semi-active suspension for quarter car as well as a comparison with a passive suspension system. In order to analyzethecomfort level of the driver, simulations are done using MATLAB software. Another significant feature is that this work may be extended for half and full car model, whereas various types of random road input may be incorporated with the system to analyze its dynamic behavior on severe harsh conditions.

2. Mathematical Model : A quarter car model with 2-DOF is considered for analysis. Fig.1 presents a quarter car model with the passive suspension system, whereas Fig.2 shows the quarter car model with semi-active system. The tire has been replaced with its equivalent stiffness and tire damping is neglected.

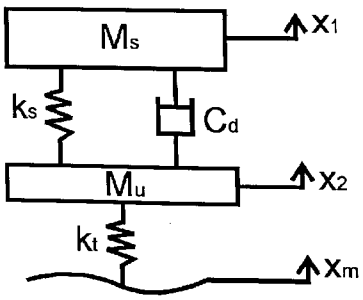


Fig. 1: Quarter car model with passive suspension system

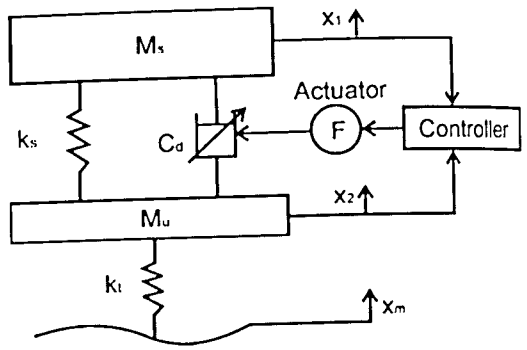


Fig. 2 : Quarter car model with Semi active suspension system

One may write the equation in state-space representation form for continuous time invariant system (Brogan,1974), input matrix may be expressed as,

$$\ddot{x} = AX + BU \qquad \text{....(1)}$$

Where,

$X(.)$ is called the "state vector", $X(t) \in R^n$

$A(.)$ is called the " state matrix", $dim[A(.)] = n \times n$

$B(.)$ is called the " input matrix", $dim[B(.)] = n \times p$

$U(.)$ is called the" input vector", $U(t) \in R^p$

while output matrix may be written as,

$$Y = CX + DU \qquad \text{....(2)}$$

Where

$Y(.)$ is called the "Output vector", $Y(t) \in R^q$

$C(.)$is called "Output matrix",$dim[C(.)] = q \times n$

$D(.)$is called "Feed through matrix",$dim[D(.)] = q \times p$

In Eqs (1-2), A, B, C, D, X,Y and U may be written in matrix form as given below:

$$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ \frac{k_s}{M_s} & 0 & \frac{k_s}{M_s} & 0 \\ 0 & 0 & 0 & 1 \\ \frac{k_s}{M_u} & 0 & \frac{(k_s + k_t)}{M_u} & 0 \end{bmatrix}$$

$$B = \begin{bmatrix} 0 & 0 \\ \frac{1}{M_s} & 0 \\ 0 & 0 \\ \frac{1}{M_u} & \frac{k_t}{M_u} \end{bmatrix}$$

$$C=\begin{bmatrix} -\frac{k_s}{M_s} & 0 & \frac{k_s}{M_s} & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

$$D=\begin{bmatrix} -\frac{1}{M_s} & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$X = [x_1; \dot{x}_1; x_2; \dot{x}_2]$

$U = [F_d; x_{in}]$

$Y = [\ddot{x}_1; \dot{x}_1; \dot{x}_2; x_1]$

3. Description of control strategies : Semi-active damper with on-off control strategy damper is switched between "on" and "off" states of damping according to the suitable control algorithms. The "on-state" damping coefficient is relatively high, while the "off-state" damping coefficient is low. Theoretically, the "off-state" damping coefficient should be zero, but this is not practically possible. Mixed control algorithms can be developed by combining various control algorithms, which were presented in literature. They can provide the benefit of both the control strategies and hence may provide better performance in terms of vibration isolation as well as vehicle handling. The nextsub-section describes different hybrid control algorithms for semi active damping control.

3.1 Basic controller algorithm

In this section, the development strategy for a controller has been presented, which are given as,

(a) Skyhook logic : The skyhook consists of a damper connected to some inertial reference in the sky (Karnopp,1974;Liu,2005) and this helps in providing adequate force toreduce body acceleration and improve ride comfort. The damping force for skyhook controller with "on" and "off" may be expressed as,

$$F_{SH}=\begin{cases} C_{max}(\dot{x}_1-\dot{x}_2), \dot{x}_1(\dot{x}_1-\dot{x}_2)\geq 0, \\ C_{min}(\dot{x}_1-\dot{x}_2), \dot{x}_1(\dot{x}_1-\dot{x}_2)<0. \end{cases} \quad ...(3)$$

(b) Groundhook logic : For on-offgroundhook logic strategy, determines whether the damper should be adjusted to its maximum value or the minimum value based on the product of the absolute velocity of the un-sprung mass and the relative velocity across the suspension, providing better road holding capabilities. The damping force for groundhook controller with "on" and "off" may be represented as,

$$F_{GH}=\begin{cases} C_{max}(\dot{x}_1-\dot{x}_2), \dot{x}_1(\dot{x}_1-\dot{x}_2)\geq 0, \\ C_{min}(\dot{x}_1-\dot{x}_2), \dot{x}_1(\dot{x}_1-\dot{x}_2)<0. \end{cases} \quad ...(4)$$

(c) Balance Logic : The fundamental concept of this semi-active control strategy is to balance the spring force by means of damping force for the instances when both the forces act in opposite direction and to set the damping force to a low value (positively zero) otherwise. Therefore, the force transmitted through the system is significantly reduced or even neglected the instances when the damper is acting and is slightly more than the spring force(Guglielmino,2008).The damping force for balance controller with "on" and "off" may be expressed as,

$$F_B=\begin{cases} C_{max}(\dot{x}_1-\dot{x}_2), (x_1-x_2)(\dot{x}_1-\dot{x}_2)\geq 0, \\ C_{min}(\dot{x}_1-\dot{x}_2), (x_1-x_2)(\dot{x}_1-\dot{x}_2)<0. \end{cases} \quad ...(5)$$

where F_{SH}, F_{GH} & F_B are the damping forces; c_{max} & c_{min} are the maximum and minimum damping coefficient respectively; $\dot{x}_1$ & $\dot{x}_2$ are the absolute velocities of the sprung and unsprung mass respectively.

3.2. Development of a mixed control

This subsection presents the combination of several control strategies to get better vibration control. These may be presented as,

(a) Mixed skyhook-groundhook control

This logic is intended to reduce both the body acceleration and the dynamic tire force. It is obtained by combining both skyhook and groundhook control algorithms.

$$F_{SH\text{-}GH}=\alpha F_{SH}+(1-\alpha)F_{GH} \quad ...(6)$$

where, $F_{SH\text{-}GH}$ is the damping force of the mixed controller, F_{SH} is the skyhook damping force, F_{GH} is the groundhook damping force, which can be obtained from Eq. (3 or 4), α

(b) Mixed skyhook-balance control

Similar to above mixed logic, other mixed strategies can be developed by combining two or more control strategies. Skyhook and balance logic are combined to give the following expression,

$$F_{SH\text{-}B} = \beta F_{SH} + (1 - \beta) F_B \quad ...(7)$$

where, $F_{SH\text{-}B}$ is the damping force of mixed controller, F_B is the balance control force, which is obtained from Eq.5,β is the weighing factor to adjust the level of skyhook control or balance control. If β is set to 1, the control will be purely skyhook control, whereas, if β is set to 0, it will be a pure balance control.

(c) Mixed groundhook-balance control

Groundhook and balance control logics were fused together to achieve a mixed control strategy as shown below,

$$F_{GH\text{-}B} = \gamma F_{SH} + (1 - \gamma) F_B \quad ...(8)$$

where, F_{GH-B} is the damping force of mixed controller and γ is the weighing factor to adjust the level of groundhook control or balance control. If γ is set to 1, the control will be purely groundhook control, whereas, if γ is set to 0, it will be a pure balance control.

4. Numerical simulation

Simulation models are relatively flexible and can be modified according to the changing environment.In this research, quarter car model suspension system is investigated at 60Kmph operating speed on random road profile using MATLAB/SIMULNIK software.The SIMULINK model of the vehicle is simulated for 10 sec to obtain different output responses. The parameters used are shown in Table 1.

Table 1: Model Parameter for 2-DOF quarter vehicle model

Parameter	Value	Unit	Parameter	Value	Unit
M_S	365	kg	C_{min}	258	Ns/m
M_U	40	kg	c_{max}	2838	Ns/m
k_s	19960	N/m	$C_{initial}$	1290	Ns/m
k_t	175500	N/m			

4.1 Random road input

A random road profile is generated according to the International Organization for Standardization (ISO 8608). It gives a depiction of the road profile through estimation of the PSD of the vertical displacements G_d, as a function of spatial frequency $n = (n = \Omega/2\pi$ *cycles / m*) . The ISO 8608 introduces a classification which is evaluated in accordance with conventional values of spatial frequency $n_0 = 0.1$ *cycles / m*. Eight classes of roads are identified; from class A to class H according to the values of $G_d(n_0)$ and $Gd(\Omega_0)$ established in ISO 8608, which is shown in Table 2 (Nguyen, 2009).

Table 2: ISO 8608 values of $G_d(n_0)$

Road Class	$G_d(n_0)$ (10^{-6} m^3)	
	Lower Limit	Upper Limit
A	-	32
B	32	128
C	128	512
D	512	2048
E	2048	8192
F	8192	32768
G	32768	131072
H	131072	-
	$n_0 = 0.1$ *cycles/m*	

In simulations, the ISO 8608 gives that the roughness of the road surface profile can be defined using the equations;

$$G_d(n) = G_d(n_0).\left(\frac{n}{n_0}\right)^{-w} \quad ....(9)$$

where, w is the waviness and taken to be 2, the PSD of vertical displacement G_d as a function of spatial frequency n.Beginning from a continuous road profile, for a specified value of spatial frequency n, loped within a frequency bandΔn, the value ofthe PSD function is represented through the following expression:

$$G_d(n) = \lim_{\Delta n \to 0}\left(\frac{\psi_x^2}{\Delta n}\right) \quad ...(10)$$

where, ψ_x^2 is the mean square value of the component of the signal for the spatial frequency n, within the frequency band Δn.So that following expression for random road profile can be generated according to ISO classification as (Davis,2001).

$$h(t) = \sum_{i=0}^{n}\sqrt{\Delta n}.2^k.10^{-3}\left(\frac{n_0}{i.\Delta n}\right)\cos(2\pi i.\Delta n.V.t + \varphi_i) \quad ...(11)$$

where, t is the abscissa variable from 0 to t;

$\Delta n = 1/L$; $n_{max} = 1/B$;

$N = n_{max}/\Delta n = L/B$;

V is the velocity of the vehiclewhere L=250, N=100; k is a constant value depending from ISO road profile classification.In this work, k is a constant value depending from ISO road profile classification, it assumes integers increasing from 3 to 9, Herekis assumed to take the value 3 corresponding to the class A road profile and $G_d(n_0)G_d(n_0)$ is taken to be 32. $n_0 = 0.1$ *cycles/m*; φ_i; is random phase angle following an uniform probabilistic distribution within the 0 – 2π range.

5. Result and discussion

This section contains body acceleration and body displacement results. Ride comfort can be easily determined from body acceleration and safety measures can be roughly estimated from the body displacement graph. The results of different mixed logics are compared with passive system and at last comparative discussion is done for best operating logic.Mixed controllers are named as MS-1, MS-2 and MS-3 for SH-GH, SH-B, and GH-B respectively. Best operating values of weighting factors were chosen and are shown in Table 3.

Table 3: Optimized value of weighing factors for hybrid logics

Mixed logics	α	β	γ+
MS-1	0.85	....	....
MS-2	....	0.4	....
MS-3	....	....	0.45

5.1 Performance of Quarter Car Model for Random Road Input

(a) Body acceleration : The 2-DOF quarter car model has been subjected to a random road input and mixed on-off logics (such as MS-1, MS-2, and MS-3) have been applied to control the damping force of the suspension system. Fig. 3represents the acceleration response of the MS-1 controller

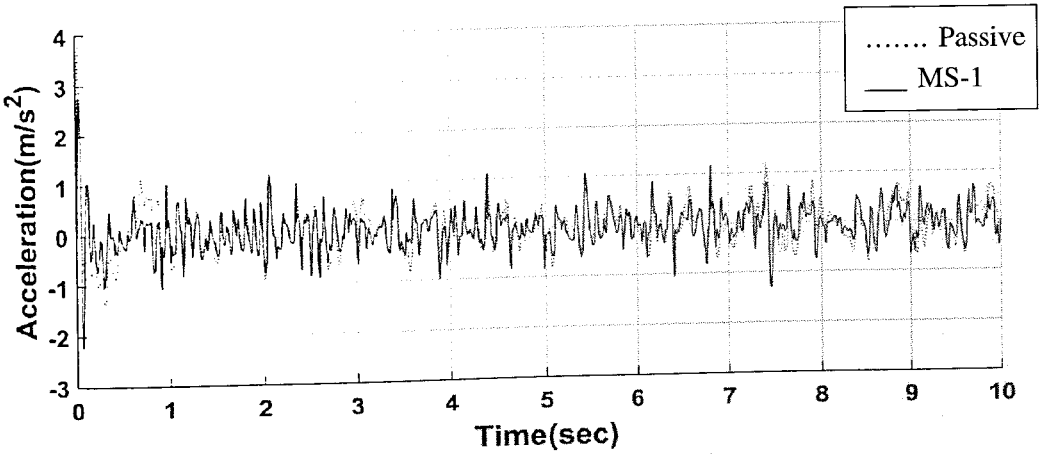


Fig. 3: Body acceleration response of quarter car with MS-1 controller

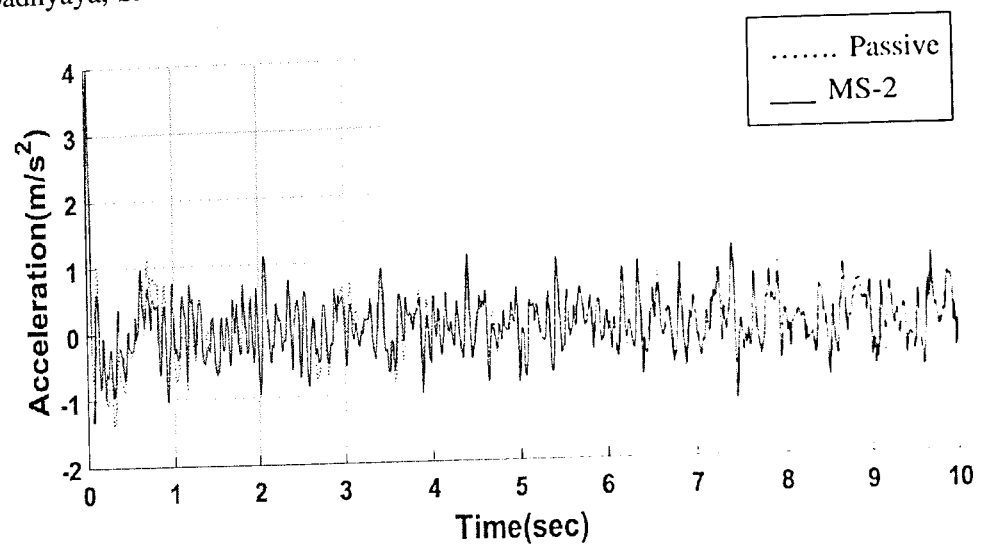


Fig. 4: Body acceleration response of quarter car with MS-2 controller

It can be observed that the MS-1 logic gives better acceleration results in comparison to passive system. Some jerks may be present but overall acceleration is reduced and this helps in providing better ride comfort. Response of MS-2 logic has been displayed in Fig. 4.

It has been found that the magnitude of acceleration is less in case of MS-2 control than passive system for most of the time. The number of sharp peaks has also been found to be less in case of MS-2 logic. The initial peak gets reduced to 2.1 m/s^2.

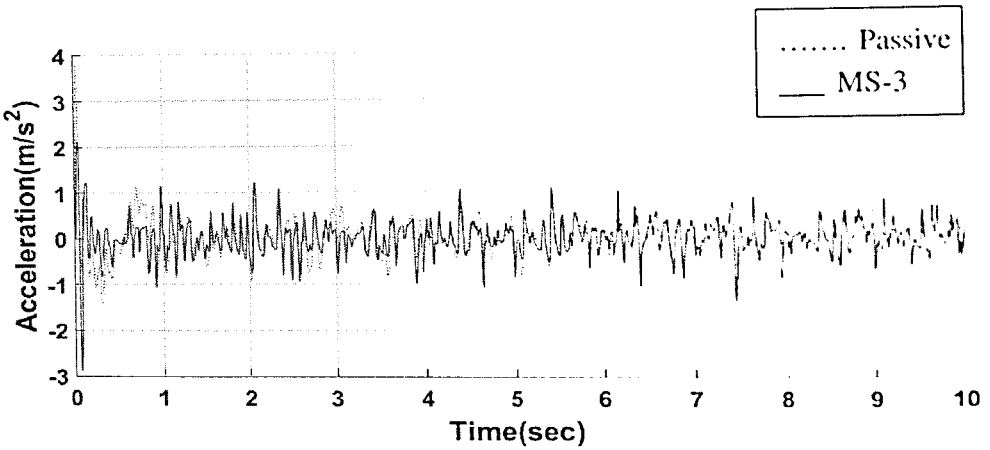


Fig. 5: Body acceleration response of quarter car with MS-3 controller

Fig. 5 represents the acceleration response of MS-3 logic for random road input. In this case, the response of the system almost follows the passive system. However, there are numerous jerks present in this case as well. The magnitude of acceleration is found to be less at some instances and more at others. But its force balancing capability is better, so it can provide better stability.

(b) Body displacement

Body displacement vstime for all the control logics has been demonstrated in Fig. 6. In the figure, it can be noticed that MS-1, MS-2, MS-3 and passive systems are compared with each other.MS-2 gives best results followed by MS-1 and MS-3. Lesser the body displacement, lesser will be the movement of passenger in the vehicle. All the hybrid logics have better performance than passive system in terms of displacement neutralization.

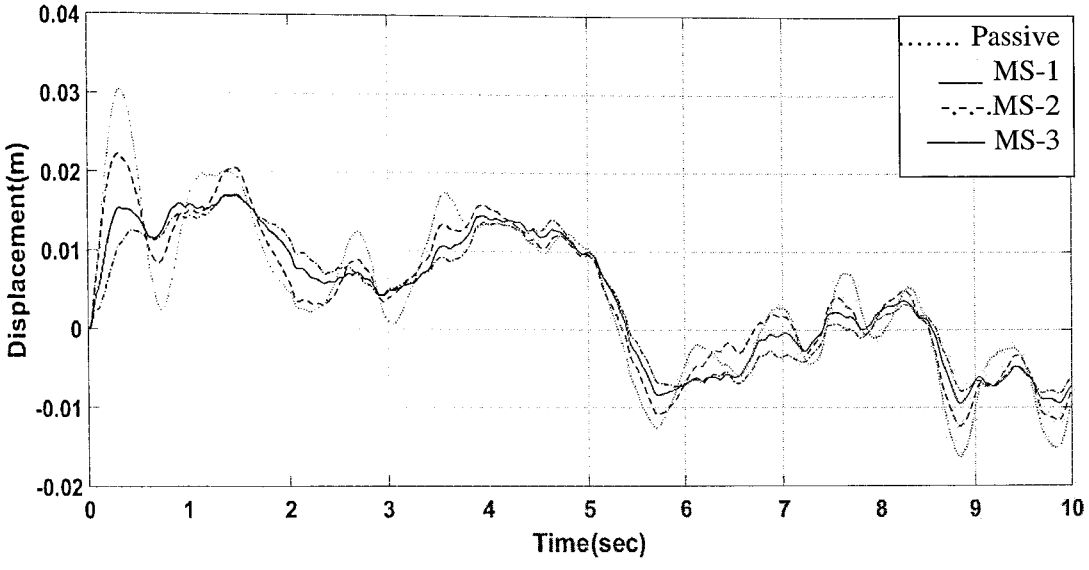


Fig. 6: Body displacement response of mixed logics for quarter car

6. Conclusions

The various models were subjected to a random road input. The results are scrutinized to evaluate the performance of different control logics used for semi-active suspension control. The following conclusions were drawn in this work.

- The computational model of a quarter car model is simulated in MATLAB/SIMULINK environment to create real time situations.
- It is concluded from all plots that the semi active suspension with MS-2 controller gives almost 50% reduction in body acceleration and best initial body displacement.
- The MS-1 controller gives better response when overall results are compared.
- The MS-2 controller gives better performance in terms of safety and even performs better than passive system.
- The mixed controllers i.e. MS-1 and MS-2 gives better results in terms of vertical displacement of the vehicle body. The magnitude and the severity both were found to be less in these cases.

References

Alanoly, J., Sankar, S. (1987):*A new concept in semi-active vibration isolation*, American Society of Mechanical Engineers, Journal of Mechanisms, Transmission, and Automation in Design 109, 242-247.

Alanoly, J., Sankar, S. (1988):*Semi-active force generators for shock isolation*, Journal of Sound and Vibration126 (1), 145-156.

Amin, M. H. I. M., Hudha, K., Kadir, Z. A., Amer, N. H. (2015):*Skyhook Control for 7 DOF Ride Model of Armored Vehicle due to Road Disturbance*, IEEE, 978-1-4799-7862-5/15, 1-5.

Bessinger, F. H., Cebon, D., Cole, D. J. (1995): *Force control of a semi-active damper*, J.Veh. Syst. Dyn. 24, pp. 695–723.

Brogan, William L. (1974): Modern Control Theory (1st ed.). Quantum Publishers, Inc. 172.

Davis, B R, and A G Thompson. (2001): "Spectral Density of Road Profiles." Vehicle System Dynamics 35 (6), .409–415.

E. Guglielmino, T. Sireteanu, C.W. Stammers, G. G. M Giuclea,(2008): Semi-active Suspension Control, Springer,Italy.

Hailong Z., Enrong, W., Fuhong, M., Rakheja, S., Chunyi, S. (2013):*Skyhook-based Semi-active Control of Full-vehicle Suspension with Magneto-rheological Dampers*, Chinese Journal of Mechanical Engineering, Vol. 26, No. 3, 498-505.

Harris, C. M.(1987):*Shock and Vibration Handbook*, Mcgraw-Hill, New York.

Karnopp, D. C. (1990):*Design principles for vibration control systems using semi-active dampers*, American

Society of Mechanical Engineers, Journal of Dynamic Systems, Measurement, and Control112, 448-455.

Karnopp, D. C., Crosby, M. J., Harwood, R. A. (1974) ;*Vibration control using semi-active force generators*, American Society of mechanical Engineers, Journal of Engineering for Industry, 96 (2), 619-626.

Kashem, S. B. A., Ektesabi, M., Nagarajah, R. (2015):*Comparison between different sets of suspension parameters and introduction of new modified skyhook control strategy incorporating varying road condition*, Vehicle System Dynamics, 50:7, 1173-1190.

Liu, Y., Waters, T. P., Brennan, M. J. (2005):*A comparison of semi-active damping control strategies for vibration isolation of harmonic disturbances*, Journal of Sound and Vibration 280 .21-39.

Nguyen, Q. H., Choi, S. B. (2009):*Optimal design of MR shock absorber and application to vehicle suspension*, Smart Mater. Struct. 18, 035012.

Phu, D. X., Choi, S.-M., & Choi, S. B. (2016): A new adaptive hybrid controller for vibration control of a vehicle seat suspension featuring MR damper. Journal of Vibration and Control, (January). 437-458

Raj. R. A., S. Shrivastava and M. W. Trikande,(2015):Modelling and analysis of skyhook and Fuzzy logic controls in semi-active suspension system, *2015 International Conference on Industrial Instrumentation and Control (ICIC)*, Pune,.730-734.

Shamsi, A., Choupani, N. (2008):*Continuous and Discontinuous Shock Absorber Control through Skyhook Strategy in Semi-Active Suspension System (4DOF Model)*, World Academy of Science, Engineering and Technology, International Journal of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing EngineeringVol:2, No:5, 697-701.

Strecker, Z., Mazurek, I., Roupec, J., Klapka, M. (2015):Influence of MR damper response time on semiactive suspension control efficiency, Meccanica50:1949-1959, pp. 674-677.

Strydom, A., Els, P.S. (2014):*The Applicability of Hybrid Control to a Small Off-Road Vehicle without a Differential*, in: Proceedings of the ASME 2014 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2014, August 17-20, 2014, Buffalo, New York, USA, doi:10.1115/DETC2014-34344

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 25–30

BIOLOGICAL SYNTHESIS OF NANOPARTICLES AND THEIR APPLICATIONS : A REVIEW

HARI MADHAV, NEETIKA SINGH, PARAMJIT SINGH, GAUTAM JAISWAR

Abstract : There are number of physicochemical procedures available for the synthesis of nanoparticles but these methods are plenary with many problems including use of toxic solvents, generation of hazardous by-products, and high energy consumption. In this review, to overcome these problems, we are discussing about eco-friendly biological procedures for synthesis of nanoparticles by using organisms such as plants, fungi, bacteria, etc. These methods are eco-friendly and free from toxicity and other problems. The nanoparticles were characterized by TEM, XRD, UV-Vis, FTIR, etc. The synthesized nanoparticles were used in various fields, i.e. - medicine, nanotechnology, electronics, and defense, etc.

Keywords: Nanoparticles, biological synthesis, bacteria, fungi, plants.

Introduction : We heard about "Nano" containing terms in Newspapers, Magazines, Science Reports, and Popular Books, etc., which becomes very familiar to public as well as in non-experts. Then the single question arises that, "What is Nano?"

The word Nano generally used to represent the size in nanometer. To define nanoparticles, there is no international accepted definition available, so every author and every researcher define nanoparticles in their own manner. On the basis of some definitions which are delivered by British Standards Institution, we can say "Nanoparticles are those particles which have at least one or more dimension in nanoscale." The word "Nano" comes from Greek "?a~???" meaning dwarf or in other words very small (Pal et al., 2011). We can define nanoscale as the size of 100 nm or less than 100 nm because in term of diameter, the particles which comes between ranges of 100-2500 nm are called fine particles while size of ultrafine or nanoparticles considered between 1- 100 nm. Nanoparticles show its size related properties due to its small size and large surface area. The size between 1 to 100 nm may be considered as intermediate state between atomic or molecular state and bulk state where materials exhibit some unexpected and usual properties, which cannot be defined by classical laws of physics (Hochellaet al., 2008). These unexpected properties attract the researchers from almost every field include biology, physics, medicine, chemistry, etc. The nanoparticles are synthesized by various chemical methods such as, Sol-Gel, Solvothermal, Chemical Reduction, Laser Ablation,Emulsion Solvent Evaporation, etc. but these methods are fraught with many problems i.e. use of toxic solvents, generation of hazardous by-products which are harmful to environment, high energy consumption, high cost etc. To overcome these problems the new approach is seen in now a days which is the use of biological entities in the synthesis of nanoparticles for e.g. bacteria, actinomycetes, fungi, plants, etc.

History : In other words, nanoparticles are considered as a base of modern nanoscience but nanoparticles have a long background history. In ancient time, nanoparticles had been used in pottery and in medicine. From historical evidence we can see that Gold nanoparticles were used as a drug by Chinese during 2500 BC. Red colloidal gold is still in use under the name of "SwarnaBhasma and Makaradhwaja" in traditional medicine system of India called Ayurveda, which dates back to 1st millennium BC (Bhattacharya *et al.,* 2008). Nanoparticle research is also seen in 9th Century in

Hari Madhav, Neetika Singh, Paramjit Singh, Gautam Jaiswar
Department of Chemistry,
Dr. B. R. Ambedkar University, Agra
E-mail: harimadhavgautam@gmail.com,
E-mail: gjaiswar@gmail.com

Mesopotamia, when artisans used these to generate a glittering effect on the surface of pots. Recent scientific study of a vessel of Roman period (4th century AD) called "Lycurgus Cup," kept in British Museum, London shows the use of Nanoparticles of Gold-Silver alloy for its decoration (Freestone *et al.*, 2007). In 16th Century Europe, an aqueous form of colloidal gold called "Aurum Potabile (drinkable gold)" was thought to have curative properties for many diseases (Caseri, 2000). In last, the credit for nanoparticles concept in modern science is given to Richard P. Feynman to explain the importance of nanoparticles and giving a concept of nanoparticles in his Nobel lecture in 1959 at California Institute of Technology (Caltech) during Annual meeting of the American Physical Society (Feynman, 1959).**Feynman** is often referred as Father of the field of nanoparticle research (Erren, 2007). Later Eric Drexler Published His book "Engines of Creation: The Coming Era of Nanotechnology" which brought Feynman's vision to a broader audience (Wilsdon, 2004). However in last 10-12 years, the dramatic improvement is seen in the development of nanoparticles and in the properties of nanoparticles. There are many nanoparticles have been synthesized in last decade and used in various fields such as drug delivery, medicine, pharmaceuticals, electronics, storage devices, etc.

Chemical Synthesis of Nanoparticles

There are many chemical methods, which are used to synthesize nanoparticles. From them, some are discussed in table 1.

Table 1: Chemical synthesis methods for nanoparticles.

Sol- Gel	Fabrication of metal oxide from a chemical solution which acts as a precursor for integrated network (Gel).
Solvothermal	Polar solvents under pressure and at temperatures above their boiling points are used.
Chemical Reduction	The reduction of an ionic-salt in an appropriate medium in the presence of surfactant using reducing agents formed.
Laser Ablation	At low laser flux, the material is heated by absorbed laser energy and evaporates or sublimates and at higher flux, the material is converted to plasma.
Inert Gas Condensation	Metals are evaporated in separate crucibles inside an ultra-high vacuum chamber filled with Helium or Argon gas at typical pressure of few 100 Pascal. Evaporated metal atoms lose their kinetic energy by collisions with gas atoms and condense in the form of small crystals.
Emulsion-Solvent Evaporation	This is two-step process. The first step requires emulsification of the polymer solution into an aqueous phase and in second step polymer solvent is evaporated. The nanoparticles are collected by ultra-centrifugation and washed with distilled water.
Salting Out	It is based on the separation of a water miscible solvent from aqueous solution via a salting-out effect. Polymer and drug are initially dissolved in solvent which is subsequently emulsified into an aqueous gel containing the salting out agent such as $MgCl_2$, etc.

Biological Synthesis of Nanoparticles

To overcome the problems of chemical methods, researchers are starting to use biological methods for synthesis of nanoparticles. From results of these methods, it seems that these methods are more eco-friendly, cost effective, less production of hazardous by-products, etc. Biological synthesis of nanoparticles comes under the category of bottom up approach where the synthesis of nanoparticles is based on the reaction of reduction/oxidation. The microbial enzymes, or the plant phytochemicals with anti-oxidant or reducing properties are usually responsible for the reduction of metal compounds into their respective nanoparticles. Nature has devised various processes for the synthesis of nano- and micro- length scaled inorganic materials which have contributed to the development of relatively new and largely unexplored area of research based on the biosynthesis of nanomaterials (Mohanpuria*et al.*, 2008). In this type of synthesis, researchers mainly used bacteria, plant extracts, fungi, actinomycetes, etc. which are discussed as below-

Use of Bacteria

For the synthesis of nanoparticles, the use of bacteria

is introduced as a novel approach because the interaction between microorganisms and metals have been well explained and the ability of microorganisms to extract and/or accumulate metals is employed in commercial biotechnological processes such as bioleaching and bioremediation (Gerickeet al., 2006). Microorganisms are generally known as bio-factory to produce nanoparticles either extracellularly or intracellularly. S layer bacteria is well known to produce gypsum and calcium carbonate layers (Shankar *et al.*, 2004). *Pseudomonas stutzeri* AG 259 isolated from silver mines has been shown to produce silver nanoparticles (Mohanpuriaet al., 2008). Recently the Gold nanoparticles are synthesized by using various bacteria i.e. *Pseudomonas aeruginosa* extracellularly (Husseinyet al., 2007), *Rhodopseudomonas capsulate* (He *et al.*, 2007;He *et al.*, 2008), *Escherichia coli* (Du *et al.*, 2007) are reported and the nanoparticles of ZnO by using *Anabaena strains* L31 (Singh *et al.*, 2014) is also reported.

Use of Actinomycetes

Actinomycetes are microorganisms that share important characteristics of fungi and prokaryotes such as bacteria. They were originally designated as ray fungi. It has been observed that, *Thermomonospora sp.* synthesized gold nanoparticles extracellularly when exposed to gold ions under alkaline conditions (Sastryet al., 2003). Duránet al., 2003 also reported that *Fusarium oxysporum* generate stable gold and silver nanoparticles in water.

Use of Fungi

Fungi is one of the important and widely used microorganism to synthesize nanoparticles. Literature shows that fungi may be used for the synthesis of large amount of nanoparticles compare to bacteria. This is due to the fact that fungi secrete more amounts of proteins which directly translate to higher productivity of nanoparticle formation (Mohanpuriaet al., 2008). Synthesis of Gold nanoparticles are reported by many researcher with the help of some fungi such as *V. luteoalbum* (Gerickeet al., 2006), *Colletotrichum sp.* (Shankar *et al.*, 2003). Silver nanoparticles are synthesized by using *Aspergillus niger* (Gadeet al., 2008), *Fusarium sp.* (Singh *et al.*, 2008), *Guignardiamangiferae* (Balakumaranet al., 2015) reported. Biosynthesis of Au-Ag alloy nanoparticles was reported with fungi *Fusariumsemitectum* (Sawleet al., 2008).

Use of Plants

Plants are easily available in nature, they are safe to handle, generally non-toxic or harmful and possess a wide variety of phytochemicals and metabolites that may help in reduction of metals. Due to these advantages, many researchers used plant extract of various plants in the synthesis of nanoparticles. Nanoparticles of Gold are synthesized by using plants i.e. Azadirachtaindica (Shankar et al., 2004), Sargassum sp. (Liu et al., 2005), Lemna minor (Ksarithaet al., 2014). Synthesis of Silver & Gold nanoparticles by using extract of Cinnamomumcamphora (Huang et al., 2007), Memecylonumbellatum leaf (Arunachalamet al., 2013) reported. Synthesis of Silver nanoparticles with the help of plants extract are widely done by many researchers. Pelargonium graveolens (Shankar et al., 2003), Helianthus annus, Basella alba, Oryza sativa, Saccharumofficinarum, Sorghum bicolour, Zea mays (Leelaet al., 2008), Eucaluptushybrida (Dubey et al., 2009), fruit extract of Garcinia mangostana (Rajakannuet al., 2015), Ocimumtenuiflorum, Solanumtricobatum, Syzygiumcumini, Centellaásiatica and Citrus sinensis (Logeswariet al., 2015), Pistaciaatlantica (Sadeghiet al., 2015) are also used for the synthesis of Ag nanoparticles. Synthesis of Pd nanoparticles are also reported by Jiaet al. by using Cinnamomumcamphora leaf extract (Yang et al., 2010). TiO2 nanoparticles were also synthesized by using Nyctanthes leaves extract (Sundarajanet al., 2011). Shendeet al., 2015 synthesized Cu nanoparticles by using the extract of medicinal plant Citrus medica Linn.

Yeast strain MKY3 (Kowshiket al., 2003) is used for Ag nanoparticles & protein Spirulina platensis (Suganayaet al., 2015) used to synthesized Au nanoparticles while enzyme a-amylase used for TiO2 (Ahmad et al., 2015) and Au (Manivasaganet al., 2015) nanoparticles.

Applications

In modern science, nanoparticles are used in almost every field such as in drug delivery system. Silica (Slowing *et al.*, 2007) and Gold (Han *et al.*, 2007) nanoparticles also used in various drug delivery systems. In medical fields, nanoparticles are used in Nano drugs, medical devices, tissue engineering (Ito *et al.*, 2004), etc. Nanoparticles are also used in nanoscale chemicals and compounds for e.g. cosmetics, paints and coatings, etc. The involvement

of nanoparticles is also seen in the materials for e.g. polymer nanocomposites to improve their properties i.e. thermal, antibacterial and conductivity, etc. (Singh *et al.*, 2017; Madhav *et al.*, 2017), chip, etc. In food processing (Weir *et al.*, 2012), nutraceutical food, nanocapsules, and in the field of military and energy such as biosensors (Li *et al.*, 2010), weapons, sensory enhancements, nanoparticles plays a significant role.

The use of nanoparticles is also play an important role in the field of environment and energy in water and air purification filters, fuel cells (Shao-Horn *et al.*, 2007), photovoltaic (Stratakis*et al.*, 2013) etc. They also used in semiconductors, memory storage, etc.

Conclusion

In the last, we can see from the literature is that, these biological methods are eco-friendly, less production of hazardous products, safe to handle, cost effective, etc. We can see from various researches that the nanoparticles are synthesized in very fine range i.e. 2-30nm and when the nanoparticles are synthesized from plant extract then plant extract also plays a role of capping agent, it is a great advantage. The main reaction which is done during the synthesis is reduction/oxidation. When we talk about the Ag nanoparticles then biologically synthesized nanoparticles show more antibacterial effect over the chemically synthesized Ag nanoparticles. We think it may be possible due to the effect of phytochemicals whom capped the nanoparticles during the synthesis. In the last, we can say that the researchers should explore biological methods to get more advantages in the synthesis and applications of nanoparticles. These biological methods may play a major role in the field of nanoparticles in future.

References

Ahmad, R., Mohsin, M., Ahmad, T., Sardar, M. (2015):Alpha Amylase Assisted Synthesis of TiO2 Nanoparticles: Structural Characterization and Application As Antibacterial Agents. *J Hazard Mater, 283*, 171-177.

Arunachalam, K.D., Annamalai, S.K., Shanmugasundaram, H. (2013):One-Step Green Synthesis and Characterization of Leaf Extract-Mediated Biocompatible Silver and Gold Nanoparticles from MemecylonUmbellatum. *Int J Nanomedicine, 8*, 1307-1315.

Balakumaran, M.D., Ramachandran, R., Kalaichelvan, P.T. (2015): Exploitation of endophytic fungus, Guignardiamangiferae for extracellular synthesis of silver nanoparticles and their in vitro biological activities. *Microbiol Res, 178*, 9-17.

Bhattacharya, R., Mukherjee, P. (2008):Biological properties of "naked" metal nanoparticles. Adv Drug Deliv Rev, 60, 1289-1306.

Caseri, W. (2000): Nanocomposites of polymers and metals or semiconductors: Historical background and optical properties. Macromol Rapid Commun, 21, 705-722.

Du, L., Jiang, H., Liu, X., Wang, E. (2007): Biosynthesis of gold nanoparticles assisted by Escherichia coli DH5a and its application on direct electrochemistry of haemoglobin. ElectrochemCommun, 9, 1165-1170.

Dubey, M., Bhadauria, S., Kushwah, B.S. (2009):Green Synthesis of Nanosilver Particles from Extract of Eucalyptus Hybrida (Safeda) Leaf. Dig J Nanomater Bios, 4, 537-543.

Durán, N., Marcato, D.P., De-Souza, G.I.H., Alves. O.L., Esposito, E. (2007):Antibacterial Effect of Silver Nanoparticles Produced by Fungal Process on Textile Fabrics and Their Effluent Treatment. J Biomed Nanotech, 3, 203-208.

Erren, T.C. (2007): Prizes to solve problems in and beyond medicine, big and small: It can work. Med Hypotheses, 68, 732-734.

Feynman, R.P. (1959): in Annual meeting of the American Physical Society, California Institute of Technology, California.

Freestone, Meeks, N., Sax, M., Higgitt, C. (2007): The Lycurgus Cup - A Roman nanotechnology. Gold Bull, 40, 270-277.

Gade, A.K., Bonde, P., Ingle, A.P., Marcato, P.D., Durán, N., Rai, M.K. (2008):Exploitation of Aspergillus Niger for Synthesis of Silver Nanoparticles. J Biobased Mater Bioenergy, 2, 1-5.

Gericke, M., Pinches, A. (2006):Biological Synthesis of Metal Nanoparticles. Hydrometallurgy 83 (2006) 132-140.

Han, G., Ghosh, P., Rotello, V.M. (2007): Functionalized gold nanoparticles for drug delivery. Nanomedicine. 2, 113-123.

He, S., Guo, Z., Zhang, Y., Zhang, S., Wang, J., Gu.

N. (2007): Biosynthesis of Gold Nanoparticles Using the Bacteria Rhodopseudomonas Capsulate. Mater Lett, 61, 3984-3987.

He, S., Zhang, Y., Guo, Z., Gu, N. (2008):Biological Synthesis of Gold Nanowires Using Extract of Rhodopseudomonas capsulate.BiotechnolProg, 24, 476-480.

Hochella, Jr.M.F., Lower, S.K., Maurice, P.A., Penn, R.L., Sahai, N., Donald, L.S., Benjamin, S.T. (2008):Nanominerals, mineral nanoparticles, and Earth systems. Science, 319, 1631-1635.

Huang, J., Li, Q., Sun, D., Lu, Y., Su, Y., Yang, X., Wang, H., Wang, Y., Shao, W., He, N., Hong, J., Chen, C. (2007):Biosynthesis of Silver and Gold Nanoparticles by Novel Sundried CinnamomumCamphora Leaf. Nanotechnology, 18, 105104-105121.

Husseiny, M.I., Aziz, M.A.E., Badr, Y., Mahmoud, M.A. (2007):Biosynthesis of Gold Nanoparticles Using Pseudomonas Aeruginosa. SpectrochimActa Part A, 67, 1003-1006.

Ito, A., Takizawa, Y., Honda, H., Hata, K.I., Kagami, H., Veda, M., Kobayashi, T. (2004): Tissue engineering using magnetite nanoparticles and magnetic force: heterotypic layers of cocultured hepatocytes and endothelial cells. Tissue Eng, 10, 833-840.

Kowshik, M., Ashtaputre, S., Kharrazi, S., Vogel, W., Urban, J., Kulkarni, S.K., Paknikar, K.M. (2003):Extracellular Synthesis of Silver Nanoparticles By A Silver-Tolerant Yeast Strain MKY3. Nanotechnology, 14, 95-100.

Ksaritha, K., Saraswathi, U., Singaravelu, G., Revathi, S., Jayanthi, V. (2014):Biological Synthesis and Characterization of Gold Nanoparticles Using Lemna Minor. Asian J Pharm Clin Res, 7, 165-167.

Leela, A., Vivekanandan, M. (2008):Tapping the Unexploited Plant Resources for the Synthesis of Silver Nanoparticles. Afr J Biotechnol, 7, 3162-3165.

Li, Y., Schluesener, H.J., Xu, S. (2010): Gold nanoparticle-based biosensors. Gold Bull, 43, 29-41.

Liu, B., Xie, J., Lee, J.Y., Ting, Y.P., Chen, J.P. (2005):Optimization of High-Yield Biological Synthesis of Single-Crystalline Gold Nanoplates. J PhysChem B, 109, 15256-15263.

Logeswari, P., Silambarasan, S., Abraham, J. (2015): Synthesis of silver nanoparticles using plants extract and analysis of their antimicrobial property. J Saudi CheSoc, 19, 311-317.

Madhav, H., Singh, P., Singh, N., Jaiswar, G. (2017): Evaluations of Thermal and Antibacterial Properties of Nanocomposites of Functionalized Poly (Methyl Methacrylate) with Different Amino Containing Groups. Macromol Res, doi:10.1007/s13233-017-5076-y.

Manivasagan, P., Venkatesan, J., Kang, K.H., Sivakumar, K., Park, S.J., Kim, S.K. (2015):Production of a-Amylase for the Biosynthesis of Gold Nanoparticlesusing Streptomyces Sp. MBRC-82. Int J BiolMacromol, 72, 71-78.

Mohanpuria, P., Rana, K.N., Yadav, S.K. (2008):Biosynthesis of Nanoparticles: Technological Concepts and Future Applications. J Nanopart Res, 10, 507-517.

Pal, S.L., Jana, U., Manna, P.K., Mohanta, G.P., &Manavalan, R. (2011): Nanoparticle: An overview of preparation and characterization. Journal of Applied Pharmaceutical Science,1, 228-234.

Rajakannu, S., Shankar, S., Perumal, S., Subramanian, S., Dhakshinamoorthy, G.P. (2015):Biosynthesis of Silver Nanoparticles using Garcinia mangostana Fruit Extract and their Antibacterial, Antioxidant Activity. Int J CurrMicrobiol App Sci, 4, 944-952.

Sadeghi, B., Gholamhoseinpoor, F. (2015): A study on the stability and green synthesis of silver nanoparticles using Ziziphoratenuior (Zt) extract at room temperature. SpectrochimActa Part A, 134, 310-315.

Sastry, M., Ahmad, A., Khan, M.I., Kumar, R. (2003):Biosynthesis of Metal Nanoparticles Using Fungi and Actinomycete. CurrSci, 85, 162-170.

Sawle, B.D., Salimath, B., Deshpande, R., Bedre, M. D., Prabhakar, B.K., Venkataraman, A. (2008): Biosynthesis and stabilization of Au and Au–Ag alloy nanoparticles by fungus, Fusariumsemitectum. SciTechnolAdv Mater, doi:10.1088/1468-6996/9/3/035012.

Shankar, S.S., Ahmad, A., Pasrichaa, R., Sastry, M. (2003):Bioreduction of Chloroaurate Ions By Geranium Leaves And Its Endophytic Fungus Yields Gold Nanoparticles Of Different Shapes. J Mater Chem, 13, 1822-1826.

Shankar, S.S., Rai, A., Ahmad, A., Sastry, M. (2004): Rapid Synthesis Of Au, Ag And Bimetallic Au Core-Ag Shell Nanoparticles Using Neem (AzadirachtaIndica) Leaf Broth. J Colloid Interface Sci, 275, 496-502.

Shao-Horn, Y., Sheng, W.C., Chen, S., Ferreira, P.J.,Holby, E.F., Morgan, D. (2007): Instability of supported platinum nanoparticles in low-temperature fuel cells. Top Catal, 46, 285-305.

Shende, S., Ingle, A.P., Gade, A., Rai, M. (2015): Green synthesis of copper nanoparticles by Citrus medica Linn. (Idilimbu) juice and its antimicrobial activity. World J MicrobiolBiotechnol, 31, 865-873.

Singh, A.K., Rathod, V., Singh, D., Ninganagouda, S., Kulkarni, P., Mathew, J., Haq, M.U. (2015): Bioactive Silver Nanoparticles from Endophytic fungus Fusarium sp. Isolated from an Ethno medicinal Plant Withaniasomnifera (Ashwagandha) and its Antibacterial Activity. Int J NanomatBiostruc, 5, 15-19.

Singh, G., Babele, P.P.K., Kumar, A., Srivastava, A., Sinha, R.P., Tyagi, M.B. (2014): Synthesis OfZnO Nanoparticles Using The Cell Extract Of The Cyanobacterium, Anabaena Strain L31 And Its Conjugation With UV-B Absorbing Compound Shinorine. J PhotochemPhotobiol B, 138, 55-62.

Singh, N., Madhav, H., Singh, P., Jaiswar, G. (2017): Compatibility Studies of Polyacrylamide/Nanoclay/ Copper oxide Nanocomposites on the Fluidic Physical Properties for Improvement of Inkjet Printability. Science And Engineering Applications, 2, 112-120.

Slowing, I.I., Trewyn, B.G., Giri, S., Lin, V.S.-Y. (2007): Mesoporous silica nanoparticles for drug delivery and biosensing applications. AdvFunct Mater, 17, 1225-1236.

Stratakis, E., Kymakis, E. (2013): Nanoparticle-based plasmonic organic photovoltaic devices. Mater Today, 16, 133-146.

Suganya, K.S.U., Govindaraju, K., Kumar, V.G., Dhas, T.S., Karthick, V., Singaravelu, G., Elanchezhiyan, M. (2015):Blue Green Alga Mediated Synthesis of Gold Nanoparticles And Its Antibacterial Efficacy Against Gram Positive Organisms. Mater SciEng C, 47, 351-356.

Sundrarajan, M., Gowri, S. (2011):Green Synthesis Of Titanium Dioxide Nanoparticles By Nyctanthes Arbor-Tristis Leaves Extract. Chalcogenide Lett, 8, 447-451.

Weir, A., Westerhoff, P., Fabricius, L., Hristovski, K., Goetz, N.V. (2012): Titanium Dioxide Nanoparticles in Food and Personal Care Products. Environ SciTechnol, 46, 2242-2250.

Wilsdon, J. (2004):The politics of small things: Nanotechnology, risk, and uncertainty. IEEE Technology and Society Magazine, 23, 16-21.

Yang, X., Li, Q., Wang, H., Huang, J., Lin, L., Wang, W., Sun, D., Su, Y., Opiyo, J.B., Hong, L., Wang, Y., He, N., Jia, L. (2010):Green Synthesis of Palladium Nanoparticles Using Broth of CinnamomumCamphora Leaf. J Nanopart Res, 12, 1589-1598.

Agra University Journal of Research : Science
Vol. 1 Issue 2 (May–August, 2017), pp 31–34

HEAVY METALS ESTIMATION IN MEDICINAL PLANTS PRESENT AT DIFFERENT LOCATION OF AGRA CITY

KAVITA CHAUDHARY, SARITA KAUSHIK, GEETHA SINGH AND B.S. SINGH

Abstract : Pollution of soil and water with heavy metal is a major environmental problem. Heavy metal tolerance is the ability of plants to survive concentrations of metals in their environment that are toxic to other plants. Medicinal plants produce marked therapeutic effects on the human body, they accumulate biologically important elements but sometimes they may accumulate toxic heavy metals, such as Pb, Cd, which might interfere with pharmaceutical activity of medicinal plants. During the experimental analysisit was observed in case of estimation of Pb conc. it shown an was increase in *Polyalthia longifolia* (N), in case of Mn estimation, conc. it was maximum in *Eucalyptus globulus* (SW) and minimum conc. in *Withania somnifera* (N) and *Eugenia jambolana* (SW).The *Eucalyptus globulus*(SW) was high conc. and low conc. observed in Eugenia jambolana in case of Ni. In Cr estimation was observed feable decreased from Cannabis (N) to Eugeniajambolana (N). In case of Co estimation conc. was maximum observed in Cannabis sativa (SW) in comparison to other samples of the Agra City.

Keywords: Heavy metals, medicinal plants, AAS, Pb, Cd.

Kavita Chaudhary, Sarita Kaushik
Geetha Singh and B.S. Singh
Department of Botany
St. Johns College, Agra
E-mail:gjaiswar@gmail.com,

Introduction : Increasing industrial production, utilization of fertilizers of natural sources may elevates content of heavy metals in the environment. Heavy metal tolerance is the ability of plants to survive concentrations of metals in their environment that are toxic to other plants. This can be potentially dangerous for human health due to their biotoxicity and high bioaccumulation throughout the food chain(Uraguchi, Watanaba, Yoshitomi, Kiyono, Kunu, 2006). The control of heavy metal contents in medicinal plants represents one of the factors for the evaluation of their quality. Since these plants originate from different growing areas great differences in the uptake and concentrations of heavy metals in the plant tissue can be expected (Dragoja, Mladenovic, Jakovjevic and Mirjana, 2007).

Medicinal plants display diverse pharmacological activities e.g., antimicrobial, adaptive, stimulatory and sedative properties and are used as cholagogic, hypotensive, capillary-enforcing, antiulcer, anticholine sterase, anticancer, spasmolytic, analgesic and analeptic medications (Lovkova, Buzuk, Sokolova, Kliment'eva, 2001). An advantage of medicinal plants is that they provide patients with a complex of natural compounds, have smoother action and are better tolerated than synthetic drugs, and produce few allergic reactions. They do not accumulate and therefore can be administered for a long time. Medicinal plants and phytopreparations are used for therapy and prevention of various human dis

eases, including cardiovascular, gastrointestinal, nervous and skin diseases and even malignancies (Lovkova, Buzuk, Sokolova, Kliment'eva, 2001).

It has been found that certain plants show hyper accumulation, however most of them accumulate only a single metal/metalloid. A few terrestrial plants like *Thlaspi caerulescens* and aquatic like *Ceratophyllm demersum* show potential to hyperaccumulate more than one metal (Prasad, Anuradha, Badarinath, 2005; Brown, Chaney, Angle, Baker, 1995; Mishra, Srivastava, Tripathi, Dwivedi, Shukla, 2008).

In the present studies attempt were made to evaluate the data and compared the accumulation of heavy metal in medicinal plants viz., *Polyalthialongifolia, Eucalyptus globulus, Cannabis sativa, Withania somnifera, Eugenia jambolana* growing under both normal and polluted habitants near Hospital, residential, roadside.

Materials and methods

Medicinal plants leaves were collected from the solid waste areas situated in Agra city, the northern central part of India. Plants samples were firstly wiped with 0.01N HCl and then washed with tap water followed by rinsing with deionised water. The washed leaves were dried in oven at 70° C for 48hrs.

For analysis of heavy metals (Pb, Mn, Ni, Cr, Co and Cd) all the samples were digested with $HClO_4$:HNO_3 (1:4 v/v) and diluted with double distilled water

The study samples in the present investigation was *Polyalthia longifolia, Eucalyptus globulus, Cannabis sativa, Withania somnifera, Eugenia jambolana.* For physico-chemical analysis, the samples were collected from both normal(N) and polluted habitants, i.e. solid waste(SW) near Hospital, residential, roadside. The heavy metals were estimated using AAS spectroscopy.

Results and Discussion : In the case of leadestimation, high conc. was observed in *Cannabis* (SW),*Eucalyptus* (N),*Withania* (N), *Polyalthia* (SW) and *Eugenia jambolana* (N) in comparison to *Cannabis* (N),*Eucalyptus* (SW),*Withania* (SW), *Polyalthia* (N) and *Eugenia jambolana* SW) (as show in Fig 1)

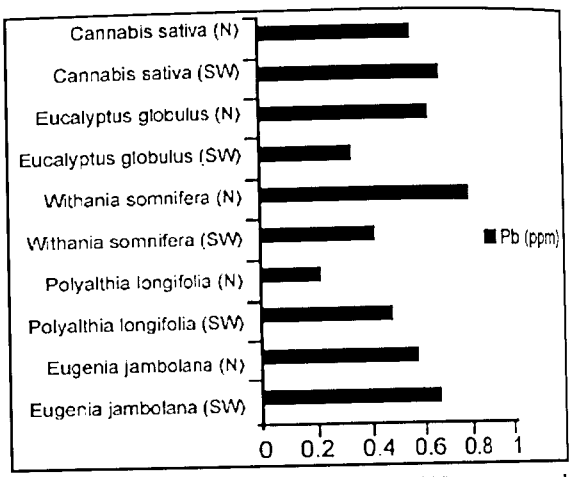


Fig 1: Estimation of Lead in different sample of plants.

In the case of Mn estimation, high conc.was observed in *Cannabis* (N),*Eucalyptus* (SW),*Withania* (SW), *Polyalthia* (SW) and *Eugenia jambolana* (N) comparison to *Cannabis* (SW), *Eucalyptus* (N),*Withania* (N), *Polyalthia* (SW) and *Eugenia jambolana*N) (as show in Fig 2)

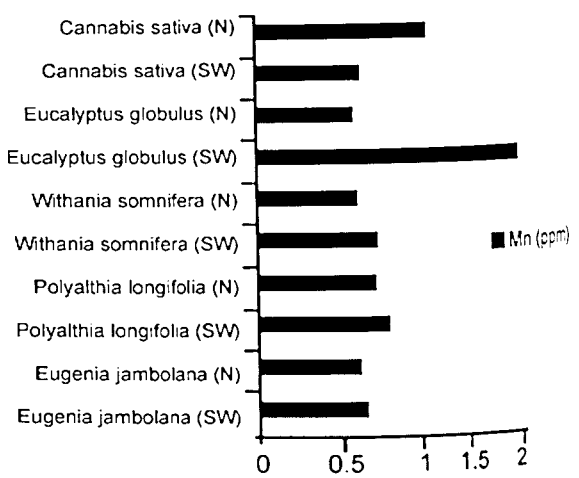


Fig 2: Estimation of Manganese in different sample of plants.

In the case of Niestimation, high conc.was observed in *Cannabis* (SW),*Eucalyptus* (N),*Withania* (N), *Polyalthia* (SW) and *Eugenia jambolana* (SW) comparison to*Cannabis* (N), *Eucalyptus* (SW),*Withania* (SW), *Polyalthia* (N) and *Eugenia jambolena* N) (as show in Fig 3)

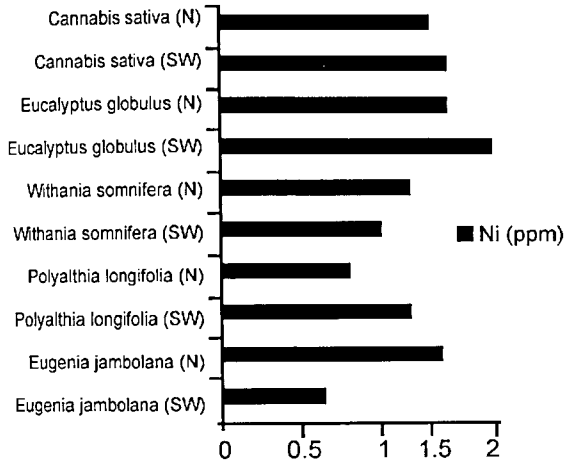


Fig 3: Estimation of Nickel in different sampleof plants.

In the case of Cr estimation, high conc.was observed in *Cannabis* (N), *Eucalyptus* (N),*Withania* (N) &(SW), *Polyalthia* (SW) and *Eugenia jambolana* (N)&(SW) comparison to*Cannabis* (SW), *Eucalyptus* (SW), and *Polyalthia* (N) (as show in Fig 4)

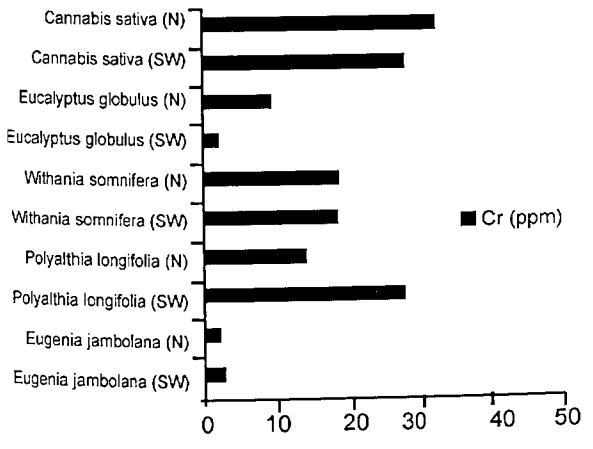


Fig 4: Estimation of Chromium in different sample of plants.

In the case of Co estimation, high conc.was observed in *Cannabis* (N), *Eucalyptus* (N),*Withania* (SW), *Polyanthia* (N) and *Eugenia jambolana* (SW) comparison to *Cannabis* (SW), *Eucalyptus* (N),*Withania* (N), *Polyalthia* (SW) and *Fugenia jambolena* N) (as shown in Fig 5)

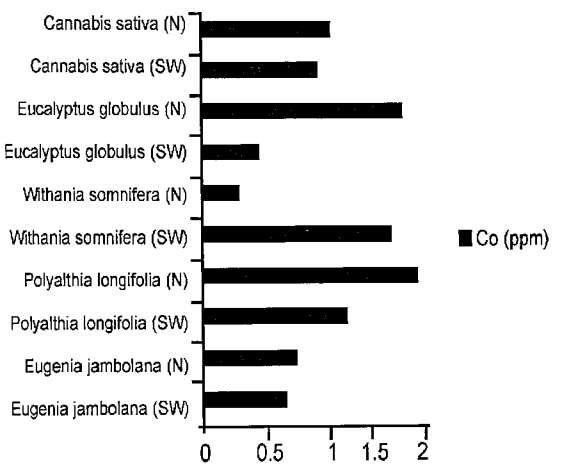


Fig 5: Estimation of Cobalt in different sample of plants.

In the case of Cd estimation, high conc.was observed in *Cannabis* (SW), *Eucalyptus* (SW),*Withania* (SW), *Polyalthia* (SW) and *Eugenia jambolana* (N) comparison to *Cannabis* (N), *Eucalyptus* (N),*Withania* (N), *Polyalthia* (N) and *Eugenia jambolana* (SW) (as show in Fig 6)

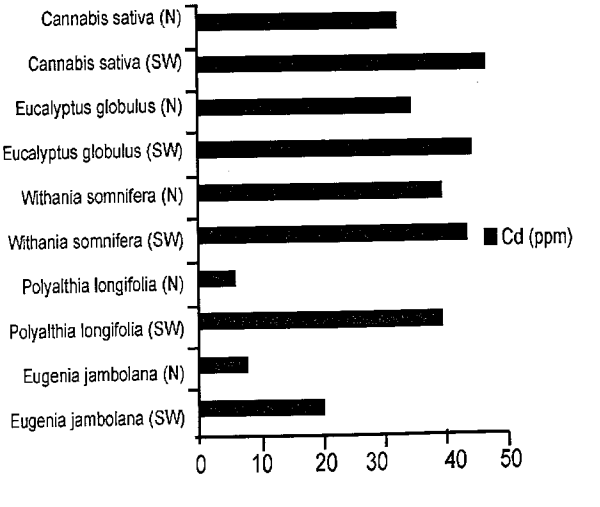


Fig 6: Estimation of Cadmium in different sample of plants.

Conclusions

In the present heavy metals estimation such as: Pb, Mn, Ni, Cr, Co and Cdwas observed, which shows that in case of lead conc. it was observedslightly increase from *Polyanthia* (N) to *Withania*(N). In case of Mn estimation, conc. was maximum observed in *Eucalyptus*(SW) and minimum conc. observed same in *Withania* (N) and *Eugenia jambolana* (SW).The *Eucalyptus*(SW) was high conc.observed and low conc. observed in *Eugenia jambolana*in case of Ni. In Cr estimation was observed feable decreased from *Cannabis* (N) to *Eugeniajambolana* (N). In case of Co estimation. conc. was maximum observed in *Cannabis* (SW)in Comperision to other samples.

References:

Brown, S.L. Chaney, R.L. Angle, J.S. Baker, A.J.M. (1995): Zinc and cadmium uptake by hyperaccumulator *Thlaspi caerulescens* grown in nutrient solution. *Soil Science Society of America Journal*, 59. 125–133.

Dragoja, R. antic – Mladenovic, S. Jakovjevic and Mirjana, K. (2007): Content of heavy metalsin *Gentianaa lutea L.* root and galenic forms. *Journal of Serbian Chemical Soc*iety, 72(2), 133-138.

Lovkova, M.Y. Buzuk, G.N. Sokolova, S.M. Kliment'eva, I. (2001): Chemical features of medicinal plants (Review). *Applied Biochemical Microbiology*, 37, 229-237.

Mishra, S. Srivastava, S. Tripathi, R.D. Dwivedi, S. Shukla, M.K. (2008): Response of antioxidant enzymes in coontail (*Ceratophyllum demersum L.*) plants under cadmium stress. *Environal Toxicology*, 23, 294-301.

Prasad, V.K. Anuradha, E. Badarinath, K.V.S. (2005): Climatic controls of vegetation vigor in four contrasting forest types of India- evaluation from National Oceanic and Atmospheric Administration's Advanced Very High Resolution Radiometer datasets (1990-2000). *International Journal of Biometeorology*, 50, 6-16.

Uraguchi, S. Watanaba, I. Yoshitomi, A. Kiyono, M. Kunu, K. (2006): Characteristic of Cadmium accumulation and tolerance in novel Cd accumulating crops, *Avena strigosa* and *Crotalaria juncia*. *Journal of Experimental Biology*, 57, 2955-2965.

Agra University Journal of Research : Science
Vol. 1 Issue 2 (May–August, 2017), pp 35–42

SYNTHESIS OF SUBSTITUTED IMIDAZOLE DERIVATIVES AS POTENTIAL ANTIBACTERIAL AND ANTICANCER ACTIVITY

POOJA SHARMA AND RAVI SHEKHAR

Abstract : Owing to the wide range of biological activity of imidazole, the synthesis of imidazole from p-aminophenol and aromatic aldehydes which are having antibacterial and anticancer activity. Seven Schiff's bases were synthesized followed by, Seven imidazole. All the reported title compounds were synthesized. This reaction, it involved all the three reactants getting cyclized simultaneously to form the products. All the reactions were performed under solvent conditions irrespective of whether the reagents are liquids or solids using activated silica gel. The activated silica gel was used in the above reactions to absorb the water molecules generated during the course of reaction. All the synthesized title compounds were analyzed by initially performing thin layer chromatography and further determining melting point. Then the synthesized compounds were subjected to spectral analysis such as NMR and Mass.. All the analytical details showed satisfactory results.

Keywords : Imidazole, Schiff base, anticancer activity, antibacterial activity

1. Introduction : It is evident from the preceding account that imidazole derivatives possess a wide spectrum of pharmacological activities like anti-parasitic (Sharma,& Pathak, 2009) analgesic (Sisko,& Mellinger, 2002), anti-inflammatory (Sharma,& Pathak, 2010), platelet aggregation inhibitory, antiepileptic (Kocabalkanli, & Schinazi, 2002), antitubercular (Puratchikodi, Nallu & Gopalakrishnan, 2004), anti-HIV (Reddy et al, 1991), antibacterial and anticancer activities(Sharma,& Pathak, 2010; Kumar &Lown, 2005; Foroumadi, Mirzaei & Shafiee, 2001) *etc.* Furthermore, they act as inhibitors of p38 MAP (mitogen activated protein) kinase, glucagon receptors and therapeutic agents (Siddiqui et al 2005). In 1858, Debus reported the reaction between glyoxal and ammonia. Ever since, this reaction became a novel route for the synthesis of imidazole (Debus,&*Chem*, 1858). Later, a number of articles have described the synthesis of imidazoles and their medicinal significance(Sarshar, Siev, Mjalli, 1996; Balalaie& Arabanian, 2000; Usyatinsky, & Khemelnitsky, 2000).

On the basis of the above observations, attempts have been made to synthesize novel aryl imidazoles which are incorporated with the chemotherapeutic pharmacophores such as PABA (*p*-aminobenzoic acid), INH (isoniazid) and *p*-amino phenol as possible antibacterial and anticancer agents.

In view of the medicinal importance of imidazole as anti-inflammatory, antiepileptic, antiamoebeic, antitubercular, antibacterial and antiulcer agents, it was worthwhile to study and synthesize such compounds which possess imidazole moiety. It was pertinent to investigate their structural modification. Early antibiotics, which were developed by screening in the 1940's and 1950's and beyond, were all natural products including Penicillin & Cephalosporin, which have been an important source of antimicrobial agents till today. Recent interest has been rekindled in the screening approach by the discovery of naturally occurring antimicrobial peptides. These include peptides known as Cathelicidins, which are found in mammalian skin and other tissues and pescidins, which are found in the mast cells of fish. Another new route for the development of natural products from soil has been proposed.

(Sharma,& Pathak, 2010) Chemical synthesis can be used to make fundamentally new structures that might act at different bacterial targets to those already identified. Drugs arising from such approaches include the quinazolinones, oxazolidinones and ketolides (Sharma, & Pathak, 2010).

Pooja Sharma and Ravi Shekhar
Department of Pharmacy
Dr. B. R. Ambedkar University, Agra

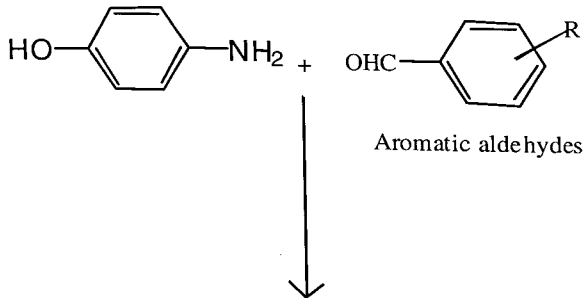
The overall problem with classic screening coupled with assays that use actively multiplying bacteria is that bacterial resistance arises soon after the new antimicrobial agent is widely used in the community. This means that it is necessary to produce new antimicrobial agents that have different mechanisms of action at regular intervals to meet the market demand. Cancer (medical term: malignantneoplasm) is a class of diseases in which a group of cells display uncontrolled growth (division beyond the normal limits), invasion (intrusion on and destruction of adjacent tissues) and sometimes metastasis (spread to other locations in the body via lymph or blood). These three malignant properties of cancers differentiate them from benign tumors, which are self-limited, do not invade or metastasize. Most cancers form a tumor but some, like leukemia, do not. The branch of medicine concerned with the study, diagnosis, treatment, and prevention of cancer is oncology. (Sharma & Pathak, 2009)

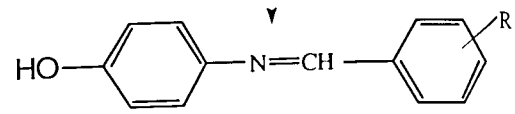
2. Material and Method

Table I : General Properties of Imidazole

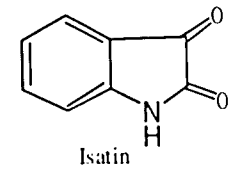
Systematic name	1,3-diazole
Others name	Imidazole 1,3-diazacyclopenta-2, 4-diene
Molecular formula	$C_3H_4N_2$
Molar mass	68.07726
Appearance	White or pale yellow
Density	1.116 ± 0.06 g/cm^3
Solubility in water	Miscible
Melting point	362-364 K
Boiling point	529 K
Composition	C (52.93%), H (5.92%), N (41.15%)
Average Mass	68.0773 Da

Scheme



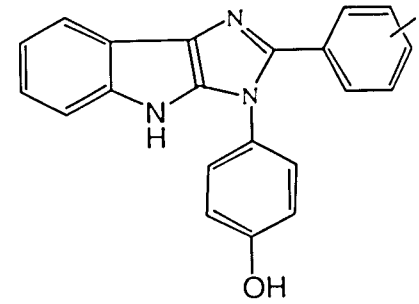


Schiff's base



Isatin

NH_4OAC



1. R = 2-hydroxy
2. R = 3-hydroxy
3. R = 4-hydroxy
4. R = 2-chloro
5. R= H
6. R = 4-chloro
7. R = 3-nitro

Preparation of substituted imidazole conv:[C], glacial acetic acid, dichloromethane and silica gel, refluxed: 6 hr at 50-60° C. Conv; [D], isatin, ammonium acetate, refluxed with stirring 6 hr at 50-60° C.

2.1. Procedure

STEP-I : Preparation of schiff's base from p-aminophenol and aromatic aldehyde

Equimolar amounts (0.01 mole) of p-aminophenol and aromatic aldehyde were transferred to a 250-mL flat bottom flask containing 1.5 ml of glacial acetic acid to serve as a solvent along with dichloromethane and silica gel, then refluxed with stirring for about 6 hr at 50-60° C. After completion of the reaction, the reaction mixture was allowed to cool to give a corresponding product.The completion of reaction was monitored by running TLC using 10 % methanol in chloroform as a solvent. Based on the TLC data the reaction mixture were withdrawn and without the

workup the reaction mixture were used for the next step.

STEP-II : Preparation of imidazole compounds from schiff's Bases

Schiff's base (0.01 mol), isatin (0.01 mol) and excess of ammonium acetate (1mol, added in 3 parts) were transferred into a 100 ml beaker, then refluxed with stirring for about 6 hr at 50-60° C. After completion of the reaction, the reaction mixture was allowed to cool to give a corresponding product. The completion of reaction was monitored by through TLC using 10% methanol in chloroform and 1 to 2 drops petroleum ether. Then the reaction mixture was washed with 2 x 5 ml of water to remove traces of any unreacted ammonium acetate, further extracted with ethyl acetate and finally recrystallized from 70 % methanol in water.

2.2. Determination of melting point range

Melting points of the newly synthesized compounds were determined by open capillary method using the melting point apparatus. Compounds were placed in one end sealed capillary and placed in the cave made for the capillary. Thermometer was placed in the cave. The temperature at which compounds start melting to the temperature at which it completely melts, was recorded as the melting point range.

2.3. Thin layer chromatography of compounds

Thin layer chromatographic analysis of compounds was performed on silica gel-G coated glass plates. The adsorbent silica gel-G was coated to a thickness of about 0.3 mm on previously cleaned TLC plates by pouring method. The plates were placed in hot air oven at 105 ^{0}C for 30 min. The solution of compounds was applied as a spot on the activated plate about 2cm above from the lower edge. The mobile phases were selected according to the polarity of the compounds Chloroform: Methanol (9:1) was used as mobile phase. The spots were visualized by exposure to iodine vapors.

2.4. Solubility studies

Various solvents such as water, ethanol, chloroform, ether, benzene, carbon tetrachloride, dimethyl formamide (DMF) and dimethylsulphoxide (DMSO) were taken for dissolving the intermediates and final products. 10 mg of each compound was weighed and added to 10 ml of each solvent individually taken in 50 ml beaker.

Spectral analysis

2.5. H NMR Spectral analysis

^{1}H NMR Spectra of compounds was recorded on Bruker Advance II 400 NMR in DMSO using TMS as internal standard (Chemical shift d in ppm).

2.6. Mass Spectral analysis

Mass spectrum of the compounds was obtained using MS (Schimadzu-2010AT, Software-class VP).

3. Result and discussion

Owing to the wide range of biological activity of imidazoles, we synthesize imidazoles from p-aminophenol and aromatic aldehydes which are having antibacterial activity. Seven Schiff's bases[20] were synthesised followed by, Seven imidazoles (Compound No. SP1 to SP7). All the reported title compounds were synthesized. This reaction, it involved all the three reactants getting cyclised simultaneously to form the products.

All the reactions were optimized for both the temperature and reaction time conditions. All the reactions were performed under solvent conditions irrespective of whether the reagents are liquids or solids using activated silica gel. The activated silica gel was used in the above reactions to adsorb the water molecules generated during the course of reaction.

All the synthesized title compounds were analyzed by initially performing thin layer chromatography, determining melting point and solubility studies (shown in table-II and III) All the analytical details showed satisfactory results. All the synthesised compounds were screened for antibacterial activity against gram positive bacteria and gram negative bacteria. All compounds showed antibacterial activity 100 µg concentration. SP1 is more potent against Escherichia coli, whereas compound SP6 is more potent against Bacillus subtilis(shown in table-VII) All the synthesised compounds were screened for in vitro anticancer activity using DLA cell lines. Compounds showed moderate CTC50 values under in vitro anticancer screening using DLA cell line. Compounds showed good CTC50 values under in vitro anticancer screening using cell line

Table-II : Physical and analytical data of compounds (SP1-SP7)

Comp. No.	Molecular formula	Molecular Weight	R_f value	M.P (°C)
SP1	$C_{21}H_{15}N_3O_2$	341.36	0.70	102
SP2	$C_{21}H_{15}N_3O_2$	341.36	0.71	136
SP3	$C_{21}H_{15}N_3O_2$	341.36	0.70	185
SP4	$C_{21}H_{14}ClN_3O$	359.81	0.69	222
SP5	$C_{21}H_{14}ClN_3O$	359.81	0.72	270
SP6	$C_{21}H_{14}N_4O_3$	370.36	0.71	300
SP7	$C_{21}H_{15}N_3O$	325.36	0.73	200

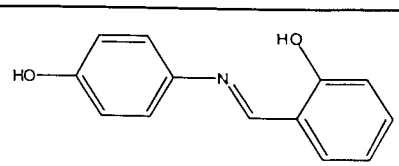
Table-III : Solubility of synthesize compounds

Compound no.	Water	Methanol	Chloroform	Ether	Benzene	Carbon Tetrachlo-ride	DMF	DMSO
SP1	Insoluble	Soluble	Soluble	Insoluble	Insoluble	Insoluble	Soluble	Soluble
SP2	Insoluble	Soluble	Soluble	Insoluble	Insoluble	Insoluble	Soluble	Soluble
SP3	Insoluble	Soluble	Soluble	Insoluble	Insoluble	Insoluble	Soluble	Soluble
SP4	Insoluble	Soluble	Soluble	Insoluble	Insoluble	Insoluble	Soluble	Soluble
SP5	Insoluble	Soluble	Soluble	Insoluble	Insoluble	Insoluble	Soluble	Soluble
SP6	Insoluble	Soluble	Soluble	Insoluble	Insoluble	Insoluble	Soluble	Soluble
SP7	Insoluble	Soluble	Soluble	Insoluble	Insoluble	Insoluble	Soluble	Soluble

Table IV : Antibacterial activity of synthesized compounds showing zone of inhibition

	Escherichia coli			*Bacillus subtilis*		
CONC.	**25µg ml^{-1}**	**50µg ml^{-1}**	**100µg ml^{-1}**	**25µg ml^{-1}**	**50µg ml^{-1}**	**100µg ml^{-1}**
SP1	**7.6±0.12**	**11.7±0.07**	**12.4±0.17**	5.5±0.14	6.1±0.15	7.63±0.10
SP2	5.7±0.15	7.6±0.08	10.6±0.05	8.4±0.10	9.6±0.08	11.5±0.23
SP3	3.5±0.05	5.1±0.11	7.1±0.06	6.3±0.18	8.5±0.15	10.1±0.05
SP4	4.3±0.11	5.7±0.15	7.6±0.05	5.3±0.23	7.7±0.04	9.7±0.03
SP5	5.3±0.17	8.4±0.08	12.3±0.20	8.1±0.15	9.6±0.12	11.6±0.8
SP6	3.7±0.08	5.5±0.10	7.4±0.14	**11.4±0.21**	**13.5±0.16**	**15.7±0.1**
SP7	7.5±0.11	8.6±0.14	9.6±0.16	**8.1±0.14**	**9.3±0.13**	**11.4±0.05**
Amoxycillin	-		23.3±0.13	-	-	27.5±0.49

Table V : The yield and time (hr) duration of different intermediate compounds

Compound No.	IUPAC name	Molecular structure	Time (hr)	Yield (%)
SP1.	4-(E)- (2-hydroxybenzyliden eamino) phenol		6	70.1

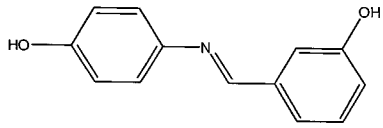
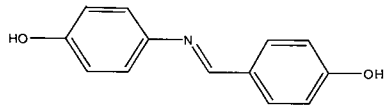
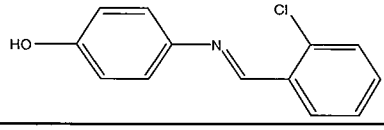
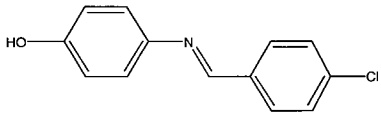
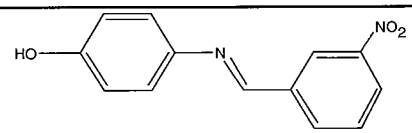
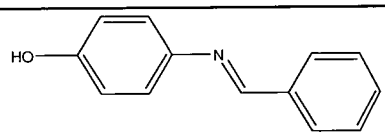
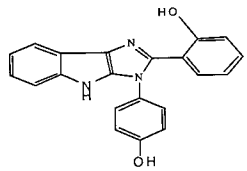
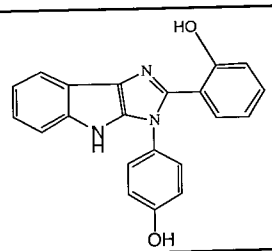
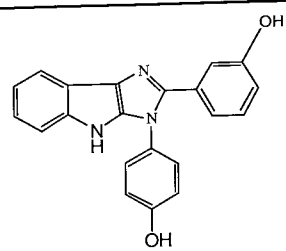
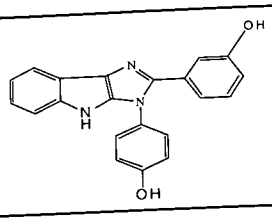
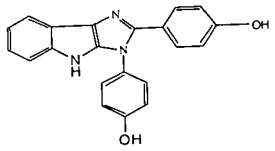
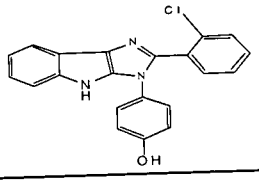
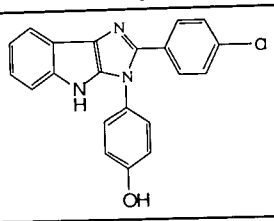
SP2.	4-(E)- (3-hydroxybenzyliden eamino) phenol		6	72.3
SP3	4-(E)- (4-hydroxybenzyliden eamino) phenol		6	75.4
SP4.	4-(E)- (2-chlorobenzylidenea mino)phenol		6	71.1
SP5.	4-(E)- (4-chlorobenzylidenea mino)phenol		6	70.3
SP6.	4-(E)- (3-nitrobenzylideneam ino)phenol		6	69.1
SP7.	4-(E)-(benzylideneamino) phenol		6	72.5

Table-VI : The yield and time (hr) duration of different final compounds

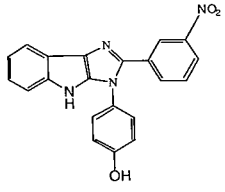
Compound No.	IUPAC name	Molecular structure	Time (hr)	Yield (%)
SP1	2-(2-hydroxyphenyl)-3-(4-hydroxyphenyl) imidazo (4,5-b)indol		6	52.5
SP2	2-(3- hydroxyphenyl)-3-(4-hydroxyphenyl) imidazo (4,5-b)indol		6	51.0
SP3	2,3-(4- dihydroxy phenyl)imidazo (4,5-b)indol		6	50.97

SP4	2-(,2-chlorophenyl)-3-(4-hydroxyphenyl) imidazo(4,5-b)indol		6	60.35
SP5	2-(4-chlorophenyl)-3-(4-hydroxyphenyl) imidazo(4,5-b)indol		6	50.25
SP6	2-(3-nitrophenyl) -3-(4-hydroxyphenyl) imidazo(4,5-b)indol		6	60.22
SP7	2-phenyl (3-(4-hydroxyphenyl)imidazo (4,5-b)indol		6	61.20

3.1. Spectral analysis

NMR and MASS values for the synthesized compounds.

Comp.SP1

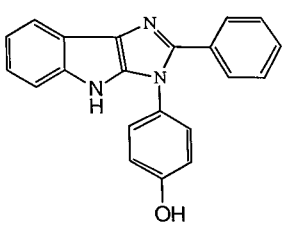


NMR (DMSO) d: 5.3 (s, 2H, Aromatic OH), 6.7-7.52 (m, 12H, Ar-H), 9.7 ppm (s, 1H, NH).

MS (M/Z): M+1 peak found, 340.1 (M+1 peak calculated, 341).

Calcd. for $C_{21}H_{15}N_3O_2$: C, 73.89; H, 4.43; N, 12.31; O, 9.30.

Comp.SP2

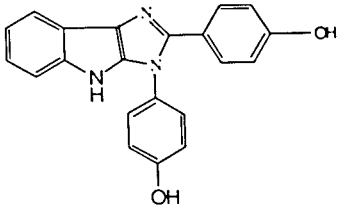


NMR (DMSO) d: 5.3 (s, 2H, Aromatic OH), 6.7-7.52 (m, 12H, Ar-H), 9.9 ppm (s, 1H, NH).

MS (M/Z): M+1 peak found, 340.1(M+1 peak calculated, 341).

Calcd. for $C_{21}H_{15}N_3O_2$: C, 73.89; H, 4.43; N, 12.31; O, 9.30.

Comp.SP3

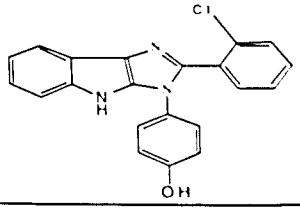


NMR (DMSO) d:.5.4 (s, 2H, Aromatic OH), 6.7-7.52 (m, 12H, Ar-H), 10.2 ppm (s, 1H, NH)

MS (M/Z): M+1 peak found, 340.1 (M+1 peak calculated, 341).

Calcd. for $C_{21}H_{15}N_3O_2$: C, 73.89; H, 4.43; N, 12.31; O, 9.30.

Comp.SP4

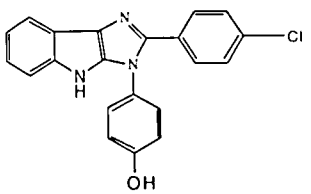


NMR (DMSO) d: 5.2 (s, H, Aromatic OH), 6.7-7.52 (m, 12H, Ar-H), 9.6 ppm (s, 1H, NH).

MS (M/Z): M+1 peak found, 358.1 (M+1 peak calculated, 359).

Calcd. for C21H14 CLN3O: C, 70.10; H, 3.92; CL, 9.85; N, 11.68; O, 4.45

Comp.SP5

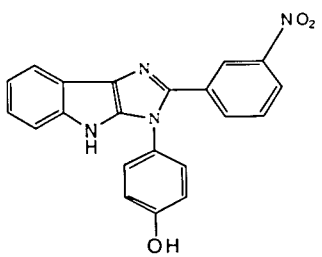


NMR (DMSO) d: 5.3 (s, H, Aromatic OH), 6.7-7.52 (m, 12H, Ar-H), 9.8 ppm (s, 1H, NH).

MS (M/Z): M+1 peak found, 358.1 (M+1 peak calculated, 359).

Calcd. for $C_{21}H_{14}$ CLN_3O: C, 70.10; H, 3.92; CL, 9.85; N, 11.68; O, 4.45.

Comp.SP6

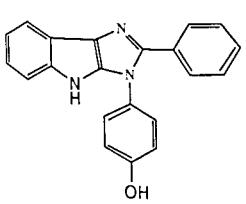


NMR (DMSO) d: 5.2 (s, H, Aromatic OH), 6.7-8.32 (m, 12H, Ar-H), 9.14 ppm (s, 1H, NH).

MS (M/Z): M+1 peak found, 370.1 (M+1 peak calculated, 370.11).

Calcd. for $C_{21}H_{14}$ N_4O_3: C, 68.10; H, 3.81; N, 15.13; O, 12..96.

Comp.SP7



NMR (DMSO) d: 5.2 (s, H, Aromatic OH), 6.7-7.52 (m, 12H, Ar-H), 9.6 ppm (s, 1H, NH).

MS (M/Z): M+1 peak found, 325.1 (M+1 peak calculated, 325.12).

Calcd. for C21H15 N3O: C, 77.502; H, 4.65; N, 12.91; O, 4.92.

3.2. Anticancer Screening

Short-term anticancer activity of the newly synthesized compounds were assessed by determining the percentage inhibition of Dalton's Lymphoma Ascites cells (DLA cells) and using Tryphan blue dye exclusion technique. DLA cells were cultured in the peritoneal cavity of healthy albino mice by injecting the suspension of DLA cells (1 x 106cells/ml) intraperitoneally. The cells were withdrawn from the peritoneal cavity of the mice between 15-20 days with the help of sterile syringe.

3.3. Antibacterial screening Determination of zone of inhibition by cup plate method

The synthesised compounds were subjected to *in vitro* antibacterial screeningby agar plate method for determining the bacterial growth inhibition at the concentration of 100 µg/well

Bacteria's used

Bacillus subtilis (Gram positive)

Escherchia coli (Gram negative)

Standard drug used

Amoxycillin

Solvent (Control)

DMSO

Culture media

Nutrient Agar

The synthesized compounds were subjected to antibacterial screening by agar plate method. The minimum inhibitory concentrations of the active compounds were estimated serial dilution technique. The antibacterial activity of synthesized compounds was tested against gram positive and gram negative bacteria.

Acknowledgements:

The authors are thankful to The Director CDRI Lucknow for analyzing data and spectral measurement of the compound.

References:

Abbate F, CasiniA, Owa T, Scozzafava A & Supuran C T, (2004), *Bioorg Med Chem Lett*, 14, 217.

Aceret T L, Coll J C, Uchio Y & Sammarco P W, (1998),*Pharmacol Toxicol Endocrinol*, 120, 121.

Balalaie S & Arabanian A. (2000):*Green Chem*, 2, 274.

Balalaie S, Hashemi M M & Akhbari M. (2003):*Tetrahedron Lett*, 44, 1709.

Bauer A W, Kirby W M, Sherris J C & Turck M. (1966):*Am J Clin Pathol*, 45, 493.

Bhaskar V H, Puli K, Sangameswaran B & Jayakar B (2006):*Indian J Heterocycl Chem*, 15, 299.

Debus H. ,(1858):*Justus Liebigs Ann Chem* 107,199.

Fioravanti R, Biava M, Porretta G C, Artico M, Lampis G, Deidda D & Pompei R (1997):*Med Chem Res*, 7,87.

Foroumadi A, Asadipour A, Mirzaei M, Karimi J & EmamiS. (2002):*Il Farmaco*, 57, 765.

Foroumadi A, Mirzaei M & Shafiee A(2001):*Il Farmaco*, 56,621.

Helmick R A, Fletcher A E, Gardner A M, Gessner C R, Hvitved A N, Gustin M C & Gardner P R (2005):*Antimicrob Agents Chemother*, 49, 1837.

Kocabalkanli A & Schinazi R F. (2002):*Il Farmaco*, 57, 993.

Kumar B R P, Sharma G K, Srinath S, Noor M, Suresh B & Srinivasa B R (2009):*J. Heterocycl Chem*, 46, 278.

Kumar R &Lown J W (2005):*European Journel of Medicinal Chemistry*, 40,641.

Kuttan R, Bhanumathy P, Nirmala K & George M C. (1985):*Cancer Lett*, 29, 197.

Puratchikodi A, Nallu M & Gopalakrishnan S (2004):*Indian Journal of Heterocycl Chem*, 14,149.

Raghavendra N M, Thampi P, Gurubasavarajaswamy P M & Sriram D. (2007): *Chem Pharm Bull*, 55,1615.

ReddySastryCV,SrinivasaRaoK,RastogiK&JainML. (1991):*Indian Journel of Chemistry*, 30, 480.

Sarshar S, Siev D & Mjalli A M M (1996):*Tetrahedron Lett*, , 37,835.

Sharma G K & Pathak D. (2009):*Indian Journal of Heterocyclic Chemistry*, 19, 203.

Sharma G K & Pathak D (2010):*Letters in Drug Design and Discovery*, 7, 128.

Sharma G K & Pathak D,(2010):*Chemistry of Pharmaceutical Bulletin*, 58, 375.

Siddiqui S A, Narkhede U C, Palimkar S S, Daniel T, Lahoti R J & Srinivasan K V (2005):*Tetrahedron*, 61,3539.

Sisko J & Mellinger M. (2002):*Pure and Applied Chemistry*, 74, 1349.

Usyatinsky A Y & Khmelnitsky Y L. (2000):*Tetrahedron Lett*, 41,5031.

Usyatinsky A Y & Khemelnitsky Y L. (2000):*Tetrahedron Lett*, , 41, 5031.

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 43–47

IMPLEMENTATION OF QUANTUM GATES USING MATLAB FOR QUANTUM NEURAL NETWORK

KISHORI RADHEY & MANU PRATAP SINGH

Abstract:
In this work, we are exploring the possibilities to use the Quantum Gates for the Quantum Neural Network Modelling. Since the Quantum information can be processed as a Unitary Operation, the Quantum Gates are used as Unitary Matrices, defining the reversible Quantum Operations. We have applied various Quantum Gates to implement the mathematical model of Quantum Neural Network using the MATLAB and analysed the suitability of each to select the Quantum Gate as an operator for the Quantum Neural Network (QNN). Results obtained using the Operators are compared and problem occurred during the implementation of Quantum Neural Network are discussed.

Keywords : Quantum Gates; Entanglement; QNN; Perceptron

1. Introduction : With the overwhelming success in the field of quantum information in the last decades,quantum entanglement (Feynman, 1982) has played a vital role in the fields of quantum information theory (Shor, 1994;Grover, 1997) computers (Simon, 1997):, universal quantum computing network (Ezkov, Nifanava, and Ventura, 2000), teleportation (Li, Nie, Hong, Yi, and Huang, 2008), dense coding (Huang, Li, and Nie, 2009; Li, 2012), geometric quantum computation (Wang,Wu, Feng, Kwek, Lai, Oh, and Vedral, 2007; Wang,2009) and quantum cryptography (Jennewein, Simon, Weihs, Weinfurter, and Zeilinger, 2000; Naik, Peterson, White, Burglund, and Kwiat, 2000;Tittel, Bendel, Zbinden, and Gisin, 2000). The reason behind its consideration is the fact that since quantum states exist as superposition, these correlations exist in superposition as well and when superposition is destroyed, the proper correlation is somehow communicated between the qubits (Tan, Zhang, and Li,2011). It is this communication that is the crux of entanglement. Entanglement is one of the key resources required for quantum computation and hence the experimental creation and measurement of entangled states is of crucial importance for various physical implementations of quantum computers. The generation of quantum entanglement among spatially separated particles requires non-local interactions through which the quantum correlations are dynamically created (Smirne, Breuer, Piilo, and Vacchini, 2010).

Ventura and Martinez have built (Ventura, and Martinez, 2000).Quantum Associative Memory (QuAM) is an important tool for pattern recognition, where the stored patterns are considered as the basis states of the memory quantum states. They used a modified version of well-known Grover's quantum search algorithm (Grover, 1997) in an unsorted database as the retrieval algorithm. Therefore, to overcome the limits of this model to only solve the completion problem by doing data retrieving from the noisy data,Ezhov et al have used (Ezkov,Nifanava, and Ventura, 2000) an exclusive method of quantum superposition and Grover's algorithm (Grover, 1997) with distributed queries. Thus QuAM is the realization of extreme condition of using many Hopfield networks (Hopfield, 1982), each storing a single pattern in parallel quantum universes. New situations like Quantum Hopfield Networks and Quantum Associative memory opened the doors for the development of Quantum Neural Networks (QNN) which are Artificial Neural Networks (ANN) functioning according to quantum laws.In this paper we have considered the conventional single layer feed-forward neural network and proposed its equivalent single layer quantum perceptron.The perceptron is a fundamental building block for various

Kishori Radhey & Manu Pratap Singh
Department of Computer Science,
Dr. B R. Ambedkar University, Agra (U.P.)
k.radhey2011@gmail.com,
manu_p_singh@hotmail.com

machine learning models including neural networks and support vector machines. In this paper, we are presenting the basic quantum neural network models, quantum gates(Ventura, 2001) and exhibit the method of quantum perceptron neural network model for generating the solution of pattern classification problem for 2-qubit system.

2. Quantum Computing

A simple two- state quantum system is the basic unit of quantum computation: quantum-bit (qu-bit) exhibits the two states i.e |0> state and |1>state . Smallest unit of information stored in a two-state quantum computer is called a qu-bit. If there is a system of m qu-bits, it can represent2^m states at the same time.

Qubit is simply a two-level system with generic state as

$$|\psi> = \alpha|0> + \beta|1>, \qquad (2.1)$$

a two-dimensional complex vector, where are complex coefficients specifying the probability amplitudes of corresponding states such that

$$|\alpha|^2 + |\beta|^2 = 1 \qquad (2.2)$$

and the vector representation is

$$[\alpha\ \beta]' = \begin{vmatrix}\alpha\\ \beta\end{vmatrix} \qquad (2.3)$$

Similarly the vector representation of 2 qubit in superposition

$|\psi> = [\alpha_1|00> + \alpha_2|00> + \alpha_3|00> \alpha_4|00>], (2.4)$ is

$$[\alpha_1\ \alpha_2\alpha_3\ \alpha_4] = \begin{vmatrix}\alpha_1\\ \alpha_2\\ \alpha_3\\ \alpha_4\end{vmatrix} \qquad (2.5)$$

|0> can be represented in 1-qubit system as $[1\ 0]^T$ and |1> can be represented as $[0\ 1]^T$, whereas as we know 0 in 2 qubit system is |00> , 1 is |01>, 2 is |10> and 3 is |11>. Similarly werepresent 0, 1, 2 and 3 in 2-qubit as $[1\ 0\ 0\ 0]^T$,$[0\ 1\ 0\ 0]^T$, [0 0 1 0] and [0 0 0 1] respectively.

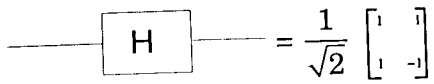
3. Quantum Gates

Quantum logic gate which acts on n qubits is represented by a $2^n \times 2^n$ matrix that must be unitary in nature. The term unitary is a category of matrices i.e. $W^+ = W$ (complex conjugate). The action of the particular quantum logic gate can be obtained by multiplying the corresponding matrix representation of gate with vector of the quantum state.

There are various quantum gatesacting on a single qubit, but some of the popular gates are as follows:

(1) Hadamard Gate (H Gate)

Here we show the notation and the unitary matrix of a very important quantum gate – the Hadamard gate. This is a "truly quantum" gate, which is used in our proposed single layer feed-forward neural network.



Handamard Gate

$$H = \frac{1}{\sqrt{2}}\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix}$$

Hadamard gate notation and its unitary matrix.

When gate H is applied to a basis quantum state |0ñ we calculate the output quantum state by multiplying its matrix by the vector of the input state:

$$\frac{1}{\sqrt{2}}\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix}\begin{bmatrix}1\\ 0\end{bmatrix} = \frac{1}{\sqrt{2}}\begin{bmatrix}1\\ 1\end{bmatrix} = \frac{1}{\sqrt{2}}|0\rangle + \frac{1}{\sqrt{2}}|1\rangle$$

α_1The output is therefore a superposition of basis states.

α_2(2) Pauli-X gate (NOT Gate, also known as bit flip gate, or X) - This flips a bit from 0 to 1 and vice

$\alpha_3$versa.

α_4

$$\text{NOT} = \begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$$

(3) Pauli-Y gate- It equates to a rotation around the Y-axis of the Bloch Sphere by p radians. It maps |0> to i|1> and |1> to -i|0>. It is represented by the Pauli Y matrix:

$$Y = \begin{bmatrix}0 & -i\\ i & 0\end{bmatrix}$$

(4) Phase Flip, also known as Z (Pauli Z)-It equates to a rotation around the Z-axis of the Bloch Sphere by p radians.The gate can be represented as

$$Z = \begin{bmatrix}1 & 0\\ 0 & -1\end{bmatrix}$$

4. Quantum Perceptron Model

Aclassical perceptron [ ] with ninput channels x_1, ... , $x_n$and one output channel y, can be defined as

$$y = f\left(\sum_{j=1}^{n} w_j x_j + b\right)$$

(4.1) wheref(·) is the perceptron activation function and w_j are the weights tuning during learning process and b is the

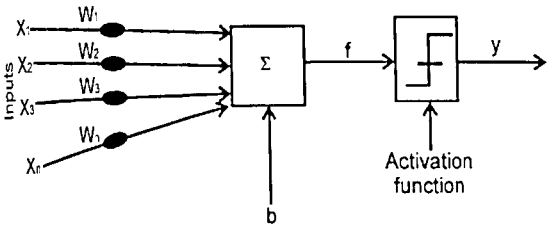


Figure-4.1 : Classical Perceptron

The perceptron learning algorithm works as follows:

1. The weights wjare initialized to small random numbers.
2. A pattern vector (x1, . . . ,xn) is presented to the perceptron and the output y generated according to the rule (X).
3. The weights are updated according to the rule

wj(t + 1) = wj(t) + ?(d - y)xj , (4.2)

where it is discreet time, d is the desired output provided for training and

0 < η <1 is the step size.

It will be hardly possible to construct an exact analog of the nonlinear activation function f, like sigmoid and other functions of common use in neural networks, but we will show that the leaning rule of the type (A) is possible for a quantum system too.

Consider a quantum system with n inputs Ix1>, . . . , Ixn>, and the output Iy>derived by the rule

$$|y\rangle = F\sum_{j=1}^{n} w_j(t)|x_j\rangle \quad (4.3)$$

where $w_j$become 2 × 2 matrices acting on the basis (I0>, I1>), Fis an unknown operator that can be implemented by the network of quantum gates.

Consider the simplistic case with $F = 1$ being the identity operator. The output of the quantum perceptron at the time twill be

$$|y\rangle = F\sum_{j=1}^{n} w_j(t)|x_j\rangle \quad (4.4)$$

In analogy with classical case, let us provide a learning rule

$$w_j(t+1) = w_j(t) + \eta\,(|d\rangle - |y(t)\rangle)\langle x_j| \quad (4.5)$$

where is the desired output.

H gate-Quantum perceptron model

In this proposed approach we consider the quantum perceptron based on hadamard gate. We applied states $|x_1\rangle$ and $|x_2\rangle$ as inputs. These is one qubit representation of a state that can be either I0> or I1>. Then hadamard gate (h) acting on one qubit state, is applied separately on each state and new states $|hx_1\rangle$ and $|hx_2\rangle$ are obtained. These states are further entangled using tensor product such as $|x\rangle = (|hx_1\rangle \otimes |hx_2\rangle)$. On the other hand tensor product is again operated upon two h gates to obtain the equivalent H gate for 2-qubit states as $H = (h \otimes h)$, since states $|x_1\rangle$ and $|x_2\rangle$are already entangled and resultant state is in 2-qubit now. Now State $|X\rangle$ is passed through H gate and finally output state $|Y\rangle$is obtained by applying the sigmoidal activation function f such as $|y\rangle = f[|HX\rangle]$ Here $|y\rangle$ is the actual output. Then error e is calculated by subtracting the actual output from desired or target output T. After calculating the error, we will updatethe H gate as H=H + e.X^T. After this again state $|X\rangle$is passed through updated H gate. Figure 4.2 describes the entire

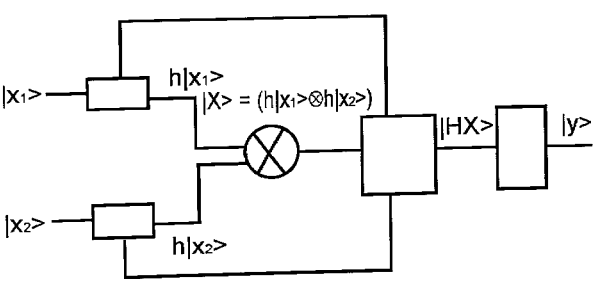


Figure-4.2 : H gate Perceptron Model

$$X = (|hx_1\rangle \otimes |hx_2\rangle) \quad (4.6)$$

$$H = (h \otimes h) \quad (4.7)$$

Generalized H gate for n qubit system can be obtained using the following equation

$$H = h^{\otimes n} \quad (4.8)$$

Now the state I X > has to be passed through H gate and the sigmoidal activation function is performed over I HX >, as follows

$$|y\rangle = f[|HX\rangle] \quad (4.9)$$

which could also be written for 2-qubit system, as shown below

$$|y\rangle = f\left[H\left[|hx_1\rangle \otimes |hx_2\rangle\right]\right] \quad (4.10)$$

5. Results

Our proposed H-gate Quantum Perceptron Neural Network is able to classify various linear and non-linearly separable problems. This model can solve pattern classification for 2-qubits, 3-qubits and can also be further extended.

(1) AND Problem:-AND problem can be solved in 2 qubit system

AND Operation

x_1	x_2	T
0	0	0
0	1	0
1	0	0
1	1	1

Table-5.1(a) : Classical implementation of AND operation on x_1 and x_2.

Quantum (Vector) Representation of AND operation

$\|x_1\rangle$	$\|x_2\rangle$	T
$[1\ 0]^T$	$[1\ 0]^T$	$[1\ 0\ 0\ 0]^T$
$[1\ 0]^T$	$[0\ 1]^T$	$[1\ 0\ 0\ 0]^T$
$[0\ 1]^T$	$[1\ 0]^T$	$[1\ 0\ 0\ 0]^T$
$[0\ 1]^T$	$[0\ 1]^T$	$[0\ 1\ 0\ 0]^T$

Table-5.1(b):-Vector representation

First consider the state $|x_1\rangle$ and $|x_2\rangle$ as |1> and |0> which could be represented as

$$|x_1\rangle = [0\ 1]^T \text{ and } |x_2\rangle = [1\ 0]^T$$

1-qubit hadamard gate (h) = $\frac{1}{\sqrt{2}}\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix}$

After passing $|x_1\rangle$ and $|x_2\rangle$ through h gate separately,

the $$|x_1\rangle = \frac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix} = \begin{bmatrix}0.7071\\0.7071\end{bmatrix}$$

and $$|x_2\rangle = \frac{1}{\sqrt{2}}\begin{bmatrix}1\\-1\end{bmatrix} = \begin{bmatrix}0.7071\\-0.7071\end{bmatrix}$$

Now the entangled state of and would be achieved using the equation (4.6)

$$|X\rangle = \frac{1}{2}\begin{bmatrix}1\\-1\\1\\-1\end{bmatrix} = \begin{bmatrix}0.5\\-0.5\\0.5\\-0.5\end{bmatrix}$$

Next is to calculate the H gate acting upon state in 2-qubit system, which could be achieved as shown below

$$H = h \otimes h$$

$$H = \frac{1}{\sqrt{2}}\begin{bmatrix}1 & 1\\1 & -1\end{bmatrix} \otimes \frac{1}{\sqrt{2}}\begin{bmatrix}1 & 1\\1 & -1\end{bmatrix}$$

$$\mathrm{H} = \begin{bmatrix}1 & 1 & 1 & 1\\1 & -1 & 1 & -1\\1 & 1 & -1 & -1\\1 & -1 & -1 & 1\end{bmatrix}$$

The state $|X\rangle$ is passed through H gate and output $|y\rangle$ is obtained using equation(4.9), which is

$$|y\rangle = \begin{bmatrix}0\\0\\1\\0\end{bmatrix}$$

While from third row of table-4.2, we can see that is obtained using equation(4.9), which is

$$\mathrm{T} = \begin{bmatrix}1\\0\\0\\0\end{bmatrix}$$

Now error would be calculated using equation(4.12) and H gate would be update using equation (4.13). This updated H is again applied on $|X\rangle$ and output is obtained by applying equation(4.9), which is

$$|y\rangle = \begin{bmatrix}1\\0\\0\\0\end{bmatrix}$$

This is the same as target output.

The same process is repeated for each pattern, but strictly using the same H gate, which would be updated for each pattern when required.

The final matrix obtained after learning to solve AND problem is

$$H = \begin{bmatrix} 1.5 & 0.5 & 0.5 & -0.5 \\ 0.5 & -0.5 & -0.5 & 0.5 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Here the H is not unitary so that it is reflecting the process as non-evolutionary.

6. Conclusion : The perceptron is a fundamental building block for various machine learning models including neural networks and support vector machines. We have considered the conventional single layer feed-forward neural network and proposed its equivalent single layer quantum perceptron. We have presented the basic quantum neural network models, quantum gates and exhibited the method of quantum perceptron neural network model for generating the solution of pattern classification problem for 2-qubit system.Further we have successfully exhibit the classification problem by linearly separable pattern. It has also been observed that our proposed model is able to generate the classification to non-linear separable patterns.

References:

Ezkov, A., Nifanava, A. and Ventura, D. (2000): Information Sciences **128,** 271-293

Feynman, R.P. (1982): International journal of Theoretical Physics., **26 (21),** 467-488.

Grover, L.K. (1997): Phys. Rev. Lett. **79,** 4709; **80** (1998) 1329

Hopfield, J.J. (1982): "Neural Network and Physical Systems with Emergent Collective Computational Abilities", Proc. National Acad. Science, USA, **79,** 2554

Huang, Y.B., Li, S.S. and Nie, Y.Y. (2009): International journal of Theoretical Physics **48,** 95-100.

Jennewein, T., Simon, C., Weihs, G., Weinfurter, H. and Zeilinger, A. (2000): Physics Review. Lett. **84,** 4729-4732

Li, S.S. (2012): International journal of Theoretical Physics. Physics **51,** 724-730

Li, S.S., Nie, Y.Y., Hong, Z.H., Yi, X.J. and Huang, Y.B. (2008): Comm. Theoretical Physics **50,** 633-640

Naik, D.S., Peterson, C.G., White, A.G., Burglund, A.J. and Kwiat, P.G. (2000): Phys. Rev. Lett. **84,** 4733-4736

Shor, P.W. (1994): Proc. 35th Ann. Symp., Found of Computer Science, Los. Alamitos, IEEE Comp. Press, 20-22

Simon, D. (1997): SIAM Journal Computer **26 (5)** (1997) 1474-1483

Smirne, A., Breuer, H.P., Piilo, J. and Vacchini, B. (2010): Physics Rev. **A 84,** 062114-119.

Tan, H.T., Zhang, W.M. and Li, G. (2011): Physics Rev. **A 83,** 032102-108.

Tittel, W., Bendel, J., Zbinden, H. and Gisin, N. (2000): Phys. Rev. Lett. **84,** 4737-4740.

Ventura, D. (2001): On the Utility of Entanglement in Quantum Neural computing, Proceedings of International Joint Conference on Neural Networks, 1565-1570.

Ventura, D. and Martinez, T. (2000): Information Sciences **124,** 273-296.

Wang, Z.S. (2009): Physics Review. **A79,** 024304-308

Wang, Z.S., Wu, C., Feng, X.L., Kwek,, L.C., Lai, C.H., Oh, C.H. and Vedral, V. (2007): Physics Review **A76,** 044303-307

●

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May August, 2017), pp 48–52

PROBOTICS : TRANSFORMING HUMAN HEALTH AND WELLBEING

JAGRITI SHARMA

Abstract : The field of probiotics has emerged as a new discipline with an application in boosting human health as a prophylactic and as an alternate to antibiotic therapy. Probiotics are beneficial gut-microbes triggering an inflammatory response to pathogenic organisms, antimicrobials production and homeostasis of the immune system so resulting into an approach, to promote thegut health. This review is an attempt to summarize the role of probiotics in improving human health and well being.

Keywords : Probiotics; Health; prophylactic; homeostasis; therapy

Introduction : The human gut microorganisms that live within us have taken on a new edge in recent times with a greater understanding of our close symbiotic relations.The gut microbiota is an ecosystem formed with a variety of ecological niches, made from several bacterial species in close contact with the intestinal mucosa or epithelial interface occupying approximately 250–400m^2. These microbes which are popularly called probiotics may include bacteria, fungi, viruses and many other prokaryotes and eukaryotes, which provide marvelous metabolic and enzymatic capabilities to benefit the host physiology. Probiotics and their genes are redefining what we call a healthy steady state through their numerous metabolic and immunologic pathways. These arefound to be useful in preventing diarrhea, Pouchitis, ulcerative Colitis, abdominal pain and even the risk of colon cancer in animal models.The Host and gut microbiome interaction is complex and condition-specific further the advent of bioinformatics and gnotobiotic facilities have provided evidences of possible gut microbiome interactions. This review explores the roles of this microbiome upon human health.

History : According to Fuller, Probiotics are defined as "A live microbial food supplement which beneficially affects the host animal by improving its intestinal microbial balance"(Fuller,1989). Probiotics are available in form of the dietary supplements such as powders, capsules, and tablets. Probiotic must be resistant to gastric juices and bile under conditions in the intestines. The important genera of Probiotics include *Lactococcus, Bacillus, Streptococcus, Saccharomyces, Clostridium* and non pathogenic *Escherichia.*

The pioneer is attributed to Eli Metchnikoff, the Russian born Nobel laureate working at the Pasteur Institute at the beginning of the 20th century. Metchnikoff observed that Bulgarian peasant depended largely on fermented milk by lactic acid bacteria was exceptionally long lived. Metchnikoff himself used sour milk fermented with bacteria he called "Bulgarian Bacillus" and noticed health benefits. Metchnikoff in his 1907 opus *The Prolongation of Life : Optimistic studies,* proposed that ingesting microbes could have beneficial effects for human beings, especially to treat GIT diseases (Metchnikoff, 2004). According to Metchnikoff Proteolytic bacteria such as clostridia, produce toxic substances including phenols, indols and ammonia which were responsible for the intestinal "auto intoxication".

Henry Tissier, a French Pediatricians, isolated bacterium named *Bacillus bifiduscommunis.* He suggested that administration of these bacteria to the patients will normalize their gut. In 1917, German Professor Alfred Nissleisolated a strain of *Escherichia cali* from the feces of a soldier and used the *Escherichia cali* Nissle 1917 strain in acute gastrointestinal infectious Salmonellosis and shigellosis. The first clinical trial was performed in

Jagriti Sharma
Department of Microbiology, School of Life Sciences,
Dr. B.R. Ambedkar University, Agra
E-mail : microjagriti@gmail.com.

1930s regarding the effect of Probiotics on constipation.

In the 1950s, a Probotic product was licensed by the United States Department of Agriculture as a drug for the treatment of Scour (*E.coli* infection) among pigs (Orrhage et al, 1994). Mann and Spoerig reported that people who used fermented yogurt with wild strains of *Lactobacillus* sp. had very low values for blood serum cholesterol (Mann and Spoerig, 1974). In 1975, it was reported that *Lactobacillus acidophilus* added to infant formula decreased levels of serum cholesterol. Many studies showed control of serum cholesterol levels in adult human by *Lactobacillus* acidophilus (Gilliland et al, 1985; 1994 and Gill and Guarner, 2004). In 1994, probiotics were deemed to be the next most important immune defense system when commonly prescribed antibiotics were rendered useless by antibiotic resistance (Kailasapathy and Chin 2000; Levy 2000)Besides the genera *Lactobacillus* and *Bifidobacterium* other important probiotic preparation include *Bacillus* sp; yeasts (eg-*Saccharomyces cerevisiae* and *Saccharomycesboulardii*) and filamentous fungi (eg-*Aspergillus oryzae*, *Entero Coccusfaecium*, *Pediococcus*, *pentosaccus*, *P.halophilus*, *P. clamnosus*, *clostridium*, *C.butyricum*, *Streptococcus faecalis*)etc.

Mechanism of action : There are three basic mechanisms through which orally ingested good bacteria confer their positive effect in a host: (i) immunomodulation e.g., induction of cytokines (ii) secretion of antimicrobial substances which suppress the growth of harmful bacteria (Fuller 1991) and (iii) competitive exclusion of GIT pathogens *e.g.*, competition for adhesion sites.There are fair evidences that *B. subtilis* spores enter the Peyer's patches and mesenteric lymph nodes (MLN), by moving across M cells (Duc et al 2003). It was reported that human monocytes stimulated with B. subtilis spores, produced significant levels of IL-1ß and TNF-a(Oggioni et al, 2003). IFN-? is also produced during inflammation as is TNF-a, whose production by macrophages has been linked with chronic diseases (Dornand et al 2002, Melby et al. 1994). IFN-? acts as an activator of cellular responses, particularly the Th1 response which, is responsible for stimulating phagocytosis. These responses indicate that there is an innate immune response and secretion of IFN- by blood mononuclear cells.

Beneficial effects on Human : Administration of probiotics is generally considered safe because they are identicalto the micro organisms present in gastrointestinal tract and normal flora of the human being. There is a list of clinical trials in children and adults which have assessed the effects of probioticsin the prevention and control of both acute and chronic gastro intestinal disorders, in addition to non-intestinal diseases such asatopy. Also probiotics have been found to enhance the antagonistic activity of antibiotics (Sharma & Chauhan 2014; Sharma et al., 2014).Besides Probiotics are reported to be helpful in treating diarrhea, reducing cholesterol, managing, diabetes, preventing osteoporosis and putting relief.

Infectious Gastroenteritis : Probiotics were found to reduce the duration as well asthe frequency of diarrheal episodes (Van Nielet al, 2002). Probioticsare capable of decreasing the excretion of rotavirus in the stool (Oberhelman, et al,1999), helping to reduce the spread of the virus. Data confirming the effectiveness of supplementation with probiotics in the treatment of gastroenteritis in children have also been analyzed in a recent review (Guarino et al, 2009) also Lactobacillus casei subsp. rhamnosus GG, Lactobacillus acidophilus,Lacto bacillus delbrueckii subsp. bulgaricus, Bifido-bacterium bifidumand Streptococcus thermophilus.

Antibiotic-associated Diarrhea : Many antibiotics can induce, diarrheaeg. cephalosporins, aminopenicillin therapies, aminopenicillin combined with clavulanic acid, and clindamycin (Szajewskaet al.,2006)The incidence of antibiotic-associated diarrhea (AAD) ranges around 5% and 30% (Szymanski et al.,2006). A number of specific strains, including *Lactobacillus* GG, *S. baulardii*, , *L.reuteriBifidobacteria* spp., and others, have been shown to have significant benefit for diarrhea (Gorbach, 2000; Benchimol & Mack,2004), traveler's diarrhea (Hilton, et al.,1977) and diarrhea disease in young children caused by rotavirus (Sgouras et al.,2004).

Necrotizing Enterocolitis : It has been reported that probiotic therapy reduced the risk of NEC by approximately 2/3 and reduced the risk of all-cause mortality by 50% (Alfaleh and Bassler, 2008; Deshpande et al, 2007).

Lactose Intolerance : Lactic acid of the yoghurt removes the symptoms of lactose intolerance in lactose-deficient individuals. The beneficial effects

appears to be a consequence of the lactic acid bacteria in fermented milk increasing lactose activity in the small intestine (Fernandes et al, 1987).

Hepatic diseases : Hepatic encephalopathy (HD) is a life threatening liver disease. Probiotic strains *Streptococcus thermophilus, Bifidobacteria, L. plantarumL. acidophilus, , L. casei, L. delbrueckiibulgaricus*and *E. faecum* containing therapeutic effect have multiple mechanisms of action that could disrupt the pathogenesis of HE and may make them superior to conventional treatment and lower portal pressure with a reduction in the risk of bleeding (Nanji et al, 1994; Cunningham-Rundles et al, 2000; Solga 2003).

Arthritis : It is reported that inflammation associated with rheumatoid arthritis may be modulated by the use of probiotics (Marteau et al, 2001). 30 patients with chronic juvenile arthritis were randomly allocated to receive Lactobacillus GG or bovine colostrums for a 2-week period, It was noticed that GI tract becomes permeable and serves as a link between inflammatory diseases of the GI tract and extra-inflammatory disorder such as arthritis

Crohn's Disease : The results of probiotic trials in crohn's disease are mixed. It was found that *E. coli* Nissle was superior to placebo in preventing relapse of crohn's disease after induction of remission by standard medical therapy . A pilot study of *Lactobacillus* GG reported benefit in pediatric patients with active crohn's disease with successful tapering of steroids in 3 of 4 patients (Guandalini, 2002)

Pouchitis : The inflammation of ileal pouch termed as pouchitis due to colectotomy mayoccure in upto 50% of patients A double blind, Placebo-controlled trial showed that daily administration of a combination of 4 *Lactobacillus* species, 3 *bifidobacterium* species, and 1 *Saccharosolivarium-* species (VSL 3) for 9 months prevented relapse of chronic pouchitis after induction of remissions by antibiotics (Gionchetti et al, 2000).

Allergies : The exact mechanism is not known but premise is based upon the ability of lactobacilli to reverse increased intestinal permeability, enhance gut specific Ig A responses, promote gut barrier function through restoration of normal microbes and enhance transforming growth factor β and IL-10 production as well as cytokines that promote production of Ig E antibodies (Kalliomaki et al, 2001; Isolauri, 2001). It is still not clear that whether the *T.helper-1* is enhanced or *T-helper-2* is reduced. Certain microbes can generate the counter regulatory T-helper cell immune responses, indicating the use of specific probioicmicro organisms could redirect the polarized immunological memory to a healthy one (MC Cracken and Lorenz, 2001).

Anti-carcinogenic Effect : The activity of the enzymes that convert procarcinogens into carcinogen is after used as an indicator of the effect of probiotics on the intestinal micro flora (Aso and Akazan 1992) and consumption of *L. casei* might delay the recurrence of bladder tumors (Aso and Akazan 1992; Aso et al, 1995), but this finding awaits confirmation. There is some evidence that cancer recurrences at after sites, such as the urinary bladder can be reduced by intestinal instillation of probiotics including *L. casei*shirota(Aso et al, 1995). *In vitro* studies with *L. rhamnosus* GG and *Bifidobacteria* and *in vivo* study using *L. rhamnosus* strains GG and LC-705 as well as *Propionibacterium* sp. showed a decrease in availability of carcinogenic aflatoxin in the lumen (El-Nezami et al, 2000; Oatley et al, 2000).

Immuno deficiency : The effect of probiotics on the immune response been reviewed widely (Perdigon and Alvarez 1992; Tomioka et al., 1992; Malin et al;, 1997; Mc Cracken and Gaskins 1999; Mc Naught et al., 2005). It is noticed that children with HIV infection suffers with malabsorption and has frequent episodes of diarrhea. Administration of *L. Plantarum* 299v can be given safely to immuno compromised hosts, may have a positive effect on immune response, and has the potential to improve growth and development. The immune response may further be enhanced when one or more probiotics are consumed together and work synergistically, as seems to be the case when *Lactobacillus* is administered in conjunction with *Bibidobacteria*(Cunningham Rundles et al., 2000).

Conclusion : We have just begun to explore the world of probiotics and their effects on us. Extensive and exhaustive studies of intricacies of the probiotics, gut-dysbiosis and synbiotics, with human health are required for better management of human health and it's well being. The future will require multidisciplinary approachto decode the chemistry this fascinating world.

References

Alfaleh,K., Bassler, D.(2008): Probiotics for

prevention of necrotizing enterocolitis in preterm infants. *Cochrane Database Syst* Rev:CD005496.

Aso, Y. and Akazan, H. (1992): Prophylactic effect of a Lacto-bacillus casei preparation on the recurrence of superficial bladder cancer. *UrolInt,49,* 125–129.

Aso, Y., Akaza,H., Kotake, T., Tsukamoto, T., Imai, K., Naito, S. (1995):Preventive effect of a Lactobacillus casei preparation on the recurrence of superficial bladder cancer in a double-blind trial. *TheBLP Study Group EurUrol,27,* 104-9.

Benchimol, E.I. and Mack, D.R. (2004): Probiotics in relapsing and chronic diarrhea. *J Pediatr Hematol Oncol26,* 515–517.

Cunningham-Rundles, S., Ahrne, S., Bengmark, S., Johann-Liang,R., Marshall, E., Metakis, L., Califano, C., Dunn,A.M. et al. (2000): Probiotics and immune response. *Am J Gastroenterol 95,* S22–S25.

Deshpande, G., Rao, S., Patole,S.(2007): Probiotics for prevention of necrotisingenterocolitis in preterm neonates with very low birth-weight: a systematic review of randomised controlled trials. *Lancet36,* 1614–1620.

Dornand,J., Gross, A., Lafont, V., Liautard, J., Oliaro, J. and Liautard, J.P.(2002):.The innate immuneresponse against Brucella in humans. *Vet. Microbiol.,90,* 383–394.

Duc, L.H., Hong, H.A. and Cutting,S.M.(2003): Germination of the spore in the gastro intestinal tractprovides a novel route for heterologous antigen presentation. *Vaccine,21,*4215–4224.

El-Nezami,H., Mykkänen, H., Kankaanpää, P., Salminen, S., Ahokas,J .(2000): Ability of Lactobacillus and Probionibacteriumstrains to remove aflatoxin B1 from chicken duodenum. *J Food Protect,63,*549-552.

Fernandes, C.F., Shahani, K.M. and Amer, M.A. (1987): Therapeutic role of dietary lactobacilli and lactobacillic fermented dairy products. *FEMS Microbiol Rev46,* 343–356

Fuller, R.(1989):. Probiotics in man and animals. *J. Appl. Bacteriol., 66,* 365–378.

Fuller, R.(1991): Probiotics in human medicine. *Gut,32,* 439–442

Gorbach, S.L. (2000) Probiotics and gastrointestinal health. *Sam J Gastroenterol95* S2-S4.18- Guarino, A., Lo, V.A., Canani ,R.B.(2009): Probiotics as prevention and treatment for diarrhea. *CurrOpin Gastroenterol.,25,* 18–23.,

Gilliland, S.E., Nelson, C.R. and Maxwell, C. (1985:) .Assimilation of cholesterol by Lactobacillus acidophilus. *Appl Environ Microbiol.,49,* 377–381.

Gill, H.S. and Guarner, F. (2004): Probiotics and human health: a clinical perspective. *Postgrad Med J,80,* 516–526

Guandalini, S. (2002):.Use of *Lactobacillus-GG* in paediatric Crohn's disease. *Dig Liver Dis,34(suppl 2),*S63–S65.

Gionchetti, P., Rizzello,F., Venturi, A., Brigidi,P., Matteuzzi, D., Baz-zocchi, G., Poggioli, G., Miglioli, M., Campieri, M.(2000): Oral bacterio-therapy as maintenance treatment in patients with chronic pouchitis:a double-blind, placebo-controlled trial. *Gastroenterology;119,*305–309.

Hilton, E., Kolakawaki, P., Singer, C. and Smith, M. (1977):.Efficacy of Lactobacillus GG as adiarrheal preventive in travelers. *J Travel Med4,* 41–43.

Isolauri, E. (2001).*Probiotics in prevention and treatment of allergic disease. Pediatr Allergy Immunol, 12(S14),*56-59.

Kailasapathy, K. and Chin, J. (2000): Survival and therapeutic potential of probiotic organisms with reference to Lactobacillus acidophilus and Bifidobacterium spp. *ImmunolCellBiol,78,* 80–88.

Kalliomaki, M., Salminen,S., Arvilonni, H., Kero, P., Koskinen, P., Isolauri, E. (2001): Probiotics in Primary preyention of atopic disease; a randomized placebo-controlled trial. *Lancet,357,* 1076-1079.

Levy, J. (2000): The effects of antibiotic use on gastrointestinal function. *Am J Gastroenterol,95,* S8–S10.

Malin, M., Verronen, P. and Korhonen, H. (1997): Dietary therapy with Lactobacillus GG, bovine colostrums or bovine immune colostrums in patients with juvenile chronic arthritis: mallett evaluation of effect of gut defense mechanisms. *Inflammopharmacology5,* 219–236.

Mann, G.V. and Spoerig, A. (1974): Studies of a surfactant and cholesterolemia in the Masai. *Am J ClinNutr27,* 464–469.

Marteau, P:., de Vrese, M., Cellier, C.J. and

Schrezenmeir, J.(2001) : Protection from 3 gastrointestinal diseases with the use of probiotics. *Am J ClinNutr73*, 430S–436S.

McCracken, B.J. and Gaskins, H.R. (1999): Probiotics and the immune system. In Probiotics: A Critical Review ed. *Tann-ock,G.W.* pp. 85–111.

McCracken ,V. J., Lorenz, R.G.(2001*)*:The gastrointestinal ecosystem: A precarious alliance among epithelium, immunity and microbiota. *Cell Microbiol, 3(1),*1-11.

McNaught, C.E., Woodcock, N.P., Anderson, A.D. and Mac-Fie,J. (2005): A prospective randomised trial of Probiotics in critically ill patients. *ClinNutr*,24, 211–219.

Metchnikoff, E. (2004).The prolongation of life: optimistic studies. New York, NY: *Springer Publishing Company, Inc*,.

Melby, P., Andrade-Narvaez, F.J., Darnell, B.J., Valencia-Pacheco ,G., Tryon, V.V. and Palomo-Cetina, A. (1994):Increased expression of proinflammatory cytokines in chronic lesions of humancutaneous leishmaniasis. *Infect. Immun., 62*, 837–842.

Nanji, A.,A., Khettry, U. and Sadrzadeh, S.M.H. (1994): Lacto-bacillus feeding reduces endotoxemia and severity of experimental alcoholic liver (disease). *Proc Soc Exp Bio Med,205*, 243–247.

Oatley,J.T., Rarick,M.D., Ji, G.E., Linz, J.E .(2000):Binding of aflatoxinB1 to*bifidobacteria*in *vitro. J Food Prot, 63,*1133-6.

Oberhelman, R.A., Gilman, R.H., Sheen, P., Taylor, D.N., Black, R.E., Cabrera,L. (1999):A placebo-controlled trial of Lactobacillus GG to prevent diarrhea in undernourished Peruvian children. *J Pediatr ,134*,15–20.

Oggioni, M.R., Ciabattini, A., Cuppone, A.M. and Pozzi,G.(2003): *Bacillus* spores for vaccine delivery. *Vaccine., 21*, 96–101.

Orrhage, K., Brismar, B. and Nord, C.E. (1994) : Effect of supplements with Bifidobacteriumlongum and Lactobacillus acidophilus on the intestinal microbiota during administration of clindamycin. *MicrobEcol Health Dis7*, 17–22.

Perdigon, G. and Alvarez, S. (1992): Probiotics and the immune state. in Probiotics. *The Scientific Basis ed.Fuller, R. p,* 146–180. London: Chapman and Hall.

Sgouras, D., Maragkoudakis, P., Petraki, K., Martinez-Gonzalez, B., Eriotou, E.Michopoulos, S.Kalantzopoulos,G.,Tsakalidou,E.,Mentis, A.(2004): *In vitro* and *in vivo* inhibition of *Helicobacter pylori* by *Lactobacillus casei* strain Shirota. *Appl Environ Microbiol. 70,*518–26.

Sharma, J. and Chauhan, D.S. (2014): Inhibition of *pseudomonas aeruginosa* by antibiotics and probiotics combinations-*In vitro* study. *European journal of experimental biology,4(6),*10-14.

Sharma, J., Chauhan ,D.S. and Goyal, A.(2014): Enhancement of antimicrobial activity of antibiotics by probiotics against *Escherichia Coli*-An *Invitro* study. *Advances in applied science research, 5(6),*14-18.

Solga, S.F. (2003): Probiotics can treat hepatic encephalopathy. *Med Hypotheses61*, 307–313.

Szajewska, H., Ruszczynski, M., Radzikowski, A. (2006)Probiotics in the prevention of antibiotic-associated diarrhea in children: a meta-analysis of randomizedcontrolled trials. *J Pediatr., 149*, 367–72.

Szymanski, H., Pejcz, J., Jawien, M., Chmielarczyk, A., Strus, M., Heczko, P.B. (2006):Treatmentof acute infectious diarrhoea in infants and children with a mixture of three Lactobacillus rhamnosus strains – a randomized, double-blind, placebo controlled trial. *Aliment Pharmacol Ther.,23*, 247–53.

Tomioka, H., Tomioka, K., Sato, K. and Saito, H. (1992) : The protective activity of immuno stimulants against Listeria monocytogenes infection in mice. *J Med Microbiol36,* 112– 116.

Van Niel, C.W., Feudtner, C., Garrison, M.M., Christakis, D.A. (2002) : Lactobacillus therapy for acute infectious diarrhea in children: a meta-analysis. *Pediatrics,*109,678–84.

Agra University Journal of Research : Science
Vol. 1. Issue 2 (May–August, 2017), pp 53–57

HEALTH STATUS AND NUTRIENT INTAKE OF YOUTH USING HERBAL GREEN TEA

ARCHANA SINGH, TRAPTI SEN

Abstract : Herbal green tea is all the rage for the many medicinal qualities they are supposed to possess. Health-oriented individuals are turning to herbal green tea as alternative to caffeinated beverages such as coffee, tea, and cocoa and for low-caloric supplements. It's claimed they can help with everything from easing a cold and indigestion to fighting infection andnausea. Dietary and lifestyle behaviors among adolescents are risk factors for several chronic diseases in adulthood. Thus,the objective of the study to assessment of health status and nutrient intake of youth using of herbal green tea. Multistage stratified random sampling technique was used for selecting 100 youths of age group 20-35 years in Agra district. Significant effects of herbal tea were observed on the health in youth.

Tables : 07 Figures : 0 References : 11

Keywords : Dietary habits, Herbal Green Tea or Herbal Tea, BMI

Introduction : Herbal Green Tea is a healthy & delicious beverage with the natural flavors and wide variety available which don't need to be sweetened, like many people do with black tea, or milk which may cut down the antioxidant level. Herbal green teas are often high in vitamins and minerals as well as antioxidant, helping to prevent deficiencies in diet. Herbal Tea that has received so much acclaim for its health benefits isn't really a Tea at least not is the strictest sense of the world(Rodale,1987). Herbs (Basil, Ginger etc.) when made as teastrength, nourish and enliven the whole body through their supply of powerful plant nutrition(Chang-Xiao &Yaniv, 2005).They are often rich in antioxidants, which help keep the levels of free radicals low in our bodies. Infusing the plant in hot water and drinking the infusion is a great way to access the vitamin and minerals that these plants have to offer benefits of herbal teas include aiding digestion, relaxing stress, speeding up metabolism and some are even used as a treatment for ailment such as common cold and irritable bowel syndrome (IBS)(Thomson, 2007,Ridker, 1987&Samy, Sugumaran, & Lee, 2005). Today more and more people are taking to drinking Tisane since it helps to relax and revive them.When these Nutritive Herbs are infused in Herbal Tea Preparation and Herbal Tea Recipes, Their Healing properties are unlocked, providing a mineral boost that is packed with Calcium, Silica Magnesium, Zinc and Ironetc.Thus, thepurpose of the study to assessment of health status and nutrient intake of youth using of herbal green tea. Both green and black tea are derived from *Camellia sinensis* but differences in postharvest processing ensure that polyphenols with potent antioxidant and anticancerproperties are better preserved in the green form. Green tea's clinical applications are primarily based on its antioxidant activity. Green tea polyphenols have demonstrated greater antioxidant protectionthan vitamins C and E(Werbach& Murray, 2000).

Methodology : The study was carried out in 100 youths (50 Users of herbal green tea and 50 non users of herbal green tea) were selected for the present study with the help of multistage stratified random sampling technique. Information was collected regarding general information, anthropometric measurements, food habits and dietary survey among the youths. The objective of the study and information in the questionnaire were explained to the youths by qualified nutritionists, who also supervised the collection of the data.The 24 hours recall method was used in the present study. Height and weight measurement were recorded of each subject and the BMI

Archana Singh, Trapti Sen
Department of Food & Nutrition (Biochemistry)
Institute of Home Science
Dr. B.R. Ambedkar University, Agra
E-mail id: 301archana@gmail.com

was calculated of each subject. BMI were classified as mentioned in ICMR book written by C.Gopalan. Nutrient intakes were calculated as per the recommendation of ICMR book.

Result & Discussion:

Table 1: Distribution of users and non users of herbal tea according to age.

Age in Years	Herbal Green Tea			
	Users		Non -Users	
	Number	Percentage	Number	Percentage
20 - 25	20	40.0	21	42.0
25 - 30	14	28.0	23	46.0
30 - 35	16	32.0	6	12.0
Total	50	100.0	50	100.0

Above Table shows the distribution of users and non-users of herbal tea according to age. Out of 50 users of herbal tea, majority of them (40.0%) were in age group of 20-25 years, followed by 32.0% in the age group of 30-35 and minimum (28.0%) were in the group of 25-30 years while among the 50 non-users of herbal tea, majority of them (46%) were in the age group of 25-30 years, followed by 42% in the age group of 20-25 years and minimum (12%) were in the age group of 30-35 years.

Table 2: Distribution of users of herbal tea according to duration of use.

Duration of use in months	Users	
	Number	Percentage
One	39	78.0
Two	6	12.0
Three	5	10.0
Total	50	100.0

Above Table highlights the distribution of users of herbal tea according to the duration of use. Out of 50 users of herbal tea, majority of them (78.0%) were using it for a month, followed by 12% for 2 months and the minimum (10%) were using herbal tea for three months.

Table 3: Distribution of users according to reason of herbal green tea used.

Reasons	Users	
	Number	Percentage
Health	9	18.0
Reduce Weight	27	54.0
Fitness	5	10.0
Change Taste	7	14.0
Anti - oxidant	2	4.0
Total	50	100.0

Above Table indicates the distribution of users according to reasons of herbal green tea used. Out of 50 users of herbal tea, majority of them (54.0%) reported that they used herbal tea to reduce weight, followed by 18% for the reason to maintain health and minimum (4.0%) informed that they used herbal tea as an anti-oxidant. Paul, M. accepted, economical, and safe drink that is enjoyed every day by hundreds of millions of people across all continents and it is the richest source of a class of antioxidents, (Ridker, 1987).

Table 4: Mean nutrient intake among the users and non-users of herbal tea.

Nutrients intake	Herbal Green Tea				Statistical	
	Users		Non-users			
	Mean	SD	Mean	SD	t	p
Calories	1971.48	110.81	2040.41	108.78	3.139	<0.05
Protein	62.26	1.60	62.78	3.07	1.062	>0.05
Calcium	612.74	63.22	589.50	49.06	2.054	<0.05
Vitamin B1	1.14	0.08	1.10	0.08	2.500	<0.05
Vitamin C	38.98	14.11	35.77	10.03	1.311	>0.05
Iron	26.10	2.40	26.42	2.61	0.638	>0.05
Fat	30.45	1.75	31.05	2.10	1.552	<0.05
Riboflavin	1.11	0.06	1.11	0.06	0.000	>0.05
Niacin	13.34	1.50	13.21	1.46	0.445	>0.05

Above Table reveals the mean nutrient intake among the users and non users of herbal tea. The mean nutrient intake of calories (2040.41), protein (62.78), iron (26.42) and fat (31.05) were found more among the non-users of herbal tea as compared to users of herbal tea while the mean nutrient intake of calcium (612.74), vitamin B1 (1.14), vitamin C (38.98) and niacin (13.34) were found more among the users of herbal tea as compared to non users of herbal tea. The mean nutrient intake of riboflavin was same (1.11) among the users and non users of herbal tea. Statistically, significant difference in mean nutrient intake of calories, calcium, fat and Vitamin B1 were observed between the users and non-users of Herbal Tea ($p<0.05$), while no significant difference in mean nutrient intake of protein, Vitamin C, iron, riboflavin and niacin were observed between the users and non users of herbal tea even at 5% level of significance.

Table 5: Distribution of users and non- users of herbal tea according to body mass index.

Body Mass Index	Herbal Green Tea			
	Users		Non-user	
	Number	Percentage	Number	Percentage
15 – 20	3	6.0	17	34.0
20 – 25	35	70.0	22	44.0
25 and above	12	24.0	11	22.0
Total	50	100.0	50	100.0
Mean	23.29		21.68	
SD	1.91		3.17	
t	3.076			
p	0.05			

The body mass index of users and non-users of herbal green tea was calculated and presented in the above Table. Out of the users of herbal green tea, majority of the (70.0%) were have body mass index of 20-25 (normal), followed by 24.0% having body mass index of 25 and above (obese) and the minimum (6.0%) were having body mass index of 15–20 (under weight) while among non-users of herbal tea, majority of them (44.0%) were have body mass index of 20–25 (normal), followed by 34.0% having body mass index of 15-20 (under weight)and the minimum (22.0%)were having body mass index of 25 and above (Obese). Further analysis of the data from the above Table shows that the mean body mass index was more

among the users of herbal tea (23.29) as compared to non users of herbal tea (21.68). Statistically, significant difference in mean body mass index was observed between the users and non users of herbal tea ($p<0.05$)(SARS, 2004, & Jamshid Najafian et.al, 2014).

Table 6: Correlation between nutrient intakes with BMIof the users of herbal tea.

Parameter	Statistical Values				
	Mean	SD	r	t	p
BMI	23.21	1.91			
Calories	1971.48	110.81	+0.298	2.163	<0.05
Protein	62.26	1.60	+0.307	2.181	<0.05
Calcium	612.74	63.22	+0.316	2.308	<0.05
Vitamin B1	1.14	0.08	-0.071	0.493	>0.05
Vitamin C	38.98	14.11	+0.126	0.880	>0.05
Iron	26.10	2.40	+0.375	2.803	<0.05
Fat	30.45	1.75	+0.313	2.283	<0.05
Riboflavin	1.11	0.11	+0.270	1.943	>0.05
Niacin	13.34	1.50	+0.448	3.472	<0.05

Above table reveals the correlation between nutrient intakes with BMI of the users of herbal tea.
Positive and significant correlations were observed between nutrient intake of calories, calcium, iron, fat and protein, niacinwith body mass index of users of herbal tea ($p<0.05$), that is as the nutrient intake of calcium, iron, fat and niacin increase, the BMI of the users of herbal tea also increases and vice-versa.(Jurgens, Whelan, Killian, Doucette, Kirk, Foy, 2012&http:// www.herbalteareview.com).

Table 7: Correlation between nutrient intakes with BMI of non-users of herbal tea.

Parameter	Statistical Values				
	Mean	SD	r	t	p
BMI	21.68	3.17			
Calories	2040.41	108.78	-0.050	0.347	>0.05
Protein	62.78	3.07	-0.264	1.896	>0.05
Calcium	589.50	49.06	-0.225	1.600	>0.05
Vitamin B1	1.10	0.08	-0.310	2.259	<0.05
Vitamin C	35.77	10.03	-0.177	1.246	>0.05
Iron	26.42	2.61	+0.255	1.827	>0.05
Fat	31.05	2.10	+0.312	2.275	<0.05
Riboflavin	1.11	0.06	-0.066	0.458	>0.05
Niacin	13.21	1.46	+0.288	2.089	<0.05

Above table reveals the correlation between nutrient intakes with BMI of the non-users of herbal tea. Positive and significant correlations were observed between nutrient intake of fat and niacin with BMI of the non users of herbal tea ($p<0.05$), that is as the nutrient intake of fat and niacin increases, the BMI of the non users of herbal tea also increases and vice versa. Positive and insignificant correlation was observed between nutrient intakes of iron, withBMI of the non-users of herbal tea even at 5% level of significance. Negative and significant correlations was observed between nutrient intake of vitamin B1 with BMI of the non users of herbal tea ($p<0.05$), that is as the nutrient intake of vitamin B1increases, theBMI of the non users of herbal tea also increases and vice versa. While negative and insignificant correlation was observed between nutrient intake of calories, protein, calcium, vitamin C and Riboflavin with BMI of the non-users of herbal tea even at 5% level of significance.

Conclusion:

On the basis of the results obtained from the present study the most of herbal tea users started using herbal tea for one month to reduce weight. The mean body

mass index was more among the users of herbal tea as compared to non-users of herbal tea and significant difference in mean BMI was observed between the users and non users of herbal tea ($p<0.05$). The calories, protein, iron and fat consumed more among the non-users of herbal tea as compared to users of herbal tea while calcium, vitamin B1, vitamin C and niacin consumed more among the users of herbal tea as compared to non-users of herbal tea. Our results emphasize that we need to focus on overall healthy eating patterns rather than individual foods or nutrients and to make small changes that are really easy to stick with over a long term. Green tea is commonly believed to be a weight loss aid, but there is no good evidence that its consumption has any meaningful benefit in helping overweight or obese people to lose weight, or that it helps them to maintain a healthy body weight.

Acknowledgment:

Acknowledge to Nutritionist (dietician) who helped me in collecting the required information and collection of data and statistician for statistical analysis.

References:

Chang-Xiao Liu &Yaniv, Z. (2005): Research and Developmentof New Drugs Originating From Chinese Plants, 61-96.

In, Yaniv, Z. &Bachrach, U. (Eds.), 'Handbook of Medicinal Plants'. Food Products Press - Haworth Press, 500.

http://www.herbalteareview.com

Jamshid Najafian et.al.(2014): Safety of herbal medicine in treatment of weight loss Jan; 10(1): 55–58

Jurgens TM, Whelan AM, Killian L, Doucette S, Kirk S, Foy E. (2012): "Green tea for weight loss and weight maintenance in overweight or obese adults". *Cochrane Database Syst Rev* (Systematic review).

Ridker, Paul M.(1987): Archives OfEnvironmental Health: An International Journal Volume 42, - Issue 3

Rodale (1987): Illustrate Encyclopaedia of Herbs.

Samy, J., Sugumaran, M. & Lee, K. (2005): Herbs of Malaysia. Ed. K.M. Wong, Pub. Times Editions - Marshall Cavendish, 244.

SARS. (2004): Clinical trials on treatment using a combination of traditional Chinese medicine and western medicine *Geneva: WHO;. 53-61.*

Thomson, Graeme E. (2007): RIRDC Publication No. 06/128 The Health Benefits of Traditional Chinese Plant Medicines: Weighing the scientific evidence a report for the Rural Industries Research and Development Corporation by Australian Government, Australian Institute of Health and Welfare Website, www.aihw. gov.au

Werbach, M. & Murray, M. (2000): Botanical influences on illness - a sourcebook of clinical research. 2nd edition, Pub.- Third Line Press Inc. Tarzana California, 624.

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 58–60

NANOTECHNOLOGICAL REMEDIATION FOR AGRA WATER SUPPLY

ASHISH KUMAR AND AZAD KUMAR

Abstract : Nanotechnology is the understanding and control of matter at dimensions of roughly 1 to 100 nanometers. This is a field of applied science concerned with the control of matter at dimensions of roughly 1 to 100 nanometers (nm). At these particle size materials may have different molecular organizations and properties than the same chemical substances in a larger size. Nano materials are used in wastewater treatment and environmental remediation. Reactive metal fine powders show high reactivity towards various chlorocarbons in aqueous medium. This provides a novel method for groundwater decontamination. Photo-excitation of fine particles of semiconductor leads to electron-hole pairs which are useful for both oxidation and reduction of various pollutants and can be used for water decontamination. Nano-particulate metal oxides exhibit high intrinsic surface reactivity owing to higher surface area and strongly adsorb many organic substances ultimately leading to photo-catalytic degradation. These materials are also finding use in anti-chemical/ biological warfare, air purification.

The current study highlights the results of photo-degradation of some organic substances like carboxylic acids (Citric Acid) in surface waters. The study shows a cost effective approach for surface water decontamination.

Keywords: Nanotechnology, photo-degradation, Citric Acid, surface water

Introduction : Photocatalysed processes have grown in importance mainly due to their widespread applications in energy conversion, pollution abatement and the synthesis of new materials (Zhang,2009). Nanoparticles of Zero Valant Iron are the first field application of free released nanoparticlesfor environmental remediation (Rathor, 2017). Researchers are using photocatalysts for oxidative degradation of various non-biodegradable wastes. Fundamentally, photocatalysis deals with reactions which are initiated by electronically excited molecules generated by absorption of suitable radiation in the visible or near ultraviolet region. One of the most widely investigated and convenient class of photocatalysts is of metal oxide semiconductors (Chirag,2015; Rabbani, 2016). Semiconductors, with suitable band gaps, can act as quantum collectors of light energy. Illuminating a semiconductor material with photons of desired energy (i.e. hn ? the band gap of semiconductor) can cause a number of photocatalytic reactions (Bickley, 1973).

Titanium dioxide (TiO_2), commonly known as titania, is one of the most commonly used photocatalysts (Beydoun 2000, Chen L.C.,2009;Qu,2013). Because of its high oxidative power, stability, and non-toxicity, it promises a broad range of uses as a photocatalysts (Ollis,1993). Advantages of using TiO_2 as photo-catalyst are: (a) using TiO_2, the process occurs under ambient conditions (Chengkun Xu, 2006), (b) Using TiO_2, the oxidation of the substrate to CO_2 is complete in most cases and (c) it is comparatively inexpensive and remains quite stable in contact with different substrate. TiO_2 has also played a leading role in the active research for the utilization of solar energy (Houlihan,1983;Manilal, 1992). TiO_2 is also a potent photocatalyst that can break down almost any organic compound when exposed to sunlight (Wang 2009, Xu2009)and a number of researches are seeking to capitalize on TiO_2,s reactivity by developing a wide range of environmentally beneficial products (Kang,2008;Karunakaran,2008;Jia, 2009;Khan, 2009; Dang, 2010).

Ashish Kumar and Azad Kumar
Agra College, Agra.
ashishx1@rediffmail.com

Methodology

Photodegradation of Organic Aids

In this study, photo-degradation of an organic acid namely Citric Acid was investigated (Lydia, 2004; Chen F,2009;Haque and Muneer, 2007). The photocatalyst powders (i.e. commercially obtained TiO_2 and Cu-TiO_2 nanocomposites) were dispersed in aqueous solutions of chosen organic acidseparately and the dispersions were subjected to UV-Visible irradiation under continuous stirring. After different duration of irradiation a suitable volume of dispersion was taken out and centrifuged to remove the photocatalyst. The residual concentration of the acids was then determined titrimetrically by volumetric titration against standard NaOH solution.

Results

Photo-degradation studies

The results (Table 1) presented in this Section comprise the residual concentrations (Figure 1) of substrate in the reaction mixture, measured at different time intervals.

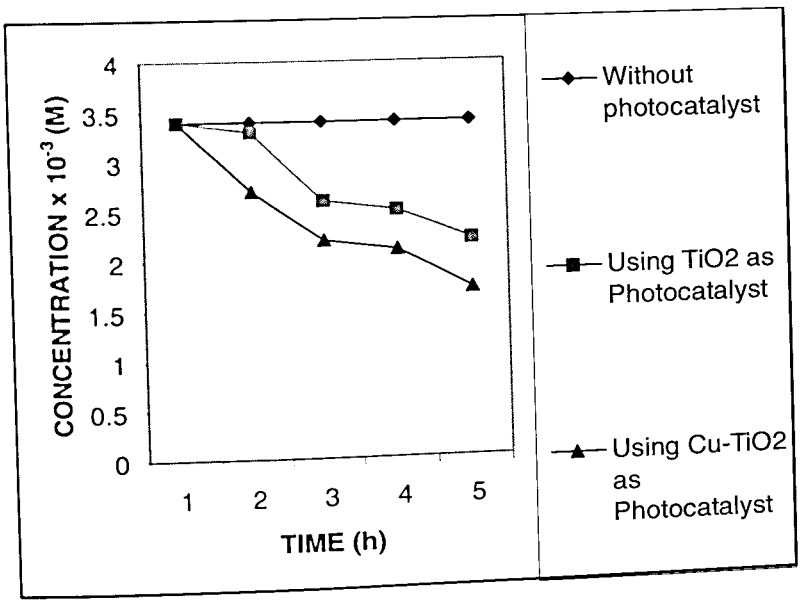
Table 1

Observed variation in Citric acid concentration with time in the reaction mixture
Reaction temperature: 29.3 °C
Initial concentration of Citric acid: $3.4*10^{-3}$ M
Amount of Photocatalyst: 20 g/ L

Reaction Time (min)	Citric acid concentration× 10^3 (M)		
	—◆—	—■—	—▲—
0	3.4	3.4	3.4
60	3.4	3.3	2.7
120	3.4	2.6	2.0
180	3.4	2.5	2.1
240	3.4	2.2	1.7

—◆— Without photocatalyst
—■— Using TiO_2 as Photocatalyst
—▲— Using Cu-TiO_2 as Photocatalyst

Fig. 1: Showing the observed concentration of Citric acid.



Conclusion : More effective photo degradation was found in case of citric acid in the presence of Cu-TiO_2 as compared with pure TiO2 or in absence of any photo catalyst. Cu-TiO_2 was found more effective as photocatalyst compared to TiO_2 for photodegradation of studied substrates. The present study, thus clearly highlights the enhanced photocatalytic behavior of Cu-TiO_2 in comparison to the commercially obtained TiO_2. The process also provides a cost effective method for water pollution remediation.

References

Beydoun, D. and Amal, R. (2000):Novel Photocatalyst: Titania-Coated Magnetite. Activity and Photodissolution*J*. Phys. Chem. B, **104** (18), 4387–4396.

Bickley, R. I.,Munuera, G., and Stone, F. S. (1973) *J*. Catal,**31**, 398 .

Chen.F, Zou.W, Qu.W, and Zhang.J, (2009) Photocatalytic Performance of a Visible Light TiO2 Photocatalyst Prepared by a Surface Chemical Modification Process Catalysis Communications, In Press, Accepted Manuscript, Available online 12 April 2009.

Chengkun, Xu, Richard,Killmeyer, McMahan, L. Gray, Khan, Shahed U.M. (2006): Photocatalytic effect of carbon-modified n-TiO2 nanoparticles under visible light illumination, Applied Catalysis B: Environmental, **64,** 3-4, 312-317.

Chen,.L.C, Ho,.Y.C, Guo,W.S, Huang.C.M, and Pan.T.C, (2009):Enhanced visible light-induced photoelectrocatalytic degradation of phenol by carbon nanotube-doped TiO2 electrodes, Electrochimica Acta,**54,** 3884-3891.

Chirag, P.N. (2015): Nanotechnology: Future of Environmental Pollution Control, IJRITCC(http:// www.ijritcc.org), Volume: 3 Issue: 2 164 – 166.

Dang, T. C.,Pham, D. L.,Le ,H. C. and Pham, V. H. (2010): "TiO2/CdS nanocomposite films" Adv.Nat.Sci.:Nanosci.Nanotechnol 1,5.

Haque, M.M., Muneer,M. (2007) : Photodegradation of norfloxacin in aqueous suspensions of titanium dioxide *J.* of Hazardous Materials, **145,** 1-2, 51-57.

Houlihan, J. F., Pollock, R. J., D. P. Madacsi. (1983):Catalytic and photocatalytic effects on photoplatinized macroscopic TiO2 photoanodes in dilute ethanol solutions Electrochimica Acta, **28,** 5, 585-590.

Jia,.H, Zheng,.Z, Zhao,.H, Zhang,. L, and Zou,. Z,(2009) : Nonaqueous sol–gel synthesis and growth mechanism of single crystalline TiO2 nanorods with high photocatalytic activity, Materials Research Bulletin, **44,** 1312-1316.

Kang,Seok Go, Sung Real Son, Sang, Done Kim (2008):Reaction kinetics of reduction and oxidation of metal oxides for hydrogen production Int.l *J.*of Hydrogen Energy, **33** 21, 5986-5995.

Karunakaran.C, and Dhanalakshmi,.R. (2008) : Semiconductor-catalyzed degradation of phenols with sunlight, Solar Energy Materials and Solar Cells, **92,** 1315-1321.

Khan,.R, and Kim,T.J. (2009):Preparation and application of visible-light-responsive Ni-doped and SnO2-coupled TiO2 nanocomposite photocatalysts *J.* of Hazardous Materials, **163,** 1179-1184.

Lydia, L. Lifongo, Derek, J. Bowden, Peter Brimblecombe. (2004) : Photodegradation of haloacetic acids in water. Chemosphere **55.** 67-476.

Manilal, V.B., Haridas,AjitRegi, Alexander, GD. Surender (1992):Photocatalytic treatment of toxic organics in wastewater: Toxicity of photodegradation products Water Research, **26,** 8, 1035-1038.

Ollis,.D.E and Al,.Ekabi.H, (1993): Photocatalytic Purification and Treatment of Water and air, Elsevier, Amsterdam.

Qu, X., Alvarez, P.J.J., Li, Q. (2013): Applications of nanotechnology in water and wastewater treatment. Water Research 47, 3931-3946.

Rabbani, M.M., Ahmed, I., Park, SJ. (2016): Application of Nanotechnology to Remediate Contaminated Soils. In: Hasegawa H., Rahman I., Rahman M. (eds) Environmental Remediation Technologies for Metal-Contaminated Soils. Springer, Tokyo.

Rathor, G., Chopra, N., AdhikariT. (2017): Synthesis and characterization of Nano particlesof zero-valent iron for environmental remediation. International Journal of Chemical Studies 5(4): 282-285.

Wang,.C, Zhang,.X, Liu,.H, Li,.X, Li,.W, and Xu.H, (2009):Reaction kinetics of photocatalytic degradation of sulfosalicylic acid using TiO2 microspheres, *J.*of Hazardous Materials, 163, 1101-1106.

Xu,.X.R, Li,.S.X, Li,.X.Y., Gu, J.D, Chen,.F, Li., X.Z, and Li, .H.B, (2009) : Degradation of n-butyl benzyl phthalate using TiO2/UV, *J.* of Hazardous Materials, **164,** 527-532.

Zhang, .Z. Brown, .Z, Goodall,.J.B.M., Weng,.X. Thompson, .K, Gong,.K, Kellici.S,. Clark, .R.J.H, .Evans, .J.R.G, .and Dar, r.J. A, (2009):Direct continuous hydrothermal synthesis of high surface area nanosizedtitania, *J.* of Alloys and Compounds,.**476,**451-456.

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 61–69

A COMPRATIVE STUDY OF FORECASTING TECHNIQUES IN ELECTRICITY DEMAND

KEERTI JAIN, SMITA SOOD, VINEETA SINGH

Abstract : India's energy consumption needslike those of many developing countries have grown many folds during last several decades. This makes forecasting of electricitydemand in India a prime focus of the government. Forecasting is the process of making predictions of the future based on past and present data and analysis of trend. In this paper, an attempt has been made to predict electricity demand of Haryana using statistical time series modelling techniques, Holt Winter's Exponential Smoothing Model (HWES) and the Auto Regressive Integrated Moving Average Model (ARIMA) and compare the two models

Keywords-Forecasting, Holt-Winter's Exponential Smoothing Model, ARIMA, Auto Regression,Moving Average

I. Introduction : Electricity supply planning requires efficient management of existing power system and optimization of the decisions concerning additional capacity. Demand prediction is an important aspect in the development of any model for electricity planning. Government worldwide use energy demand forecasting as one of the most important policy tool. Accurate load forecasting can led to better budget planning, overallreduction in cost and maintenance scheduling and fuel management. Without energy forecast, shortage in power or over capacity may lead to large losses. India's energy consumption needs are also increasing many folds day by day as other developing countries. The gaps between energy supply and demand is widening in most of the urban areas.

Load forecasting has been an important subject of research in the past. Bardkat in 1992 have used exponential smoothing to forecast demand based on past trend in southern Arabia. In 1998, Infield and Hill also used same method to forecast demand in Shetland and Scotland. Auto Regressive Integrated Moving Average Models (ARIMA) is used inprediction of dependent variable, when independent variables are missing. Li Wei and Zhang have demonstrated the ARIMA method in forecasting short term electricity load. Satya P used the same model to forecast milk production inIndia. Akuno predicted tourist arrival in Kenya using similar models.

The main objective of this study is to forecast electricity demand of Haryana using statistical time seriesmodelling techniques- Holt Winters method and ARIMA modelling. Further comparative analysis of both the models will be done on the basis of certainperformance metrics.

II. Material and Methods : The quarterly data of electricity demand in Haryana has been collected from the website www.data.gov.in. Holt Winter's Exponential Smoothing and ARIMA models are used on the electricity demand of Haryana for forecasting. The tests are conducted for seven years that is from 2005-2011 and prediction period is from 2012-2014.

A. Holt Winters Exponential Smoothing (HWES)

Exponential smoothing is used frequently throughout the world, because the method is simple, fast andinexpensive. Exponential smoothing methods are a class of methods that produce forecasts with simple formulae, taking into account trend and seasonal effects of the data. These procedures are widely used as forecasting techniques in inventory management

Keerti Jain, Smita Sood
DBAS, School of Engineering
GD Goenka University, Sohna, Gurgaon
keerti.jain@gdgoenka.ac.in,
smita.sood@gdgoenka.ac.in
Vineeta Singh
Institute of Social Sciences
Dr. B.R. Ambedkar University, Agra
vineeta20012002@yahoo.co.in

and sales forecasting. Ord [1997] had put exponential smoothing procedures on sound theoretical ground by identifying and examining the underlying statistical models.

The HWES method estimates three smoothing parameters, associated with level, trend and seasonal factors. The seasonal variation can be of either an additive or multiplicative form. The multiplicative version is used more widely and on average works better than the additive Bernvdesi segura & vercher (2006). If a data series contains some values equal to zero, the multiplicative HWES method may not be used.In such casesadditive Holt-Winters forecasting model is used (Sweet, 1985 & landon,1998). A problem which affects all exponential smoothing methods is theselection of smoothingparameters and initial values, so that forecast is betterin accord with time series data. The parameters of smoothing (and initial) in HWES are estimated byminimizing the mean square error (MSE). The Holt Winters' Exponential Smoothing Model is given in equations (1)

$$\left.\begin{aligned} Level: E_t &= \alpha(Y_t - S_{t-p}) + (1-\alpha)(E_{t-1} - T_{t-1}) \\ Trend: T_t &= \beta(E_t - E_{t-1}) + (1-\beta)T_{t-1} \\ Seasonality: St &= \gamma(Y_t - E_t) + (1-\gamma)S_{t-p} \\ Forecast: F_{t+1} &= (E_t + mT_t) + S_{t-p+m}) \end{aligned}\right\} \quad \ldots (1)$$

where α, β, γ are smoothing constants and are chosen so that MSE is minimized.

B. Auto Regressive Integrated Moving Average Models (ARIMA)

Univariate ARIMA models use only the information contained in the series itself. Thus, models areconstructed as linear functions of past values of theseries and/or previous random shocks (or errors). Forecasts are generated under the assumption that the past history could be translated into predictions for the future. The ARIMA model uses the fact that electricity demand is a stochastic time series. This modellingregresses the dependent variable Y_t on p-lags of thedependent variable (Autoregressive) and q lags of the error term (Moving Average). Sometimes instead of dependent variable $Y_t L^d Y_t$ can be used as the dependent variable.Here L is the one step lag operator, i.e., $LY_t = Y_{t-1}$. Thegeneral equation of ARIMA model (parkratz, 1983) is as follows:

$$(1 - \sum_{k=1}^{p} \alpha_k L^k)(1-L)^d X_t = (1 + \sum_{k=1}^{q} \beta_k L^k)\varepsilon_t \quad \ldots (2)$$

where is white noise error. It is identically and independently distributed with mean zero andcommon variance across all observations. In ARIMA model following steps are followed:

Step1: Model Identification

According to Box and Jenkins (1970) two graphical procedures are used to access the correlation between the observations within a single time series data. These devices are called an estimated autocorrelationfunctions and the estimated partial autocorrelation function. These two procedures measure statistical relationships within the time series data. Next step for identification is summarization of statistical correlation within the time series data. One has to choose the appropriate ARIMA model from the whole family of ARIMA as suggested by Box and Jenkins.The autocorrelation function (ACF) and partialautocorrelation functions (PACF) of a series together are the most powerful tool, usually applied to reveal the correct values of the parameters. The ACF gives the autocorrelations calculated at lags 1, 2 and so on, while PACF gives the corresponding partial autocorrelations, controlling the autocorrelations at intervening lags. Every ARIMA model have their unique ACF and PACF associated with it. One has to select the model whose theoretical ACF and PACF resembles the anticipated ACF and PACF of the time series data.

Step 2: Parameter Estimation

Maximum Likelihood Estimation Method (MLE) or Modified Least Squares Method (MLS), whichever suitable for the time series data is used to estimate the coefficients of the model. The final results includes the parameter estimates, standard errors, estimates of residual variance, standard error of the estimate, natural log likelihood, Akaike's Information Criterion (AIC). Model selection is based on the minimization of AIC. To identify the optimal ARIMA model, differentcombinations of AR and MA are tested. The one for which AIC have minimum value are considered to be optimal model. AIC is given by:

$$AIC = -2 \log L + 2m \quad \ldots (3)$$

$m = p + q$ and L is likelihood function.

Step 3: Diagnostic Checking

Diagnostic checks help to determine if the anticipated model is adequate. In this step, an examination of the residuals from the fitted model is done and if it fails the diagnostic tests, it is rejected and one have to repeat the cycle until an appropriate models is achieved.

Step 4: Forecast

These models are regression models that use lagged values of the dependent variables and/or random distributing term as explanatory models. These models rely heavily on the auto correlation pattern in the data. This model regresses the dependent variable on p lags of the dependent variable (Auto Regressive) and q lags of the error term (Moving Average).

C. Performance Evaluation

To evaluate the performance of the various models the Root Mean Square Error (RMSE) and the MeanAbsolute Percentage Error (MAPE) are used, which are as follows:

$$\text{RMSE} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(Y_t - F_t)^2} \quad \ldots(4)$$

$$\text{MAPE} = \frac{1}{n}\sum_{i=1}^{n}\left|\frac{Y_t - F_t}{Y_t}\right| \times 100 \quad \ldots(5)$$

Where Y_t is the observed value and F_t is the forecast value and n is the number of time period used as forecasting.

III. RESULT AND DISCUSSIONS

The main aim of the paper is to predictelectricity demand in Haryana and compare the two forecasting modelsTable 1, shows the quarterly electricity demand (MU)of Haryana for period 2005-2014. The time plot (Fig. 1) shows that there is fall in electricity demand in every first quarter of the years and then an increasing slopefollowed by peak in every third quarter of the years. This shows seasonality in quarters of the years and also an increasing trend over years.

TABLE 1: Quarterly Electricity Demand (MU) in Haryana from 2005-2014

Sl.no	Year	Quarter	Electricity Demand (Y_t)(MU)	Sl.no.	Year	Quarter	Electricity Demand (Y_t) (MU)
1		I	1607.00	6	2010	I	2418.13
		II	1945.67			II	2712.85
		III	2273.67			III	3261.00
		IV	1865.33			IV	2817.33
2		I	1845.67	7	2011	I	2706.33
		II	2193.67			II	2630.67
		III	2589.37			III	3652.67
		IV	2068.33			IV	3157.67
3	2007	I	1898.33	8	2012	I	2838.67
		II	2198.00			II	3223.00
		III	2797.67			III	4086.33
		IV	2381.00			IV	3297.33
4	2008	I	2358.33	9	2013 2013 2013	I	2917.33
		II	2227.67			II	3681.33
		III	2775.00			III	4630.67
		IV	2369.00			IV	3227.00
5		I	2334.00	10	2014	I	2948.00
		II	2439.33			II	3689.00
		III	3432.84			III	5082.00
		IV	2758.17			IV	3157.67

Source: Ministry of Power, India

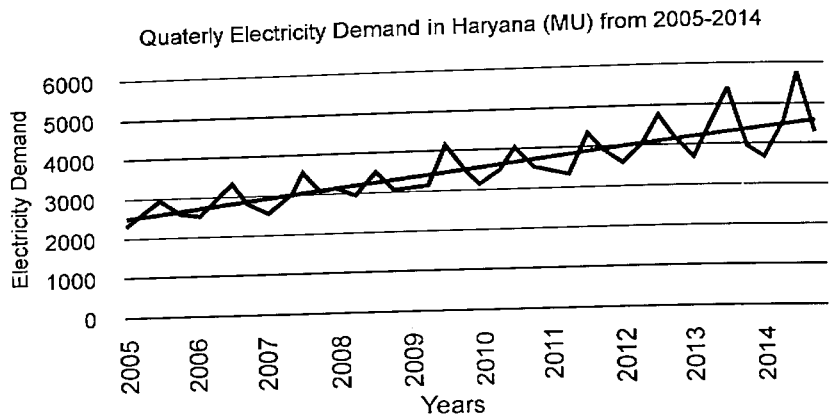


Fig 1: Time plot of Electricity Demand in Haryana from 2005-2014

A. Holt- Winter's Exponential Smoothing (HWES)

HWES model is appropriate when trend and seasonality are present in the time series. It decomposes the series down into three components that are base, trend and seasonal components. Additive model of Holt-Winter's Exponential Smoothing is used for forecasting. In defining the smoothing parameters of base, trend and seasonality statistical program Solver, a tool contained in Excel is used. For HWES model the best fitted value of are 0.044552, 1 and 0.061224 respectively. MAPE (7.14) and RMSE(302.98) are least.Finally the observed and forecasted values are shown in table 2.

TABLE 2: Forecast of Quarterly Electricity Demand in Haryana from 2012- 2014

Sl.No	Year	Quarter	Electricity Demand (MU)	
			Observed Values	Forecasted values HWES Model
1	2012	I	2838.67	2977.61
		II	3223.00	3229.60
		III	4086.33	3656.15
		IV	3297.33	3226.50
2	2013	I	2917.33	3181.14
		II	3681.33	3445.58
		III	4630.67	3929.55
		IV	3227.00	3524.09
3	2014	I	2948.00	3459.51
		II	3689.00	3747.86
		III	5082.00	4238.51
		IV	3545.67	3779.94

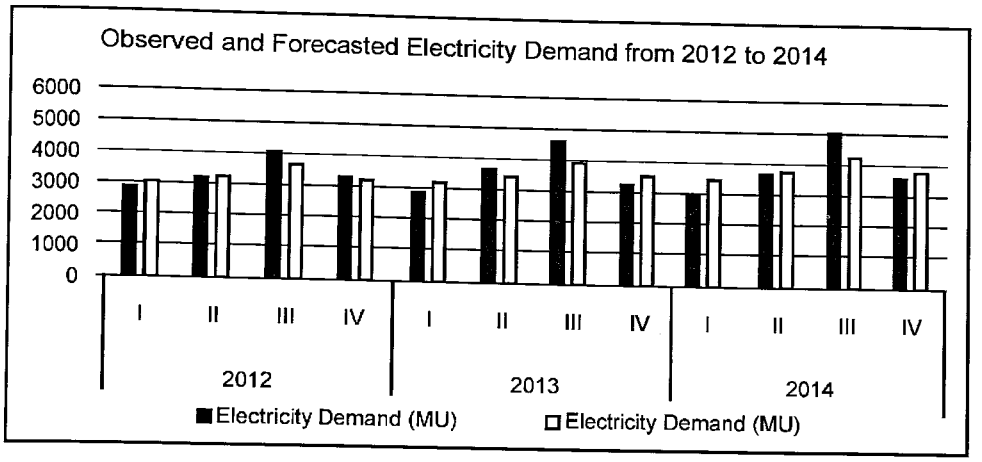


Fig 2: Comparison of Observed and Forecasted values using HWES Model.

B. Auto Regressive Integrated Moving Average (ARIMA)

ARIMA uses the fact that electricity demand is stochastic time series. In this paper ARIMA modelling is done using R-programming From fig 1, it is observed that the given time series is non-stationary, on applying Dickey-Fuller test also electricity demand series d(0) for lag order(3) is found to be non-stationary. Therefore, the series has to be transformed to a stationary series, by differencing.The variance of first difference series is minimum, so applying Dickey Filler test on first difference series and it is found to be stationary.

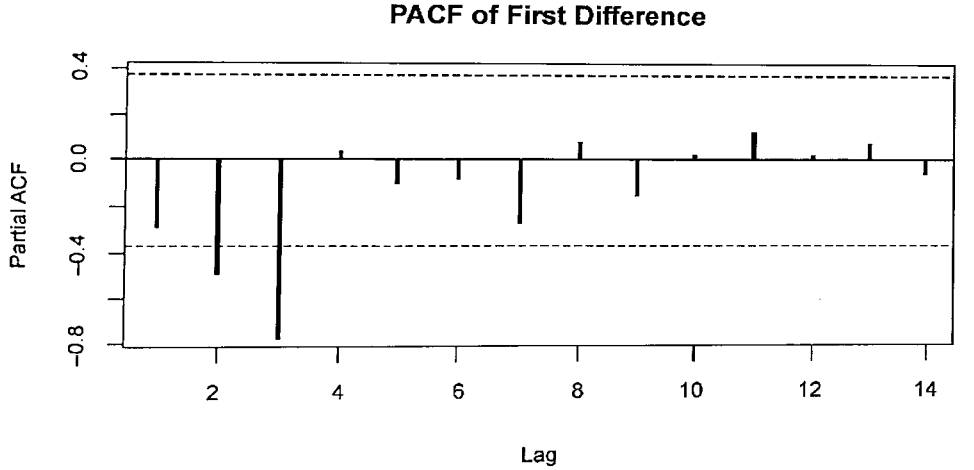


Fig.3: Autocorrelation of firstDifference of Electricity Demand

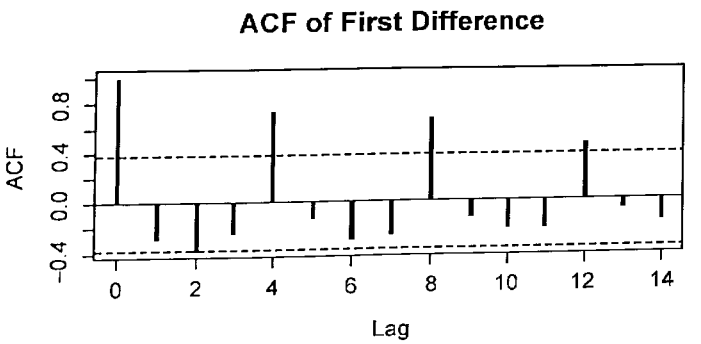


Fig. 4: Partial Autocorrelation of first Difference of Electricity Demand

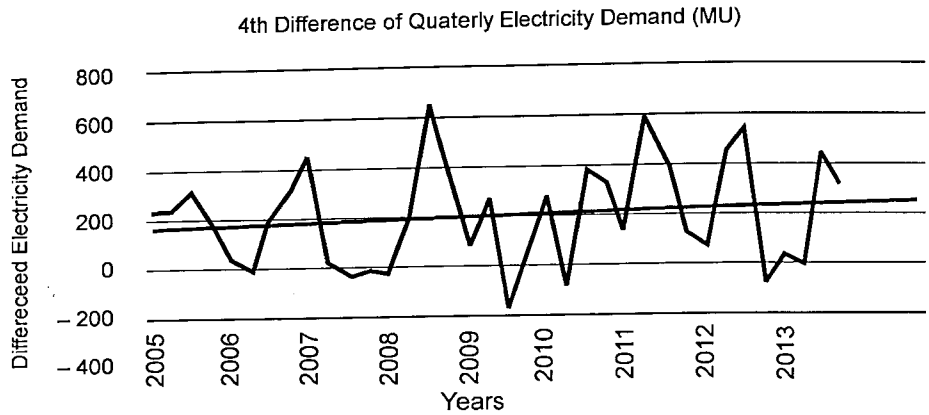


Fig. 5: Time plot of 4th difference of electricity demand data

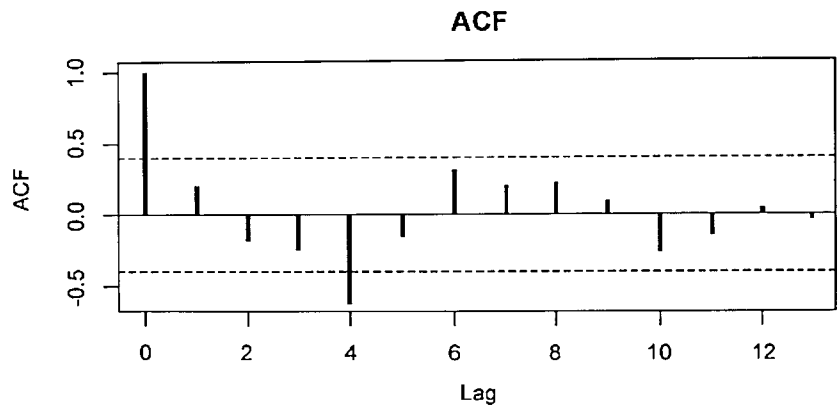


Fig. 6 : Autocorrelation of 4thDifference of Electricity Demand

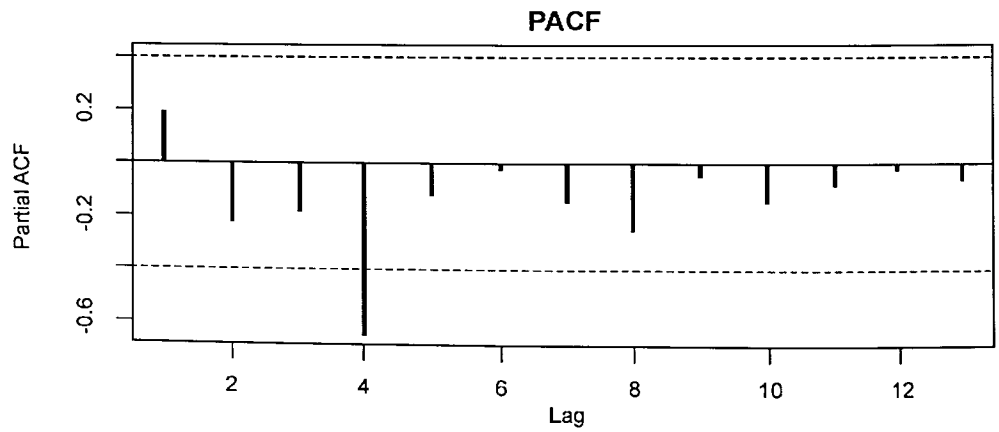


Fig. 7 : Partial Autocorrelation of 4th Difference of Electricity Demand

Box and Jenkins have specified wide variety of characteristics of ACF and PACF. Therefore, the ACF and PACF of the data should analyzed first which are shown in figure (3) and figure (4) respectively. There is a certain periodicity with period 4 in the ACF plot and spikes are significant at 0, 4 and 8. Therefore according Box Jenkins a seasonal ARIMA plot with period 4 must be considered.

Fig. 5 shows the time plot of 4th difference of electricity demand. It is found to be stationary. Also

Dickey Filler test shows 4th difference for lag order is stationary.

Hence electricity demand (Y_t) is differenced by 4, i.e. consider Y_t-Y_{t-4} as the new variable to which ACF and PACF are shown in figure (6) and figure (7) respectively.

It is observed from the fig.(6), ACF has significant spike at lag 4, indicates MA(4) term and also there is asignificant spikes at lag 4 in PACF shown in fig.(7), indicates AR(4) term. After trying various combinations of considering significant spike at lag 4 in both ACF and PACF. The AIC (308.77) is least for ARIMA (0,1,1) $(4,1,0)^4$ model. Diagnostic check has be done on this model using Box-Ljung test. It is found that the ARIMA $(0,1,1)(4,1,0)^4$ model is fit for forecasting electricity demand of Haryana.

UsingARIMA $(0,1,1)(4,1,0)^4$model the forecasted values of electricitydemand of Haryana has been obtained which are shown in table 3. The performance evaluation measures for this ARIMA model are MAPE (8.13) and RMSE (419.33).

TABLE 3: Forecast of Quarterly Electricity Demand in Haryana using ARIMA from 2012-2014

Sl.No	Year	Quarter	Electricity Demand (MU)	
			Observed Values	Forecasted values ARIMA (0,1,1) (4,1,0)4
1	2012	I	2838.67	2839.44
		II	3223.00	2951.68
		III	4086.33	3822.67
		IV	3297.33	3227.90
2	2013	I	2917.33	2900.01
		II	3681.33	3092.70
		III	4630.67	4063.52
		IV	3227.00	3531.63
3	2014	I	2948.00	3181.00
		II	3689.00	3210.22
		III	5082.00	4128.89
		IV	3545.67	3640.44

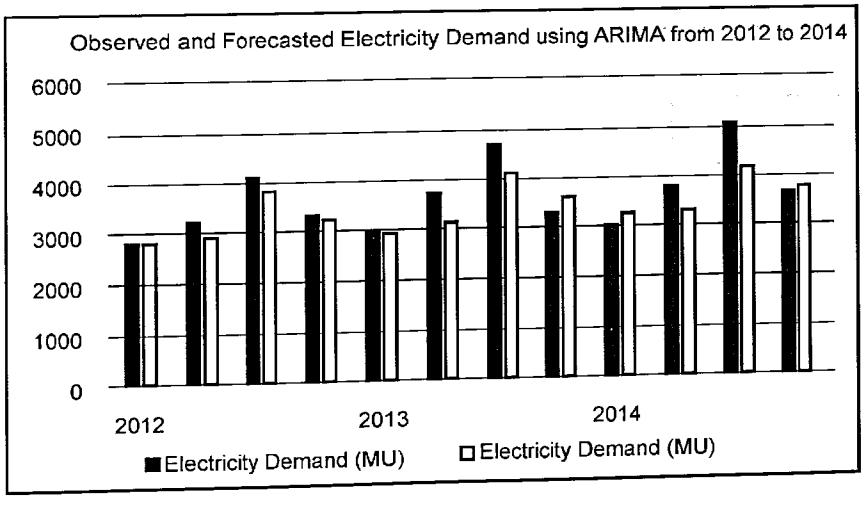


Fig. 8: Comparison of Observed and Forecasted values using ARIMA Model.

Table 3 and Fig. 8 shows thatquarterly forecasted values of electricity demand of Haryana from 2012-2014 using ARIMA$(0,1,1)(4,1,0)^4$are significantly similar to the observed values.

TABLE 4: Comparison of Forecasted values of Quarterly Electricity Demand of Haryana using HWES and ARIMA from 2012-2014

Sl.No	Year	Quarter	Electricity Demand (MU)		
			Observed Values	Forecasted values HWES Model	Forecasted values ARIMA (0,1,1) (4,1,0)4
1	2012	I	2838.67	2977.61	2839.44
		II	3223.00	3229.60	2951.68
		III	4086.33	3656.15	3822.67
		IV	3297.33	3226.50	3227.90
2	2013	I	2917.33	3181.14	2900.01
		II	3681.33	3445.58	3092.70
		III	4630.67	3929.55	4063.52
		IV	3227.00	3524.09	3531.63
3	2014	I	2948.00	3459.51	3181.00
		II	3689.00	3747.86	3210.22
		III	5082.00	4238.51	4128.89
		IV	3545.67	3779.94	3640.44
		MAPE		7.14	8.13
		RMSE		302.98	419.33

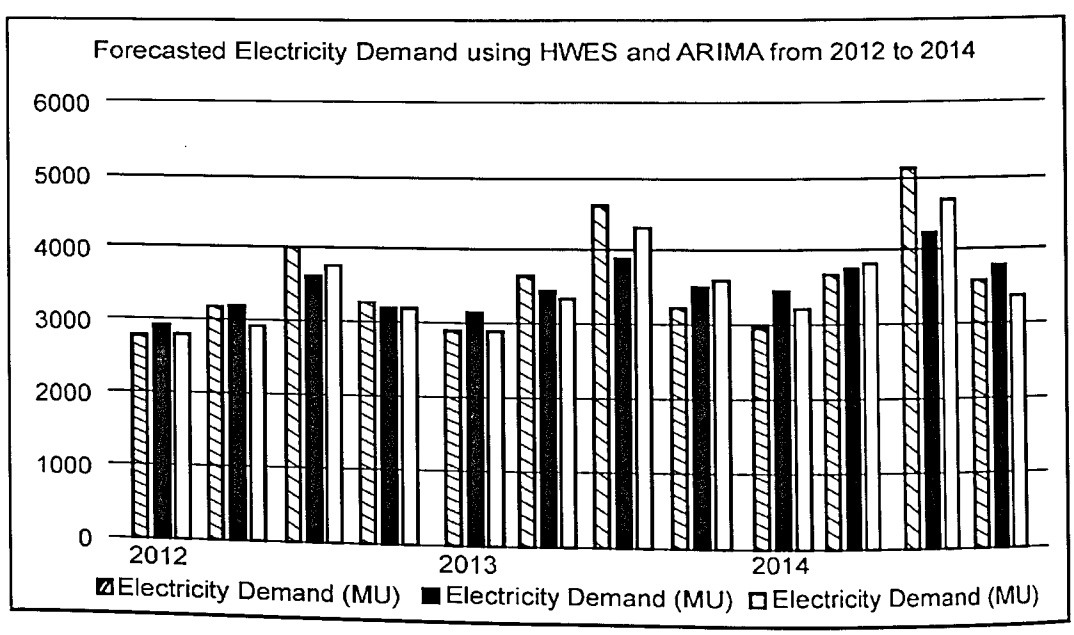


Fig. 9: Comparison of Observed and Forecasted values using HWES Model and ARIMA Model.

Table 4 and fig 9. shows comparison of forecasted values of quarterly electricity demand of Haryana using HWES and ARIMA Model. Both the methods are providing significantly good forecasted values of electricity demand. Still there is difference in their performance of the two models.The comparison of the two models based on performance evaluation measures MAPE and RMSE is also shown in Table 4. Based on the results shown in Table 4, HWES model is more efficient than ARIMA for forecasting electricity demand in Haryana. Also from fig.9, it is clear that HoltWinter's Exponential Smoothing model provides better forecasted values than ARIMA $(0,1,1)(4,1,0)^4$

IV. CONCLUSION

The study aimed at forecasting electricity demand of Haryana and to compare HWES and ARIMA based on MAPE and RMSE. Holt Winter's ExponentialSmoothing Model andARIMA $(0,1,1)$ $(4,1,0)^4$ Model both are quiet efficientfor forecasting electricity demand of Haryana. On thebasis ofresultsobtained and the past data used, Holt Winter'sExponential Smoothing model is better than ARIMA$(0,1,1)$ $(4,1,0)^4$. Therefore HWES model is found to be the best fit model for electricity demand of Haryana.

References

Barkat, E.H.; Al-Qassim,J.M; Al-Rashed, S.A.,(1992) "New model for peak demand forecasting applied to highly complex load characteristics of a fast developing area, Generation, Transmission and Distribution", IEEE Proceedings C, vol. 139, no. 2, pp136, 140, Mar

Infield, D. G.; Hill, D.C.,(1998)"Optimal Smoothing for trend removal in short term electricity demand forecasting", Power Systems, IEEE Transactions on, vol. 13, no.3, pp 1115,1120, Aug.

Li Wei; Zang Zhen-Gang,(2009) : Based on Time Sequence of ARIMA Model in the Application of Short-Term Electricity Load Forecasting," Research Challenges in Computer Science, 2009. ICRCCS'09. International Conference, pp 11-14,28-29 Dec.

Satya P, Ramasubramanian, V. and Mehta, S.C. (2007) : "Statistical Models for Forcasting Milk Production in India," Journal of the Indian Society of Agricultural Statistics,vol 61, pp80-83.

Akuno, A.O, Otieno,M.O, Mwangi, C.W.;(2015) : "Statistical Model for Forecasting Tourists' Arrival in Kenya," Open Journal of Statistics,"2015, vol.5, pp. 60-65, Published Online Feb in SciRe.

http://www.scirp.org/journal/ojs, http://dx.doi.org/10.4236/ojs.2015.51008

https://www.data.gov.in/catalogs# path = ministrydepartment/ministry-power.

Ord, J. K., A. B. Koehler & R. D. Snyder (1997) : "Estimation and Prediction for a Class of Dynamic Nonlinear Statistical Models," Journal of the American Statistical Association, vol.92, pp.1621–1629.

Bermúdez J.D., Segura J.V. and Vercher E.;(2006) : "Improving the demand forecasting accuracy using nonlinear programming software,"; Journal of the Operational Research Society vol.57, pp. 94-100.

Sweet, A. L.(1985) : "Computing the variance of the forecast error for the Holt-Winter seasonal models," Journal of Forecasting, vol. 4, 235–243.

Lawton, R. (1998) : "How should additive Holt-Winters' estimates be corrected?," International Journal of Forecasting, vol.14, pp.393–403.

Pankratz, A. (1983) Forecasting with Universal Box-Jenkis Models: Concept and Cases. John Wiley and Sons, NewYork, 1983. http://dx.doi.org/10.1002/9780470316566.

Box, G.E.P and Jenkins, G.M.;(1970) : "Time Series Analysis: Forecasting and Control," Holden-Day, San Francisco.

Agra University Journal of Research : Science
Vol. 1. Issue. 2 (May–August, 2017), pp 70–74

AN ASSESSMENT OF THE KNOWLEDGE LEVEL REGARDING HIV/AIDS AMONG SCHOOL GOING ADOLESCENTS OF DISTT. AGRA OF UTTAR PRADESH

DINESH KUMAR VERMA, P P MATHUR, SURENDRA SINGH

Abstract : 500 adolescents from two inter- mediate colleges were selected randomly. The information was collected by interviewing to assess the knowledge level and attitude of the students towards HIV/AIDS. Present study shows that level of knowledge about mode of transmission & communicability was good but in many aspects the knowledge level was low. About 50% adolescents felt that it can spread by sharing shaving blade, sharing clothes and mosquito bite, about 30% Male & 40% Female students thought that it can spread through common toilet sheet while knowledge regarding curability was also low. However at present, even in most of the urban population, the awareness about this dreaded disease is low.

Introduction : The HIV/AIDS epidemic represents the most serious Public health problem in India. There is no denial of the enormity of the problem. The prevalence of the infection in all parts of the country highlights the spread from urban to rural areas and from high risk to the general population.

The problem of lack of knowledge and indifferent attitude in the society makes the problem yet more difficult and dangerous. AIDS or suffering from HIV infection still remains a social stigma in many parts of the world (particularly in the developing countries) that adds some more and complex dimensions to this problem.

Dinesh Kumar Verma
S.S. Educational Institute, Gamri, Malpura, Agra
P. P. Mathur
Deptt of Paediatrics,
S. N. Medical College, Agra
Surendra Singh
S.S. Educational Institute, Gamri, Malpura Agra

Health education can play an important role in preventing the spread of HIV infection, by bringing the change in various beliefs and wrong information e.g. touching or kissing the AIDS patient will transmit the disease. Thus correct knowledge brings changes in the various beliefs and attitude of a person and will definitely reduce the incidence of HIV/AIDS in the community.

The present study was conducted to assess that to what extent the adolescent's know of various aspects of HIV/AIDS as knowledge regarding mode of transmissions beliefs about communicability and knowledge regarding prevention and treatment.

BJECTIVE OF THE STUDY

To measure the knowledge level among college going adolescents about HIV/AIDS.

MATERIAL AND METHODS

The study was conducted on 500 adolescent students studying in class 9th, to 12th, aged 13-19th years of the two Intermediate colleges of Agra District. For the study 250 adolescents from each college (One Urban & One Rural) were selected randomly comprising 298 male & 202 females. The information was collected by interviewing the students one by one in privacy through a pre-tested interview schedule which was prepared in the tune with the objectives of the study for the purpose of data collection.

The information collected was analyzed and results are presented below.

RESULTS

The study population comprised of 298 male & 202 female students(59.6% & 40.4%) in age group of 13-19 years.

Knowledge Regarding Mode of Trans- mission :

Table-1 on mode of HIV/AIDS transmission shows

that almost all students both male and female knew that infection is transmitted through sexual contact by having multiple sex partners (100% M and 99% F) and homosexuality (98.6 M & 97.5% F), sharing needle & syringe (99.7% M & 98.5% F), by blood transfusion (99% each) and breastfeeding the child (96% and 79.2%) however 3.2% boys & 11.4% girls gave no response on transmission by breastfeeding with significant difference ($p<.05$).

Table -1 : Knowledge Regarding Mode of Transmission

Mode of Transmission	Male = 298		Female = 202			Test of Significant	
Response Y	**N**	**NR**	**Y**	**N**	**NR**	**x^2**	**p**
* Multiple sex Partner	298	-	-	200	2	3	
%	100	-	-	99.01	0.99	-	
* Homosexuality	294	-	4	197	5	-	
%	98.66	-	1.34	97.52	2.48	-	
*Sharing Needles/Syringe	297	-	1	199	3	-	
%	99.66	-	0.34	98.51	1.49	-	
* Blood transfusion	295	3	-	200	2	3	
%	98.99	1.01	-	99.01	0.99	-	
* Breast Feeding	286	3	9	160	19	2335.110,	<0.05
%	95.97	1.01	3.02	79.21	9.40	11.39	

Y = Yes, N= No, NR = No Response

Beliefs about Communicability :

Regarding belief on communicability of HIV/AIDS, it was found that majority of both male & female students were having right belief that HIV will not spread by sharing common utensils (90.3% M & 86.1% F), by hugging and kissing (96.3% M & 87.6% F) by sharing the clothes (66.1% M & 65.3% F) and by using common toilet sheet (69.1% M & 57.4% F). More boys were having right belief that it do not spread by sharing shaving blades, (67.8%) while girl's belief was more positive that it do not spread by mosquito bite (50.5%). 23.8% boys and 14.4% girls not responded on spread by sharing the clothes with significant statistical difference ($x^2 = 14.287$, $p< 0.05$ (Table -2)

Table -2 : Beliefs about Communicability

Communicability of HIV	Male = 298		Female = 202			Test of Significance	
Response Y	**N**	**NR**	**Y**	**N**	**NR**	**x^2**	**p**
AIDS can spread :	25	269	4	22	174	6	
* By Sharing Common utensils							
%	8.39	90.27	1.34	10.89	86.14	2.97	
* By Hugging & Kissing	9	287	2	22	177	3 13.603,	<0.05
%	3.02	96.31	0.67	10.89	87.62	1.49	
* By Using Common toilet sheet	89	206	3	82	116	4 7.193,	<0.05
%	29.86	69.13	1.01	40.59	57.43	1.98	

* By Using Common shaving blade	76	202	20	101	97	4	33.895, <0.05
%	25.50	67.79	6.71	50.0	48.02	1.98	
* By Mosquito bite	143	142	13	100	102	-	0.389, >0.05
%	47.99	47.65	4.36		49.50	50.50	
* By Sharing clothes	30	197	71	41	132	29	14.287, <0.05
%	10.07	66.11	23.82		20.29	65.35	14.36

Knowledge Regarding Prevention and Treatment :

Table -3, shows that more than 90% both male and female students were knowing that condom use during sexual contact can prevent HIV transmission and about 70% students were knowing that the vaccine for prevention of HIV is not available (71.8 & 68.8%) with significant difference (p<.05). About 2/3 male and half of the female students were rightly knowing that AIDS is not a curable disease (67.8 & 53%) means complete treatment is not available in any system of medicine with significant difference (x^2 = 34.616, p = <0.05).

Table-3 : Knowledge Regarding Prevention and Treatment

Male = 298 Female = 202 2Test of Significance

Response Y	N	NR	Y	N	NR	x^2	p
* Condom can prevent AIDS	298	-	-	182	20	-	
%	100	-	-	90.10	9.90	-	
* Availability of vaccine for HIV	4	214	80	13	139	50	9.535, <0.05
%	1.34	71.81	26.85	6.44	68.81	24.75	
* AIDS is an curable disease	6	202	90	32	107	63	34.616, <0.05
%	2.01	67.79	30.20	15.84	52.97	31.19	

DISCUSSION

HIV infection has become a common problem in India. Apart from having social implications, it has a drastic and devastating economic impact on the family, society and nation. Thus it is important to take immediate steps to minimize the further spread to this disease. Major bulk of population in India is rural, where literacy, education level and awareness about this disease is very negligible.

In the study, it was observed that 47.99% male & 49.50% female students informed that it can be transmitted through mosquito bite. A large majority of students felt that mutually faithful single sex partner and use of condom are means of safe sex. Table-4 reveals that 8.39% male & 10.89% female students informed that AIDS can spread by sharing common utensils while studies conducted by Shaliesh J. Kore et al. (2002) &Goyal S. et al. (2003) reported that 8.15% & 20% respondents informed about it. Other results are compared in Table 4.

Male people are more often extrovert, out spoken and less inhibitative while females in our culture are introvert and inhibitative. In the present study it was observed that male students were more aware than female students.

Table - 4 : Comparison of results with other studies

Replied by respondents (Knowledge Level)	**Present Study**	**Other Studies**	
Spread By : Sharing common utensil	8.39% M, 10.89% F	Shaliesh J. Kore et al. (2002) 8.15%	Goyal S. et al. (2003) 20%
Sharing Toilet Sheet	29.86% M, 40.59% F	Verma Shashi (1998) 24%	Lal Panna (1996) 26.1%
Awareness Regarding spread by Needle & Syringe	99.66% M 98.51% F	Agarwal A. K. (1996) 42%	Agarwal Kamal (1995) 40.4%
Condom Use can prevent AIDS	100%M, 90.10F	Shaliesh J. Kore et al. (2002) 78.25%	Lal et al. (2000) 78.1%
No Complete Curability	67.79% M 52.79% F	Lal S.S. et. al. (2000) 45%	Maria Ganczak. et. al. (2007) 34%
No Vaccine Availability	71.81% M 68.81% F	-	Maria Ganczak. et. al. (2007) 31%

Results of these studies clearly stress the need for health education and AIDS awareness programmes for populations in general and high risk groups in particular. The young adolescents come in the high risk group because of their propensity in indulging in risky sexual activity and drugs.

The Men folk of the nation should be mainly targeted for awareness of their responsibility towards women, children and their own lives. Information Education Communication (IEC) programes must have both targeted interventions with vulnerable groups and mass-media components to reach out at the grass-root level. In a multi-religious, multi-lingual country like India, different cultural context have to be considered.

CONCLUSION

Prevalence and incidence of HIV/AIDS is rapidly increasing in India. Present study shows that level of knowledge about mode of transmission & communicability was good but in many aspects the knowledge level was low. About 50% adolescents felt that it can spread by sharing shaving blade, sharing clothes and mosquito bite, about 30% Male & 40% Female students thought that it can spread through common toilet sheet while knowledge regarding curability was also low. However at present, even in most of the urban population, the awareness about this dreaded disease is low. The most viable and acceptable step would be to increase the education and awareness about this disease among college going students and in the general population. The following steps can be recommended in this regard:

RECOMMENDATION

- Implementation of HIV/AIDS awareness programmes in schools, colleges and community.
- Inclusion of sex education and family life education in school/college curriculum to get 100% level of knowledge.
- Inclusion of HIV/AIDS in detail in curriculum of other types of medical faculties like Ayurveda, Unani, Homeopathy etc. and involvement of these doctors in AIDS awareness programe.

- Mass education using television, radio, newspapers etc. for propagating safe sex and dispelling the myths and propagating against drug abuse should be included in these programes.

REFERENCES

Agarwal, A. K. and Kumar, R. (1996): Awareness of AIDS among school children in Haryana; Indian J, Public Health 1996 Apr-Jun, 40, 38-45.

Agarwal, Kamal, and Kannan, A.T., Grover V., Kumar, Parveen, Puri, A.K. (1995): Knowledge and Attitude towards AIDS amongst college youth of East Delhi; HIV-AIDS Research in India. 213-215.

Goyel, S. and Bhardwaj, A.K. (2003): PIGMER India awareness of HIV/AIDS among adolescent age in urban area of Himanchal Pradesh. 4th International Conference on AIDS India Chennai. 9-12.

Kore,Shailesh J., Anahita Pandole, Yogini Nemade (2002) : Attitude knowledge, Beliefs about HIV/AIDS in College going Adolescents, from the different colleges sion. (http:/www.bhj.org)

Lal, Panna, Kumar, Awadesh, Ingle, G.K., Gulati Neema (1994): Knowledge and Attitudes of University Students regarding HIV/AID : An Urban - Rural difference; J. Comm. Disease, 186-191.

Lal, S.S., Vasan, R.S., Sarma, PS, Thankappan, KR. (2000): Knowledge and attitude of college students in Kerala towards HIV/AIDS, sexually transmitted diseases and sexuality. Natl. Med J India. 2000 Sep-Oct; 13. 186-191.

Maria, Ganczak, Peter, Barss, Fatima, Alfaresib, Shamma, Almazroueic, Amal, Muraddadc, Fatma, Al-Maskari. (2007): Break the Silence: HIV/AIDS knowledge, Attitudes, and Educational Needs among Arab University Students in United Arab Emirates. Journal of Adolescent Health. 40, 6, 572-578:

Verma, Shashi. (1998) : A rapid survey to assess AIDS awareness among college students in Mumbai an Pune; CARC Calling.

INSTRUCTIONS FOR AUTHOR

Manuscript preparation :

Manuscript (in Microsoft word file, compatibility mode) should be typed in single space on one side of the paper leaving 1.5 inch margin on both sides. The official langauge in English.

Title Page

The article title, author's names, affiliations, corresponding author's address, phone/fax number and/or e-mail should be included in the first page.

Article (From second page)

Title should be followed by the abstract for-5 keywords and the text matter in continuation abstract should not contain citations of references. There should be not name and address of the authors on the subsequement pages. The text proper, in times new roman font of 12 size, be subdivided into following sections; Introduction, Materials and Methods, Results, Discussion, Acknowledgments, and References.

Tables and figures should be typed in continuation with text proper on suitable position. Standard symbols, abbreviations, nomenclature and standard international units be used.

Photographs and illustraions must be original glossy print in triplicate.

Citation of Tables and Figures.

Tables and Figures should be numbered consecutively. Citation of tables and figures should use the format : Table 1, Figure 1, Parts in a figure can be identified by a, b, c, d, and cited as Figure 2a, Figure 2b, Figure 2c etc.

References

References should be arranged in alphabetical orders. Avoid putting personal communications, unpublished observations, conference abstracts or conference papers as references.

Please use the following citation format and sequence as :

Journal Paper : Eknoyan G, Beck GJ and Cheung AK, 2002. Effect of dialysis does and membrane flux in maintenance hemodialysis. Ind J Bio I stud Res; 3 (2): 47-68;

Book : Kiloh LG, Smith JS and Johnson GF, 1988. Physical treatment in psychiatry. Boston, USA. Blackwell Scientific Publisher; pp; 345.

Chapters in Edited Book : Beckenbough RD and Linscheid RI. 1988. Arthroplasty in the hand and wrist. In: Green DP, ed. Operative Hand Surgery, 2nd ed. New York Churchill Livingstone; pp; 167-214.

Web Site : 1, (Internet) WHO : Geneva, Swizerland. Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003. Revised 26 September. 2003. htt:// www.who.int/csp/sars/country/table 2003 09_23/en/

Ethics Commitee Approval and Patient Concent

As per the guidelines or Committee for the Purpose of Supervision of Experiments on Animals Experimental research involving human or animals requires approval by author's institutional review board or ethics committee. All authors are requested to ensure kindly that your institution is fulfilling the above said requirment. All authors are requested to ensure kindly that your institution is fulfilling the above said should be obtained. Patient's indentities and privacy should be carefully protected in the manuscript.

Manuscript Submission

Manuscript in single copy with e-mail with the duly filled statement of original research and transfer of copyright form through speed post to the Dr. Sunil Kumar Upadhyay, Managing Editor, Agra University Journal of Research-Science, Central Library, Dr. Bhimrao Ambedkar University, Paliwal Park, Agra-282004. Authors can submit by e-mail to sunilkup562@gmail.com

Review/Decisions

Manuscripts (other than those that are of insufficient quality or unlikely to be competitive enough for publication) will be reviewed and a decision typically returned to the authors in about 15 days. Possible decisions on manuscripts are; accept as is minor revision, major revision, or reject. Revised manuscripts should be returned within 15 days in the case of minor revision, or 1 month in the case of major revison. Manucripts with significant results will be reviewed and published at the highest priority and speed. All rights are reserved with the Editor-in-Chief for the publication of the papers.

Subscription :

Single Issue	:	450/-
Volume (3 Issue)	:	900/-

All payments/enquiries/advertisements and other related matters should be addressed to Dr. Sunil Kumar Upadhyay. Managing Editor, Agra University Journal of Research-Science, Central Library, Dr. Bhimrao Ambedkar University, Paliwal Pak, Agra-282004.

Central Library
Dr. Bhimrao Ambedkar University, Agra

Rs. ₹ 450/-