Khandesh College Education Society's

Moolji Jaitha College, Jalgaon

KNOWLEDGE IS POWER

ESTD. 1945

ISO 9001 : 2008

NAAC Reaccredited "A" Grade (CGPA : 3.63)
UGC honoured "College with Potential for Excellence"
"ISO 9001 : 2008 Certified"
Department of Biotechnology, Ministry of Science & Technology, New Delhi honoured "Star College 2011"

A Compendium of

Research Articles by Budding Researchers

(Under Research Promotion Scheme for Students)

VOL-4
(2013)

A Compendium of

Research Articles by Budding Researchers

VOL - 4 (2013)

Khandesh College Education Society's

Moolji Jaitha College, Jalgaon

NAAC Reaccredited "A" Grade (CGPA : 3.63)
UGC honoured "College with Potential for Excellence"
"ISO 9001 : 2008 Certified"
Department of Biotechnology, Ministry of Science & Technology,
New Delhi honoured "Star College 2011"

Editorial Board

Khandesh College Education Society, Jalgaon

M. J. College Campus, Jalgaon - 425002 (MS) INDIA
Website : www.kces.in
Email : kcesociety@kces.in
Telefax : + 91 257 2239800, 2239810

OW. No. :

MESSAGE

It gives me immense pleasure to state that the editorial board of **"A Compendium of Research articles by Budding Researchers"** is publishing fourth volume containing the articles of multidisciplinary research work. It has been possible due to continuous efforts taken by budding researcher supervisors and co-ordinator of **"Research Promotion Scheme for the Students"**. Certainly such research activity is an opportunity to the students to tap and execute their innovative ideas which motivate them to establish the scientific mindset and opt for research career.

I congratulate all the members of the editorial board of this volume and extend best wishes to budding researchers.

(Shri. N. G. Bendale)
Hon'ble President, KCE Society, Jalgaon.

ISO 9001 : 2008 Certified
NAAC Reaccredited Grade - A (CGPA : 3.63)
UGC honoured "College with Potential for Excellence"
Dept. of Biotechnology, Ministry of Science & Technology honoured "Star College"

ESTD. 1945
K. C. E. Society's
Moolji Jaitha College
Jalgaon - 425 002. (Maharashtra)
Ph. : 91 257 - 2237363, 2234281 FAX : 91 0257 - 2237363
e-mail : mjcollege@kces.in Website : mjcollege.kces.in

Virtual Class : I.I.T. Mumbai
Study Centre : Y.C.M. Open University, Nasik

Progressive Extensions :
JalaSRI : Watershed Surveillance & Research Institute
Ojaswini : a women's empowerment wing
Eklavya : a sports wing
ViViDhaTa : a philosophy and yoga wing

Ref. No.

FOREWORD

It indeed a matter of great pleasure that KCE Society's Moolji Jaitha College is publishing the fourth volume of compendium of research articles of the projects undertaken by students of PG and UG departments in the Faculty of Science and Arts. Under the special initiative of "Research Promotion Scheme for Students (RPSS)" as recommended in CPE scheme of UGC, under graduate and post-graduate students have been provided with golden opportunity to undertake multi-disciplinary projects and thereby get the exposure to the scientific and methodological research. From past years RPSS scheme has been continued under the sponsorship of KCE Society's Moolji Jaitha College. This year 35 projects have been completed by 74 students under the supervision of 37 dedicated teachers of 18 departments of Faculty of Science and Arts.

Launching new initiative is always easy, but sustaining it for a long period is always difficult. Therefore, the efforts taken by the teachers, students and co-ordinator of RPSS for bringing out the fourth volume is commendable.

Anil Rao
Principal
M. J. College, Jalgaon.

EDITORIAL

Greatness is not in where you stand, but in the direction you are moving. I am very much pleased to handover the fourth volume of **"Research Articles by Budding Researchers" Vol.-4, 2013**, which is the outcome research projects sponsored by K. C. E. Society's M. J. College, Jalgaon. This is year 35 projects have been completed by 74 students under the supervision of 37 teachers of the 18 departments of Faculty of Science and Arts.

The overwhelming response from students of PG and UG classes shows the research attitude among them and dedicated commitments to research activity.

I am extremely thankful to our mentor Mr. Nandkumar G. Bendale, Hon'ble President, KCE Society, Jalgaon for his constant encouragement in executing the innovative activities. I express my sincere thanks to Principal A. G. Rao for his continuous inspiration and motivation during this research activity.

I am thankful to budding researchers and project supervisors for successfully completing their research projects and preparation of research articles in time for this volume.

I extend my wholehearted thanks to Dr. S. B. Attarde, Prof. D. H. More, Dr. B.S. Chaudhari, Dr. Vishwakarma, North Maharashtra University, Jalgaon and Dr. J. N. Ahirrao, Z. B. Patil Jaihind College, Dhule for examining the projects. I acknowledge all the known and unknown efforts for bringing out this volume.

Thanks are due to Khandesh College Society for granting financial assistance for this Research Promotion Scheme for students.

I wish the budding researchers a bright research carrier. I am sure that dynamism of this activity shall be maintained in future also.

Dr. Vishvanath Zope,
Co-ordinator,
Research Promotion
Scheme for Students (RPSS).

INDEX

CHEMISTRY

Synthesis of hydrazide–precursor of various heterocyclic compounds

S. A. Patil, S. N. Patil and J. D. Bhirud*
Post Graduate Research Center, Department of Chemistry, Moolji Jaitha College Jalgaon,

ABSTRACT

Ester are valuable building block in organic chemistry, medicinal chemical industry and material industries .We report here in efficient method for the preparation of hydrazide from corresponding ester. Acid hydrazide in view of their high reactivity and also important starting material and intermediate in the synthesis of certain amide. Aldehyde and heterocyclic compound which is biologically active. Hydrazide have wide range of antibacterial activities.

Key words:ester, hydrazide, heterocyclic compound

***Address to whom the correspondence should be made**

INTRODUCTION:

Esters are extensively used for preparing flavoring essences, cosmetics ingredients e.g. ethyl format has raspberry essence and isoamyl acetate in pear essence they are used in artificial scents used in industrial solvents,[1.] . This solvents used for drugs and antibiotics, oil, paints varnishes and gum. Some of the esters are also shows antidepressant[2,3] activity. One of the most objectives of organic and medicinal chemistry in the design, synthesis and production of molecule having a value as human therapeutic agents[4]. Some widely used antibacterial drugs such as furacilin, furazolidone and ftivazide are known to contain hydrazone group[5]. Hydrazides are important intermediates in organic synthesis[6] especially in the preparation of pharmaceutical and agrochemicals. Acids Hydrazides constitute an important class of biologically active organic compounds reported Hydrazides are wide range of antibacterial activity[7], tuberculstatics[8].

MATERIAL AND METHORD:

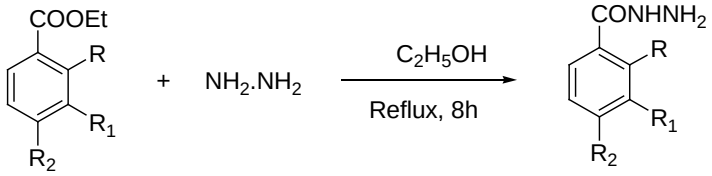
All reagents used were of analytical grade. Solvent were distilled before use. Melting points were determined in open capillary method and are uncorrected. Completion of reaction checked by TLC. IR Spectra recorded on Shimadzu FT-IR with KBr.

Synthesis of Ester from Corresponding Acids

Aromatic benzoic acid (30mmol) and 20 ml of ethyl alcohol were added to round bottom flask attach to reflux condenser. Add few drops of H_2SO_4 into reaction mixture slowly with constant stirring. After addition Reflux for 4 hr, the progress of reaction was monitored by TLC. The reaction mixture was allowed to cool and was transferred into water.

The whole mixture transferred into separation funnel and extracted with CH_2Cl_2 (20ml) and washed with 10% sodium carbonate solution till the acid was removed and dry over $MgSO_4$.

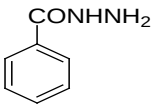
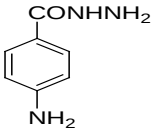
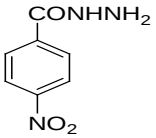
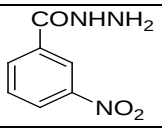
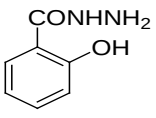
Synthesis of Acid Hydrazides from esters (5a-e)



Corresponding ester (10mmol), hydrazine hydrate (50mmol) was mixed into ethanol (25ml) and reflux for 8 h. the reaction mixture monitored by TLC. After completion of reaction the excess solvent was removed under vacuum and residue was filtered, washed, dried and recrystalised with ethanol to give acid hydrazides (5a-e).

RESULT AND DISCUSSION:

Table 1 - Acid Hydrazides

No.	Product	m.p (^{0}C)	Time (Hr)	Yield (%)	IR VALUE
5a		112	7 hr 50 min	75	852,1024,1292,1600, 1720.
5b		228	8 hr	74	852, 1024, 1292, 1310, 1597, 1710, 3422.
5c		205	7 hr 30 min	70	846, 1018, 1310,1362,1603, 1740.
5d		150	8 hr	71	775,1020,1345,1520, 1610,1730
5e		130	8 hr	62	775,1020,1345,1520, 1610,1730

CONCLUSION:

Thus, under all the above mention condition in the report all reaction carried out cleanly and none of the byproduct were detected .Formation of ester is acid catalyzed, mild reaction condition, high efficiency, high yield of products and commercially readily available starting material.

REFERENCES:

1. Weiliang Bao and Zhinsing Wang, green chem., 1028-1030, 2006.
2. Mohinder Sing Malik , Swiss federal institute of tech. 1978.
3. Shahonaz perveen, Arfo yasmeen Muhammad altmud khan, Afsana dar, Ratana jafri, Amir ahmad. Liters in drug design & discovery. Vol-7,14-17, 2010.
4. Yogoub mansoori, Firdosi seyidov tataroglu, Mitra sadaqhian, Gareen chem. 870-873, 2005.
5. Akash deep, Priyanka phagat, Mahesh kumar, Saloni kurkar. Snjeev k. mittal & Manew malhotra. Drug Research 69. 129-133, 2012.
6. Ajay shaha Rajesh kumar, Rajendra kumar & c. devkumar Indian Jou. Of Chem. Vol. 49B. April-2010, pp-526-531.
7. Bonicke r., Krach J. Z. hyg Infektionakranch. 1954, 139-140.
8. Binon f, Rayer r., I. Chem. Soc. 1953, 1358.

Synthesis and Stabilization of Silver Nanoparticles by Potassium Halide

P. S. Mahajan, M. M. More and Y.B More*
Post Graduate Research Center, Department of Chemistry,
Moolji Jaitha College Jalgaon, 425001.

ABSTRACT

In the present investigation the silver nano-particles were synthesized and stabilized by potassium halide (KCl, KBr and KI) in aqueous environment at room temperature. The silver nano-particles was characterized by UV spectrophotometer and dynamic light scattering. In UV spectrophotometer absorption maxima of synthesized silver nano-material was found to be 400-410 nm and in DLS analysis size found to be30- 50 nm in diameter.

Key words: nanoparticles, Potassium halides

***Address to whom the correspondence should be made**

INTRODUCTION:

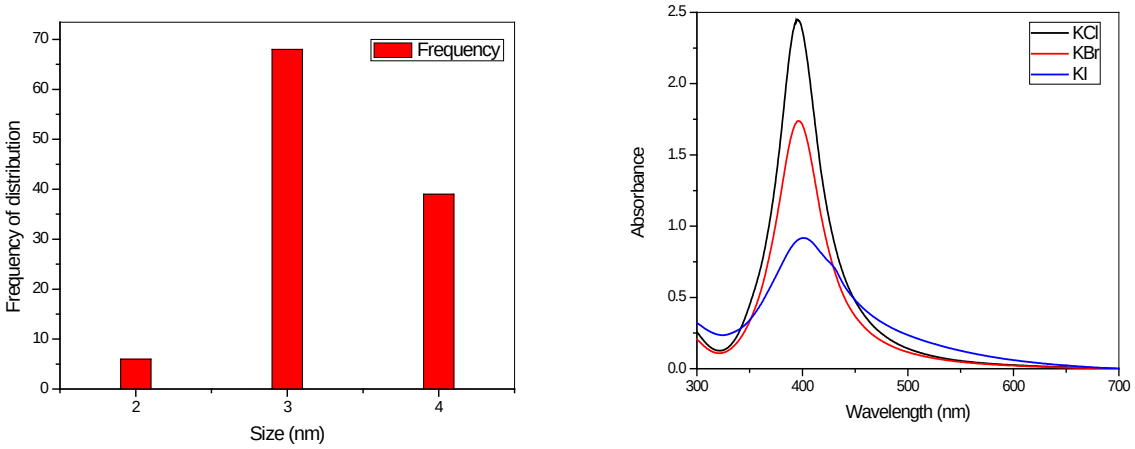
Nanotechnology is the design of objects with dimensions conveniently described in units of nanometers (10-9m). The dimensions of nano-particles lie between the width of a DNA double helix (2 nm) and the size of viruses (tens to hundreds of nanometers). From a chemical viewpoint, the synthesis of nano-particles in solution (colloidal solution) requires the use of methods allowing a precise control over the size and the shape of the nano-particles to yield a set of monodisperse nano-particles displaying a specific property. In general, the synthesis of metal nano-particles in solution is carried out by the use of the following components:

i) metal precursor;
ii) reducing agent and
iii) stabilizing agent.

MATERIALS AND METHODS:

10ml 1mM of AgNO3, was taken in 50 ml beaker and kept on a magnetic stirrer .Freshly prepared 30 ml of 2mM NaBH4 in ice cold water was added to above solution. The colour changes from black to orange and then pale yellow. After that 0.6ml of 0.01 M stabilizing agent was added to above solution and stirred vigorously, till room temperature attained. The synthesized Ag NPs were kept at room temperature for 24 hrs before using to let unreached $NaBH_4$ escaped. The synthesis was achieved by using 1:3 molar ratio solution of Ag^+ and $NaBH_4$. The stabilizer used was 1×10^{-4} M.

Qualitative characterization of silver nano particles:-Surface plasmon resonance (SPR) of synthezied silver nanoparticles stabilised by different stabilising agents.The blue



arrow indicates the change in size of Ag^0,while red arrow indicates possible change in shape of $Ag^{0.}$

Figure: 1: Surface Plasmon Resonance (SPR) of synthesized $(Ag)_n^0$ stabilized by KCl, KBr and KI.

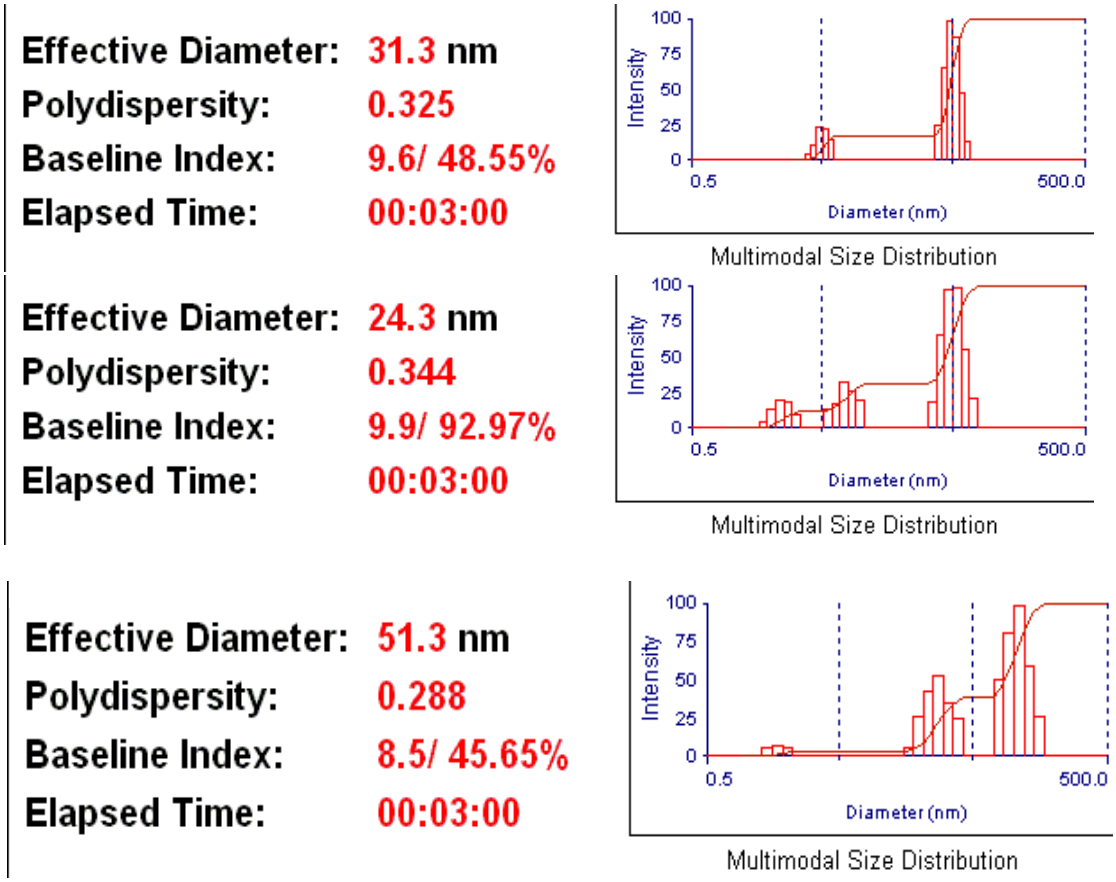


Fig: 2: The Size distribution of Silver Nanoparticles stabilized by KCl, KBr and KI Respectively.

RESULT AND CONCLUSION:

The different methods for synthesis of Metal nanoparticles are available, in this some are Chemical and Hazardous to environmental effects. In present study and investigation the Silver nanoparticles stabilized by different stabilizers has been successfully prepared by using Crighton's method. With the colour change in reaction mixture or pot pale yellow indicates the formation of Sivler Nanoparticles and that was confirmed by UV spectroscopy which shows surface Plasmon resonance near 400-420 nm. Qualitative characterization from the Surface Plasmon Resonance indicates that the Ag NPs have different size and may be different shapes (Figure 1). In the Dynamic light scattering analysis for size measurement of engineered Silver nanoparticles was found in between 31 to 50 nm. The most active Ag NP was the one stabilized with KCl, KBr and KI. Further, the dependence of catalytic activities of the Ag NPs synthesized on the stabilizing materials is a possible indication of role of stabilizing agents.

REFERENCES:

1. S. N. Batchelor; D. A. Carr; R. J. Crowford and L. Fairelough; *Patent Int.* Publication No. WO 01 44127

2. K. Hunger; Industrial Dyes Chemistry Properties and Application; Wiley-VCH, Heidelberg, 2003.

3. N. Gupta; H. P. Singh; R. K. Sharma; *J. Mol. Catalysis A: Chemical*; 2011.

4. K. K. Sharma; P. O'Neill; J. Oakes; S. N. Batchelor; B. S. M. Rao; *J. Phys. Chem. A*, 2003.

5. J. A. Crighton; D. G. Edon; *J. Chem. Soc. Faraday Trans.* 1991.

6. H. Remita; I. Lampre; M. Mostafavi; E. Balazat; S. Buffard; *Rad. Phys. & Chem.* 2005.

Green synthesis of Chalcone

N. R. Mahajan, L. B. Joshi and V. S. Narkhede*
Post Graduate Research Center, Department of Chemistry, Moolji Jaitha College Jalgaon, 425001.
Email :- vinavijaybhole@yahoo.co.in

ABSTRACT

Condensation of 9-anthraldehyde with aromatic acetophenones gave chalcones (Z)-3-(anthracen-10-yl)-1-(phenyl)prop-2en -1-one by known method with slight variation using LiOH catalyst**.**

Key words: LiOH, 9-anthraldehyde, chalcones, aromatic acetophenone.

***Address to whom the correspondence should be made**

INTRODUCTION:

Chalcone are important class of natural product belonging to flavonoids family. These synthesized chalcone shows many biological activities. Such as Anti-malarial[1], Anti bacterial[2], anti-fibrogenic[3], anti-cancer[4], anti-trichromonal[5], anti-immaflametory[6], anti-leishmania[7], potential cytotoxic agent, anti-microbial agent, anti-viral, anesthetics, mydriates, anti-oxidant[8], anti-tubercular[9, 10].

Chalcones are key precursors in synthesis of many biological important heterocycles such as Benzotiazpine[11], 1,4diketone[12], Flavone[13], Flavanone, pyrimidine derivative. Some of these reactions are performed on solid support, promoted by infrared, ultrasound or microwave and grinding method. With different catalyst such as NaOH ,KOH ,LiOH. We here by report the synthesis of few chalcones by condensation of 9-anthraldehyde with substituted acetophenone by known method with slight variation using green catalyst LiOH.

MATERIAL AND METHODS:

1. Chemicals and Reagents:

All Reagents used were of analytical grade. Solvents were distilled before use.

2. Melting Points:

Melting points were determined in Open Capillaries and are uncorrected.

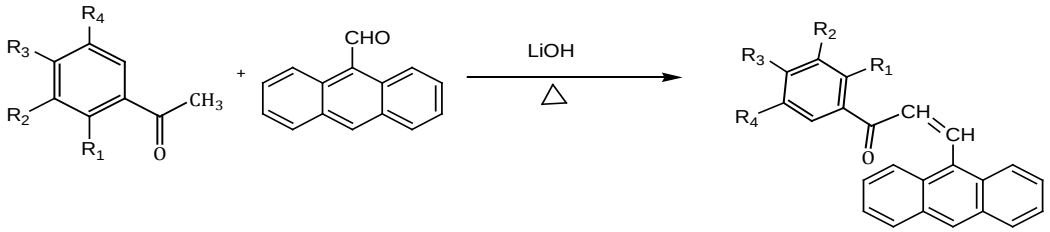
3. IR Spectrum:

IR spectra were recorded on Shimadzu FT-IR (Affinity model) using KBr.

4. Thin Layer Chromatography:

Thin layer chromatography plates were obtained from silica gel slurry prepared in Chloroform. The TLC was performed Using N-Hexane: Ethyl acetate (80:20%) iodine vapour chamber was used as detecting agent.

Synthesis of(Z)3-(anthracen)-10yl-1-(phenyl)-prop-2en-1-one using LiOH:



a) R^1 =OH,R^2=H ,$R^{3=}$H ,$R^{4=}$H, R^5=H	b) R^1 =H,R^2=H ,$R^{3=}$H ,$R^{4=}$H, R^5=H
c) R^1 =H,R^2=H ,$R^{3=}OCH_3$,$R^{4=}$H, R^5=H	d) R^1 =H,R^2=H ,$R^{3=}$H ,$R^{4=}CH_3$, R^5=H

9Anthraldehyde (4.6 ml, 0.038mole) and equimolecular amount of Substituted acetophenone, 10% LiOH (20ml) was dissolved in 20 ml ethanol with stirring. The resulting mixture was stirred for 1-1.5 hrs. After completion of reaction the mixture was poured into ice cold water. The Separated solid was filtered, washed with water and crystallize from ethanol to give chalcone derivative .

RESULT & DISCUSSIONS:

Sr. No.	Product	m.p. (^{0}c) Known/ Literature	Time (hr)	Yield (%)
a	(z)-3-(Anthracen-10-yl)-1-(2-hydroxyphenyl) prop-2-en-1-one	**102**^{0}C	1 hr	76
b	(z)-3-(Anthracen-10-yl)-1-phenyprop-2-en-1-one	**106**^{0}C	1 hr	80
c	(z)-3-(Anthracen-10-yl)-1-(3-methoxyphenyl) prop-2-en-1-one	**98**^{0}C	1 hr	78
d	(z)-3-(Anthracen-10-yl)-1-*m*-tolyl prop-2-en-1-one	**100**^{0}C	1 hr	75

CONCLUSION:

In conclusion, the merits of our work are as follow:

1. Hazardous organic solvents are avoided.
2. LiOH is green catalyst.
3. LiOH is easy to handle as it is comparatively less hygroscopic than other alkali metal hydroxides.
4. Use of catalytic amount of base.

REFERENCES:

1. Liu M, Wilarat P, Mei-Lin G, Journal of med. Chem. 44, 4443-4452, 2001.
2. Opletalow, CeskaSlov Form, 49, 278-284, 2000.
3. Lee S H, Nan J X, Zhao Y Z, Woo S W, Park E J, Kang T H, Seo G S, Kim Y c, Sohn D H, Planta, 69, 990-994, 2003.
4. Konierzny M T, Konieczny W, Sabisz M, Sklablanowski A, Wakeir R, Awqusttynowiczkopec E, Zwolska Z, Chemical and Pharmaceutical Bulletin, 55, 817-820, 2007.
5. Oyedapo A O, Mankanju V O, Adewaunmi C O, Lwalewa E O, Adenowo T K, African J. Traditional, complentary and Alternative Medi, 1, 55-62, 2004.
6. Jin F, Jin Y L, Sohn D W, Kin S A, Sohn D H, Kim Y C, Kim H S,, Archives of Pharmacol Research, 30, 1359-1367, 2007.
7. Narender T, Khaliq T, Shavata, Nishi, Goyal N, Gupta S, Biorganic and Med. Chem. 13, 6543-6550, 2005.
8. Jen-Hao Chen, chi-Feng Hung, Shyh-Chyun Yana, Jih-Pyang Wang, Shen-Jeu Won, Chan-Nan Lin, Biorg. Med. Chem. 16(15), 7270-7276, 2008.
9. Yuh-Meei Lin, Yasheen , Zhou, Micheal T Flavin, Li-Ming Zhou, WeiquoNie, FaChing Chen, Bioorg. Med. Chem.
10. Sivakumar P M, Seeniwasan S Prabu, Kumar Vanaja, DobleMukesh, Biorg med. Chem. Lett. 17, 1695-1700, 2007.
11. O Prakash, A Kumar, A Sadana, R, Prakash, P S Singh, M R Claramunt, D Sanz, I Alkaratac and J. Elguero, Tetrahedron Lett. 61, 6642-6651, 2005.
12. S Raghwan and K Anuradha, Tetrahedron lett. 43, 5181-583, 2002.
13. B A Bohn. 1998.
14. Lattanzi A, Ruso A, tetrahedron lett. 62, 12264-12289, 2006.
15. Ramalingham K, Thyvelikakath G X, Berlin K D, Chesnal R W, Brow R A, Durham N N, Ealick A E, Van der Helm D J, J. Med. Chem. 20, 847, 1977.
16. Brown R E, Shavrd, Chem Abstract, 76, 59618, 1972.
17. VENOTHINI APPU et al. 24, 830, 1981.
18. Nora M. Rateb and Husein F. Zohdi. Synthetic Communications, 39, 2789 – 2794 (2009).
19. S. Zangade, S. Mokle, A. Vibhute, Y. Vibhute. Chem. Sci. Journal, 2011
20. M.R.JAYAPAL., Int. Eng. Chem. Res. 50, 1146-1149 (2011).

Study of Activity and Activity Coefficient of Various Salts

H. N. Patil and V. S . Zope*
Post Graduate Research Center, Department of Chemistry,
Moolji Jaitha College Jalgaon,425001. e-mail: dr_zope@reddifmail.com

ABSTRACT
Activities and activity coefficient measurements plays an important role in the study of electro chemistry. Different concentrated cells without transferences, various salt solutions have been use and there emf (electro- motive force) have been recorded to evaluate the activity and activity coefficient of the salt. The effect of addition of salt on activity and activity coefficient has also been studied.
Key Words: Activity, activity coefficient, salt, potentiometry.

***Address to whom the correspondence should be made**

INTRODUCTION:

Electrolyte: The substance which is in dissolve state ionized and conducts electricity is known as Electrolyte. e.g. KCl, NaCl, $CuSO_4$, CH_3COOH etc. The substance which ionized completely in its solution is known as strong electrolyte. The substance which ionized poorly in its solution is known as weak electrolyte. The substance which do not produced ions in dissolved in fused state and do not conduct electricity is known as non-electrolyte. e.g. Sugar, Petrol, Starch, Urea etc. When an electric field is applied through the solution of electrolyte, then the ion moves towards the respective electrode. Such solution is known as electrolyte.

Ionic strength: According to Debye Huckel theory ionic strength is represented by symbol μ. It is defined by, $\mu = \frac{1}{2}[C_1Z_1^2 + C_2Z_2^2 + \ldots]$, Where, C_1, C_2,-- are the concentration of different ions in gm ionic weight per liter. Z_1, Z_2, -- are the valiancy of respective ions. Therefore, $\mu = \frac{1}{2} \sum Ci\, Z_i^2$

In case of 1 – 1 type of electrolyte ionic strength is equal to concentration while for other type it is not true.

(i) Potassium chloride (KCl): It is 1-1 type of electrolyte i.e. valence of cation and anion is 1.The ionization is represented as, $KCl \longrightarrow K^+ + Cl^-$, Let C mole per liter be the concentration then, $\mu_{(NaCl)}$ **=C,** Thus ionic strength for 1-1 type electrolyte is equal to concentration.

ii) Barium chloride ($BaCl_2$): It is 2–1 type of electrolyte. The ionization is represented as, $BaCl_2 \longrightarrow Ba^{++} + 2Cl^-$, Let C moles per lit be the concentration then, $\mu_{(BaCl2)}$ = **3C**, Thus in case of 2- 1 type ionic strength is equal to 3 times the concentration ($CaCl_2$, $ZnCl_2$, $MgCl_2$ etc.) The same result can also be obtained for 1-2 type electrolyte (Na_2CO_3, K_2SO_4).

iii) Aluminum sulphate [$Al_2 (SO_4)_3$]: It is 3-2 type electrolyte. The ionization is represented as,

$Al_2 (SO_4)_3 \longrightarrow 2A^{+++} + 3SO_4^{--}$, Let C moles liter be the concentration, μ = **15 C,** These examples shows that the ionic strength of the solution is determine not only be stoichiometric concentration of the electrolyte but also the valences of its ions.

Activity and Activity coefficient of strong electrolyte: Activity is the corrected concentration. It is corrected by taking into consideration of inter ionic attractive forces. For dilute solution activity and concentration are same and their ratio is unity. For the solution of higher concentration the activity and concentration are different and their ratio is not unity. This ration is called as activity coefficient.

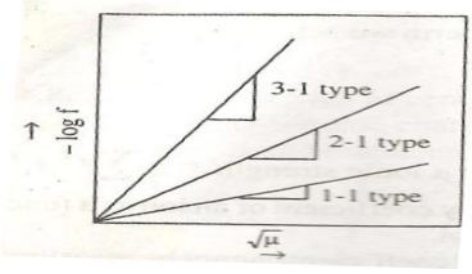
Consider the electrolyte AxBy which ionizes in the solution according to equation.

$$AxBy \longrightarrow x A^{z+} + y B^{z-}$$

Where Z_+ and Z_- are the charges for cation and anion respectively. The activity a_2 of the electrolyte is, given by equation. If C_+, C_- be the concentration of cation and anion in gm ionic weight per litre and f_+ and f_- are the activity coefficient of the respective ion, then $a_+ = C_+ f_+$ and $a_- = C_- f_-$

$a_2 = (C_+ f_+)^x (C_- f_-)^y = C_+^x f_+^x C_-^y f_-^y$ and $a_2 = (C_+^x f_-^y) (f_+^x f_-^y)$, The mean activity ($a_2$) is given as $a_2 = \left[Cf(x^x y^y)^{1/v}\right]^v$, $\therefore a_2 = C^v f^v x^x y^y$

Debye Huckel theory of activity coefficient (Debye – Huckel Limiting Law): When electrolyte dissolves, it produces positive and negative ions and there exist electrostatic attraction between the charged ions. Debye Huckel proposed this theory for activity coefficient of electrolyte in terms of electrostatic attractions operated between ions in the solution. They assume that electrically charged particles in the solution are similar to other charges. Therefore it obeys Coulomb law. The Coulomb's law is stated as "the forces of attractions or repulsion between the charges vary directly to the product of charges q_1 and q_2 and inversely with square of the distance r between them." **Force =** $\frac{1}{D}\left(\frac{q_1 q_2}{r^2}\right)$, the proportionality constant D is known as dielectric constant of the medium. It is determine by the medium in which charges are immersed. Due to these forces the distribution of ions throughout the solution is not random. But it is such that any central positive ion is surrounded by an atmosphere of other ions whose net charge is negative; on the other hand the central negative ion is surrounded by an atmosphere of positive charge. Due to presence of atmosphere about on ion there exist potential (εi) on the ion. Potential is given as, $\varepsilon_i = \frac{-Z_i e k}{D(1+ka_i)}$, where, Z_i – valence of central ion, e – Electronic charge, a_i – Ionic diameter. Due to ionic atmosphere the solution posses excess of electrical free energy



than the solution would have in absence of ionic atmosphere. The activity coefficient f_i is given by the equation which is known as **Debye Huckel Limiting law** as log f =- A Z_+ $Z_-\sqrt{\mu}$. This equation is useful to calculate activity and coefficient activity of all strong electrolytes at high dilution and at given temperature. The graph of – log Vs $\sqrt{\mu}$ is straight line passing through origin as shown in Figure. The slope of the graph depends on type of the electrolyte.

METHODOLOGY:

The concentration cell using calomel, platinum and silver electrodes were constructed to measure the emf of solutions of hydrochloric acid and silver nitrate. The potentiometer used for the experimental work is Perkin almer make.

RESULTS AND DISCUSSIONS :

The mean activity coefficient of hydrochloric acid have been found to be $\gamma \pm = 0.9082$. The mean activity coefficients of hydrochloric acid and silver ions are as shown in table I and II. It has been observed that the activity coefficient decreases with increases ionic strength up to 0.604. Further ionic strength remains almost constant.

Table-I: Mean activity coefficient of HCl in Aqueous solution using platinum and calomel electrode.

Molarity of HCl (m)	***Observed emf value in pt.electrode & calomel electrode (E) volt.***	γ
0.12	0.440	0.694
0.054	0.425	0.358
0.025	0.420	0.854
0.014	0.410	1.853
0.011	0.396	3.098

Molarity of HCl Sol^n (m)	***Observed emf value (E) volt.***	γ
0.12	0.296	1.987
0.054	0.271	7.181
0.025	0.236	30.676
0.014	0.206	98.245
0.011	0.201	137.72

Table -III Effect of ionic strength on activity coefficient of silver (Ag) ion in 0.01m silver nitrate solution.

Con .KNO_3 g	***e.m.f (E)***	***Molarity (m)***	***Ionic strength***	***E+0.05916log m_1***	$\sqrt{m_1}$	***Acti.coeffi- cient (V)***
1	0.018	0.198	0208	-0.02360	0.444	$3.14x10^{11}$
2	0.024	0.396	0.406	0.00019	0.629	$1.24x10^{11}$
3	0.026	0.594	0.604	0.01261	0.770	$7.66x10^{10}$
4	0.030	0.792	0.802	0.02400	0.889	$3.63x10^{10}$
5	0.032	0.990	1	0.03174	.994	$3.63x10^{10}$

CONCLUSION:

Activity and activity coefficients determined potentiometrically for 0.12 M solution are 0.694and $3.14x10^{11}$ respectively.

REFERENCES:

1) S. Glasstone, An Introduction to Electrochemistry, Van Nostrand, East-west, 1965.
2) G. M. Barrow, Physical Chemistry, McGraw-Hill companies. Indian 5^{th} edition, New Delhi, 1988.
3) G. N. Lewis and M. Randall, Thermodynamics, 2^{nd} ed. K. S. and Pitzer and L. Brewer, McGraw-Hill, New York, 1961.
4) P. W. Atkins, Physical Chemistry, ELBS, 1986.
5) S. W. Rajbhoj, T. K. Chanddhekar, Systematic Experimental Physical Chemistry, Anjali Publication Aurangabad.
6) V. S. Zope, A. M. Nemade, D. A. Narkhede, Physical Chemistry, Prashant Publication ed^{n}. 2004

One-Pot Multicomponent Iodine Catalyzed Synthesis Of 4H-Pyrano [2,3-C] Pyrazoles In Water

P.P. Jadhav, L.U.Jadhav, S.M.Chaudhari and R.M.Patil*
Department of chemistry, P.G.C.S.T.R College, Jalgaon. (M.S.),India
e-mail: mr.raviraj86@rediffmail.com

ABSTRACT
Several pyranopyrazoles are synthesized by an iodine catalyzed four component reaction at 25^0c in water. The yields are excellent, procedure is simple, efficient and environmentally benign.
Keywords: Iodine, pyranopyrazoles, aldehydes, ethyl acetoacetate, hydrazine hydrate
*Address to whom the correspondence should be made.

INTRODUCTION:

Multi component reactions (MCR's) have become an important tool for the efficient synthesis of a wide variety of organic molecules[1-3]. In recent years, organic reactions conducted in aq. Media have also received attention from chemists because of the environmental concern[4-6]. Pyranopyrazoles and their derivative , on the other hand, are very important class of organic compounds due to their biological and pharmacological activities[7]. In addition to their known bactericidal, fungicidal and herbicidal activities, they exhibit analgesic, anti-inflammatory activity and act as vasodilators and hypotensive and hypoglycemic agents[8-10]. Substituted 6-aminopyrano[2,3-c]pyrazoles were first synthesized by the reaction between 3-methyl-5-pyrazolone with tetracyanoethylene[11.] Recently, pyranopyrazoles are synthesized by a two component reaction involving pyran derivative and hydrazine hydrate[12] and by a four component reaction involving ethylacetoacetate, hydrazinehydrate, aldehyde and malononitrile[13].

Iodine, on the other hand, has been used extensively as a catalyst due to its inherent low toxicity, electrophilicity and due to ease in handling[14]. The attractive features of iodine as catalyst and in continuation with the work on the use of simple, nontoxic and readily available chemicals in the synthesis of biologically important molecules[15-18] herein is reported a rapid four component synthesis of biologically significant pyranopyrazoles using catalytic amount of iodine under extremely mild condition.

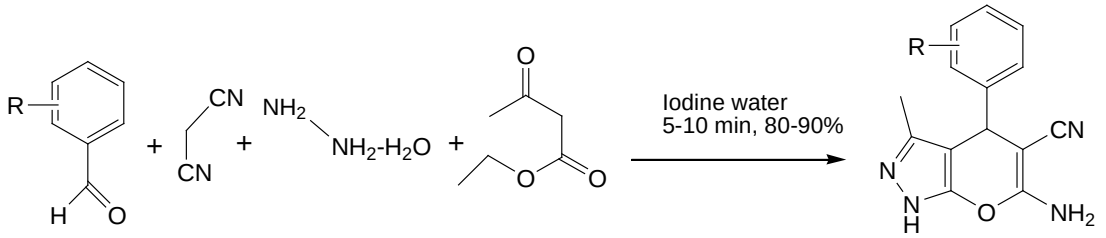
MATERIALS AND METHODS:

All reagents used were of analytical grade. Solvents were distilled before use melting points were determined in open capillaries and are uncorrected. The purity of compound was checked by TLC, IR spectra were recorded on shimadzu FT-IR (Affinity model) using KBr pellets.

Synthesis of 4H pyrano[2,3-c]pyrazoles using iodine(1-6):

In a 50 ml round bottom flask, a mixture of hydrazine hydrate (10 mmol), ethylacetoacetate (10 mmol), p-anisaldehyde (10 mmol), malononitrile (10 mmol) and iodine (0.05mmol) was taken in 5 ml water and stirred vigorously at 25^0c for appropriate time the precipitate thus obtained was filtered off, washed with water

followed by ethyl acetate/light petrol (2:8), and then purified by recrystallization from ethanol to get corresponding pyrano pyrazole in pure and crystalline form.



R= -Cl, -NO_2, -Me, -OMe, -OH

1-6

RESULTS AND DISCUSSIONS:

The authenticity of the compounds was established by comparing their melting points and IR spectral data with the data reported in literature. The results are summarized in Table-1.

Table-1

Sr. No.	Compound	M.P (^{0}C)	Time (min)	Yield (%)	IR Frequency (cm^{-1})
1.	6-amino-1,4-dihydro-3-methyl-4-phenylpyrano[2,3-c]pyrazole-5-carbonitrile	210	5	78.57	3350(N-H), 1550 (CH=CH), 2230 (CN), 1150, 1200 (C-O-C)
2.	6-amino-1,4-dihydro-4-(4-methoxyphenyl)-3-methylpyrano[2,3-c]pyrazole-5-carbonitrile	238	7	73.33	3320(N-H), 2230(CN), 1510(CH=CH), 1170(C-O-C).
3.	6-amino-4-(2-chlorophenyl)-1,4-dihydro-3-methylpyrano[2,3-c]pyrazole-5-carbonitrile	132	10	80.06	2325(CN), 1590(CH=CH), 1040(C-O-C), 750(C-Cl).
4.	6-amino-1,4-dihydro-3-methyl-4-p-tolylpyrano[2,3-c]pyrazole-5-carbonitrile	140	10	81.20	2240(CN), 3020(C-H Ar.), 1620 (CH=CH), 1225(C-O-C), 3340(N-H)
5.	6-amino-1,4-dihydro-4-(3-methoxyphenyl)-3-methylpyrano[2,3-c]pyrazole-5-carbonitrile	138	8	72.69	2180(CN), 3300-3400(N-H), 1600(CH=CH), 1170(C-O-C).
6.	6-amino-1,4-dihydro-4-(3,4,5-trimethoxyphenyl)-3-methylpyrano[2,3-c]pyrazole-5-carbonitrile	214	10	62.86	3200-3250(N-H), 2230(CN), 1590 (CH=CH), 1150(C-O-C), 769

CONCLUSION:

The iodine catalyst used to accelerate the reaction is inexpensive, nontoxic and environment friendly. The reaction procedure is very simple and involves simple workup, and therefore it is applicable to large-scale preparation of these biologically important and valuable pharmaceutical chemicals.

REFERENCES:

1. Nair V, Rajesh C, Vinod A U, Sreekenth & Balagopal L S, *Acc Chem Res*, 36, 2003, 899.

2. Orru R V A & de Greef M, *Synthesis*, 2003, 1471.

3. Bienayme H, Hukme C, Oddon G & Schmitt P, *Chem Eur J*, 6, 2000, 3321.

4. Grieco P A, in, *Organic Synthesis in Water* (Blackie Academic and Professional) 1998.111

5. Li C J & Chan T H, *Organic Reactions in Aqueous Media* (John Wiley New York), 1997

6. Lindstrom U M, *Chem Rev*, 102, 2002, 2751.

7. Nawwar G A M, Abdelrazek F M & Swellam R H, *ArchPharm*, 324, 1991, 875.

8. Kuo S C, Huang L J & Nakamura H, *J Med Chem*, 27, 1984,539.

9. Huang L J, Hour M J, Teng C M & Kuo S C, *Chem Pharm Bull*, 40, 1992, 2547.

10. Ueda T, Mase H, Oda N & Ito I, *Chem Pharm Bull*, 29, 1981,3522.

11. Junek H & Aigner H, *Chem Ber II*, 106, 1973, 914

12. Peng Y, Song G & Ruiling Dou R, *Green Chem*, 8, 2006, 573.

13. Vasuki G & Kumaravel K, *Tetrahedron Lett*, 49, 2008, 5636.

14. Paquette L A, in, *Encyclopedia of Reagents for Organic Synthesis*, Vol 4 1995,.2796.

15. Pasha M A & Jayashankara V P, *Bio Org Med Chem Lett*, 17,2007, 621

16. Pasha M A, Jayashankara V P & Swamy N R, *Synth Commun*,37, 2007, 1551

17. Pasha M A & Jayashankara V P, *Indian J Chem*, 46B, 2007,1025

18. Pasha M A, Abdulla M K & Jayashankara V P, *Synth Commun*, 37, 2007, 4319.

MICRO-BIOLOGY

Biosorption of Lead(Pb^{+2}) by bacteria isolated from effluent samples

C.R.Sharma, S.P.Borase and S.J.Chandratre*
Department of Microbiology, M. J. College, Jalgaon (M.S.), India
Email: sjchandratre@gmail.com

ABSTRACT

Biosorption is a technique that can be used for the removal of pollutants from waters, especially those that are not easily biodegradable such as metals and dyes. In this study, heavy metal resistant bacteria were isolated from sewage waters and industrial drainage water and were tested for their biosorption potential.The isolates were characterized for their heavy metal resistivity and minimum inhibitory concentration for lead(Pb) .The MIC for the isolates A and B were 450 ppm and 500 ppm respectively for lead(Pb). Biosorption experiments were carried out under optimum conditions and the biosorption potential of isolate A was about 80% and for isolate B it was about 90%.Curing of the plasmid was performed to determine the role of plasmid in heavy metal resistance of the bacterial isolates.

Keywords: Biosorption, bacteria, heavy metal, Minimum inhibitory concentration, curing.

---

*Address to whom the correspondence should be made.

INTRODUCTION:

Biosorption can be defined as the passive uptake of toxicants by dead/inactive biological materials or by materials derived from biological sources. Biosorption is due to a number of metabolism-independent processes that essentially take place in the cell wall, where the mechanisms responsible for the pollutant uptake will differ according to the biomass type.

Biosorbents for the removal of metals/dyes mainly come under the following categories: bacteria, fungi, algae, industrial wastes, agricultural wastes and other polysaccharide materials. In general, all types of biomaterials have shown good biosorption capacities towards all types of metal ions[2]. The concentration of lead in surface and ground water ranges from traces of 0.04 mg/l to about 0.01 mg/l. Industrial and mining sources contribute to lead pollution. The health effects of lead are neurotoxic and mainly affects the three systems viz. blood forming system, nervous system and renal system.

MATERIALS AND METHODS:

1. Isolation of micro organisms from the samples-

Nutrient agar medium amended with 100mg/litre of heavy metal salt was used as the medium.Serial dilutions of the sample was carried out and Pour plate technique was performed with the dilution 10^{-6} and 10^{-7}.Incubate the plates at 37^0 C for 24 hrs.

2. Determination of heavy metal resistant bacterial isolates [4]-Heavy metal salt solutions were prepared in different concentrations,10, 20, 40, 60, 80 and 100 mg/L.Each plate was spread with overnight cultures of appropriate organisms.To each of the plate 100 µl of appropriate metal salt solutions were added in each wells of 10

mm in diameter and 4 mm in depth and incubated at 37°C for 24 h. After incubation,the zone of inhibition was measured. A zone size less than 1mm scored as resistant strain.

3. To determine Minimum inhibitory concentration (MIC) of the isolate for heavy metal (Lead) [1]– Nutrient agar medium + Heavy metal salt solution (100 ppm, 200 ppm, 300 ppm, 400 ppm , 500ppm).Spread overnight grown culture on respective plates. Incubate at 37^0 C for 24 hours.

4. Biosorption of heavy metal by the isolates-Stock solutions of lead were prepared in different initial concentrations i.e. 20ppm, 40 ppm ,60 ppm, 80 ppm ,100ppm in nutrient broth. Each flask was then inoculated with 5% i.e. 2.5 ml of overnight grown culture and incubated on a rotary shaker at 120 rpm for 24 hrs. After 24 hrs. bacterial cells were removed by centrifugation and residual concentration of metal in the broth was determined by AAS.

5. Curing of plasmid from isolate and determination of role of plasmid in heavy metal resistance: The cells were grown with ethidium bromide(100 µg/ml) and then spread on nutrient agar plates, one containing metal salts and other not containing. Replica plates for both media were incubated at 35^0C.Plasmids were thought to be eliminated from those colonies that grow on metal free medium only.

RESULTS AND DISCUSSION:

Six bacterial isolates were obtained from the isolation procedure and their cultural and morphological characteristics were recorded. Out of the six isolates Isolate A and Isolate B were further considered for biosorption studies.

The plate diffusion method indicates the ability of isolates as heavy metal resistant or sensitive. Thus both the isolates A and B are resistant to Lead.

The minimum inhibitory concentration of the bacterial isolates was determined and found as for Isolate A-450 ppm and for Isolate B-500ppm.

Isolate A showed approximately 80% adsorption of Pb. *Isolate A* has the ability to adsorb the Pb at a maximum level of 100 mg/L. *Isolate B* was considered to be the most effective biosorbent because of its high adsorption capacity when compared to *Isolate A* and adsorbed 86.9% of Pb.

Plasmid was not cured from the bacterial isolates.One probable reason may also be that the resistance to heavy metal showed by the organism must be not due to plasmid but due to other mechanisms. To survive under metal-stressed conditions, bacteria have evolved several types of mechanisms to tolerate the uptake of heavy metal ions. These mechanisms include the:

- Efflux of metal ions outside the cell
- Accumulation and complexation of the metal ions inside the cell
- Reduction of the heavy metal ions to a less toxic state

CONCLUSION:

A laboratory scale biosorption experiment was carried out at flask level and the biosorption efficiency of the isolates, from effluent samples from industrial area, towards the metal concentration i.e. Lead was determined.The isolates showed high potentials for adsorption of lead.The isolates were found to be resistant to lead at very high concentrations and also have a minimum inhibitory concentration (MIC) which is high.This ability of the isolates can be exploited for bioremediation of heavy metals on large scale. In the laboratory scale biosorption experiments the potential for lead adsorption was studied and the isolate A shows approximately 80% adsorption while isolate shows upto 90 % adsorption. This shows that both the isolates have very good biosorption abilities.Curing of plasmid was performed to determine whether the higher MIC shown by the organisms was contributed by the presence of plasmid or not. Since plasmid was not cured the resistance of the organisms may be due to other efflux mechanisms.

REFERENCES:

1. **A.Rajbanshi(2008)** , "Study on Heavy metal resistant bacteria in Guheshwori Sewage Treatment plant" , Our nature : 52-57.
2. **B. Volesky and Z. R. Holan (1995),** " Biosorption of Heavy Metals" Biotechnol. Prog., 11: 235-250
3. **K. Vijayraghavan et al.(2008)**, "Bacterial biosorbents and biosorption" , Biotechnology advances 26(2008), Elsevier publications: 266-291.
4. **M.Johncy Rani et al.(2010),** "Comparative assessment of heavy metal removal by immobilized and dead bacterial cells: A biosorption approach", African journal of environmental science and technology , Vol. 4(2) : 77-83
5. **V. N. Rathnayake et. Al.(2009)** Tolerance of heavy metals by Gram Positive soil bacteria, World Academy of Science, Engineering and Technology 53: 1185- 1189

Screening of efficient microbes for treatment of Distillery spent wash

P. R. Zawar, N. B Patil., K. P. Narkhede*, M. K. Narkhede
Department of Microbiology, Moolji Jaitha College, Jalgaon
kpn.mjc@gmail.com

ABSTRACT

Distilleries, the alcohol producing industries, are one of the major polluting industries, as about 88% of its raw material ends up as waste. A typical cane molasses based distillery generates 15 L of spent wash effluent per liter of ethanol produced. Around 212 distillery units in India generate more than 30 billion liters of spent wash annually. In the present investigation microorganism were screened from its natural habitat, the spent wash and tested for the treatment of the same. Various parameters such as BOD, COD, TSS and TDS were measured before and after the treatment with microbial inoculum. An isolate which was found to be more efficient in decolorizing the spent wash can be further exploited to develop a cost effective, eco friendly biotechnology process for treatment of distillery spent wash

Key words: distillery spent wash, phenol degradation

*Address to whom the correspondence should be made.

INTRODUCTION :

Most of the distilleries produce ethyl alcohol mainly by fermentation of molasses. Molasses is the dark brown liquid obtained during the manufacture of sugar. The molasses is diluted with water, pH adjusted and fermented with a pure culture of yeast at a controlled temperature for about two days. The yeast converts sugars to alcohol and carbon dioxide. The fermented liquid is further distilled and alcohol recovered. The residual liquid remaining after the recovery of alcohol (40% v/v) is called 'spentwash'. Hence, Effluent originating from distilleries contain large amount of dark brown colored wastewater called molasses spent wash (MSW). This MSW is the unwanted residual liquid waste to dispose because of low pH, high temperature, dark brown color, high ash content, unpleasant odor and high percentage of organic and inorganic matter of which 50% may be present as reducing sugars.

Distillary spent wash is an acidic liquid (pH- 3.5-4) and contains large quantities of organic carbon and plant nutrients like K, Ca, Mg, S, etc. Higher concentrations of essential nutrients (P, S, Fe, Mn, Zn and Cu) and heavy metals (Cd, Cr, Ni and Pb) are present in crude spent wash (CSW) as compared to the digested spent wash (DSW). Spent wash is a rich source of plant nutrients, it is thus of a value as a fertilizer. It also contains 16 per cent organic matter and sugars (2 –20%) and proteins (10 –11%) in the dry spent wash along with mineral component. Its BOD (45,000-55,000mg/L) and COD (90,000-1,10,000 mg/L) is high. The distillery effluent also contains 26.5×10^6 bacteria, 14.7×10^5 actinomycetes, 24.5×10^3 fungi and 18.3×10^2 yeast per ml of distillery effluent. The color of the spent wash may be due to the molasses used for fermentation, anthocyanins and tannins and most importantly, Melanoidin and caramels, etc. and decomposition products.

The liquid residues during the industrial phase of the production of alcohol are: liquor, sugar cane washing water, water from the condensers and from the cleaning of the equipment, apart from other residual water. Spent wash also leads to significant levels of soil pollution and acidification in the cases of inappropriate land discharge. It is reported to inhibit seed germination, reduce soil alkalinity, cause soil manganese deficiency and damage agricultural crops. Waste treatment aims at the removal of unwanted compounds in wastewater for safe discharge into the environment. Pollution control is an essential part of the sustainable industrial growth and a cleaner environment as well. Better process management will minimize wastewater generation and pollution loads.

MATERIALS AND METHODS :

1. Sample collection: Distillery spent wash was collected from the distillery unit of Madhukar Co-operative Sugar factory at Faizpur, Dist. Jalgaon and stored at 4°C.

2. Isolation and screening of fungal Isolate from Distillery spent wash: In one experiment, sterile bacterial and fungal nutrient mediums were used for bacteria and fungi. They were aseptically inoculated with ten percent 0.1 ml of distillery spent wash (DSW) and Incubated at room temperature for 5 days. After incubation the isolated colonies were inculcated in respective sterile medium with 10% DSW and solid medium. After 5 days incubation at room temperature decolorization was observed. In another set of experiment, five ml of distillery spent wash was inoculated in respective 50 ml nutrient medium for bacteria and fungi and incubated at room temperature for 5 days under static conditions. About 0.1 ml enriched sample was inoculated in 2 ml sterile nutrient broth with 10% DSW tubes. It was further incubated at room temperature for 48 hrs and then observed for decolorization.

3. Determination of decolorization: The sample was centrifuged at 12000 rpm for 10 min and decolorization was measured as absorbance at 475nm with spectrophotometer (Shimadzu).

Percent decolorization = [(Initial absorbance –Final absorbance)X100] /Initial absorbance

4. Determination of Chemical Oxygen Demand (COD) Open Reflux method (Maiti, 2001):

0.4g mercuric sulfate was taken in 500 ml flask. To this 20 ml diluted sample was added followed by addition of 0.25N $K_2Cr_2O_7$ (10 ml), Conc. H_2SO_4 (30 ml) and Ag_2SO_4 reagent. After mixing, If color turns green, more Dichromate and H_2SO_4 was added or fresh sample with lesser aliquot was taken. Above mixture was Reflux for 2 hrs followed by dilution up to 150-300 ml. It is followed by titration with (0.1N) Ferrous ammonium sulphate using Ferroin indicator (100 µl). Colour changes from Bluish green to Red wine were indicator. Blank was also processed with distilled water in similar manner.

Chemical Oxygen Demand (COD) (mg/lit) = [(A – B) x N x 8 x 1000]/ ml of the sample

Where : A = Blank, B = Test sample, N = Normality of the Titrant

5. Determination of Biological Oxygen Demand (BOD) Azide modification method. **(Aneja)**

BOD bottles (250 ml) were filled with sample. To this 2 ml $MnSO_4$ and 2 ml alkaline Iodine azide solution was added followed by shaking for 6 to 8 times. The brown precipitate was dissolved by addition of 2 ml Conc. H_2SO_4 again followed by shake for 6 to 8 times. 50 ml sample was taken in separate flask and titrated against 0.025 N Sodium Thiosulphate solutions. The end point is blue to colorless when 1 % starch was used as indicator. Blank was also performed in the same manner

Biological Oxygen Demand (BOD) (mg/Lit) = $(S_1 - S_5) - (B_1 - B_5)$/ Amount of titrant (ml)

Where : $S_1 = 1^{st}$ day sample, $S_5 = 5^{th}$ day sample, $B_1 = 1^{st}$ day Blank, $B_5 = 5^{th}$ day Blank

6. Total Dissolved Solids (TDS) : 100 mL sample was filtered through whatmann 42 filter paper. Filtrate was collected in Pre-weighed dish and placed on Boiling water bath to evaporate Liquid. Plate was then placed in an oven at 100°c for 2 hours followed by cooling in Dessicator for 30 min. The constant weight was determined.

Total Dissolved Solids (TDS) (mg/Lit) = $[(W_2 - W_1) \times 10^3]$ / Volume of sample taken (mL)

7. Total Suspended Solids (TSS): Sample was filtered by pre-weighed, whatmann 42 filter paper (W_1). After filtration, oven dried at 100°c and constant weight (W_2) was taken

Total Suspended Solids (mg/Lit) = $[(W_2 - W_1) \times 10]$ /Volume of sample taken (ml)

8. Estimation of Phenol: Phenol was estimated by Folin Ciocalteau reagent method as described previously by Palmer et al. with standard stock of 100µg/ml gallic acid and 20% Sodium carbonate (Na_2CO_3) solution. The optical density was measured at 620 nm.

RESULTS AND DISCUSSION :

In the present investigation, distillery spent wash (DSW) sample was collected from nearby distillery unit for screening of efficient micro-organisms. Six fungal and 6 bacterial isolates were obtained, out of which, 4 fungal isolates and 6 isolates of bacteria had shown decolorization with 10% DSW (table 1 and 2). However, if the concentration was increased to 20 % they were unable to decololized the DSW. As observed in case of fungi after 7 days of incubation no decolorization was observed on nutrient broth with 20% DSW. However when DSW was reduced to 10 %, out of 6 isolates F2, F3, F5, F6 had shown Decolorization. This effect might be due to the acidic conditions produced in the medium after incubation; inhibiting the microbial growth.

The Distillery spent wash was characterized by its dark brown colored, characteristics unpleasant odour. During the present study, it was observed that F6 isolate shows maximum decolorization by 25.58% than other 3 isolates. This decolorization might be due to the consumption of organic substances and thus reducing COD. The COD before treatment was 38,400 mg/lit and after treatment with fungi and bacteria, maximum reduction was found with F1 isolate of fungi by 91.66% and I1 of bacteria by 45.21%.

The colored wastewater with very high BOD results in eutrophication of contaminated water sources, besides reducing dissolved oxygen in water bodies. It also blocks sunlight entry into rivers and streams, thus, reducing oxygenation of water by photosynthesis and, hence, is detrimental to aquatic life. The high COD and BOD

content can be reduced to a certain extent by methane fermentation and activated sludge treatments. But, the dark colour remains as a problem, which requires pre-treatment before its safe disposal into the environment. From the results obtained and by comparing with reference value, it was found that BOD of Distillery spent wash was 50,000 mg/lit. (Table 1, 2)

Table 1: Reduction in the parameters when treated with fungal isolates

Isolates	% reduction in Colour	% reduction in Phenol	% reduction in COD
F2	69.77	87.83	91.66
F3	46.51	85.01	70.83
F5	2.325	90.53	75
F6	25.58	87.71	79.16

Table 2: Reduction in the parameters when treated with bacterial isolates

Isolates	% reduction in COD	% reduction in Phenol
I1	45.21	83.84
I2	34.25	82.84
I3	27.40	82.70
I4	27.40	86.74
I5	23.29	81.68
I6	15.07	83.56

From the results obtained, phenol content of Distillery spent wash was found to be 4.110 mg/ml (Fig.1).As using the above graph, it was observed that maximum phenol reduction was found to be 90.53% of F5 of fungus and 86.74% of I4 bacterial isolate. From the results obtained, Total suspended solids and Total dissolved solids was found to be 0.32 mg/lit and 122 mg/lit respectively.

CONCLUSION

Color removal of industrial effluents has been a major concern in wastewater treatment, especially for wastewater that originates from distilleries with a continuous discharge of a great quantity of colored compounds. The efficient treatment of the effluent in an eco-friendly way is the need of the hour. Bioremediation is an alternative, effective and ecofriendly method of treatment of spentwash due to cost effectiveness. 12 isolates of organisms were isolated, each 6 of fungus and bacteria. Out of which, F6 found to be promising and gave significantly higher decolorization yields at all the concentrations of spent wash. Decolorisation of spent wash seems to occur due to growth of culture on refractile carbon source component of spent wash; which suggests the role of secondary metabolite reaction in degradation and mineralization process. The probable mechanism for declorisation and COD reduction needs to be investigated. An isolate which was found to be more efficient in decolorizing the spent wash can be further exploited to develop a cost effective, eco friendly biotechnology process for treatment of distillery spent wash.

REFERENCES

- Aneja K.R. (2003), Experiments in Microbiology Plant Pathology and Biotechnology, Water Microbiology, 4th edition, New age International pvt. Limited, New Delhi, 357-358.
- Agarwal et.al (2010) , Removal of Melanoidin present in Distillery effluent as colorant, Journal of Environmental Biology, 522-526.
- Pant D., Adholeya A., Biological approaches for treatment of Distillery effluent, Bioresource Technology 98: 2321-2334.
- Maiti S. K. (2001), Handbook of Methods in Environmental Studies, Physical and chemical analysis of water effluents, 60-66.
- Ghose T.K. (1987), Measurements of cellulose activities, International union of pure and applied chemistry, vol. 59, no. 2, pg no. 257-268.
- Kumar V. et.al (1997), Microbial decolorization and bioremediation of anareobiccally digested molasses spent wash effluent by aerobic bacterial culture, *Microbios*, pg no. 81-90.
- Naik Nagaraj M. (2007), Decolorisation of biomethanated spent wash by native micro-organisms, Department of Agricultural Microbiology, College of Agriculture, University of Agricultural Sciences, Dharwad.
- Olaniyi, Ibrahim, Raphael, Odoh and Nwadiogbu, J. Onyebuchi (2012), Effect of Industrial Effluent on the Surrrounding Environment, Archives of Applied Science Research, 4 (1):406-413.
- Suntud Sirianuntapiboon, Phimphaka Phothilangka, Sadahiro Ohmomo (2004), Decolorization of molasses wastewater by a strain No.BP103 of acetogenic bacteria, Bioresource Technology 92: 31–39.

Study of quality of locally available Dairy products

H. S. Patil, B. A. Wani, S. R. Naik and N.D. Patil*
Department of Microbiology, M.J.College, Jalgaon
nayanaptl@gmail.com

ABSTRACT
Contaminated dairy products are major source of transmission of various pathogenic microorganisms in human being. In the present investigation five locally available dairy products were examined for presence of microbe to study the quality of product. The isolated microbes characterized by colony characteristics, biochemical test along with MPN and TVC tests. The results indicated the products are of good quality as very less or no microbes were found during the study.
Keywords: dairy products, microbial quality

---

*Address to whom the correspondence should be made.

INTRODUCTION

Dairy products are derived from milk, the secretion of the mammary glands of mammals, usually cows (bovine), sheep, goats, buffalo, mare, camel, or yak. Most dairy products originate from bovine milk and, to a lesser extent, sheep and goat milk. As milk contains approximately 80 to 90 percent water, it is prone to undesirable microbial growth with concomitant product deterioration. To prevent this problem from occurring, and to ensure a longer shelf life, milk is processed to form different products such as ice cream, cheese, milk powders, yogurt, butter, lactose, and anhydrous milk fat. Microbiological count methods are the accepted laboratory methods used to estimate the microbial population of a tested substance. These procedures are used throughout the dairy industry and detection of microbial contamination in raw and processed dairy products for determination of the quality.

METHODOLOGY

Isolation & identification

Samples were collected from local dairy, collected samples were serially diluted and isolated on nutrient agar plate. Total five dairy products viz. pedha, barfi, shrikhand, buttermilk and kajukatli were examined for study of quality product. The isolated microbes were identified by colony characteristics, gram staining and hanging drop technique.

Total viable count

One gram sample was serially diluted up to 10^{-6} and aliquots from the dilution tube were transferred aseptically to sterile nutrient agar for bacteria and for Potato dextrose agar for fungus. The butts were poured in a sterile Petri plate and incubated at 37 ^{0}C for 24 hrs. After incubation the number of colonies observed on the plate was counted and was termed as Total Viable Count or TVC of bacteria/ fungus.

Most Probable Number (MPN)
MPN was performed using MacConkey's broth and 5 tube method. Presence of gas in the tubes was noted and results were compared with standard table to determine the Most probable number of coliform.

Characterization of bacteria
The colonies were characterized with various morphological, colonial and biochemical tests such as sugar test, IMViC, H_2S production etc

RESULT AND DISCUSSION :
TVC of the dairy product was less and within the permissible limits except butter milk where 152 cfu is observed . Few colonies obtained when tested for gram character; in most of the cases bacteria isolated from the sample was Gram positive and non motile.

It is important to be noted that the MPN test was negative in all the cases indicating the good quality of the milk products. The results were supported by the observations of IMViC test which also shows the negative for typical coliform bacteria.

Only in case of Shrikhand and Kajukatali the bacterial colony showed positive result for TSI, however further detailed identification was not done.

CONCLUSION :
Five dairy products were examined for presence of microbes and to study quality. All the products viz. Pedha, Barfi, Shrikhand, Kajukatli was of good quality as the Total viable count is within permissible limits. Few isolated microbes were characterizations using colony morphology, bacterial morphology and biochemical test, colifomrs were not detected in the given samples. In case of butter milk colonies are 152 colonies, morphological observation showed that microbes belongs to S*treptobacillus spp.* Overall results showed that the dairy products are of good quality.

REFERENCE:

- Dubey R.C. and Maheshwari D.K.2004,Practical Microbiology, S.Chand and Co.Delhi.
- Aneja K.R. (1996)Experiments in microbiology 3rd edition, Wishwa prakashan, New Delhi.
- Parija S.C. Text book of practical microbiology Ahuja publishing house, New Deihi.
- Dubey R.C. and Maheshwari D.K.2004, Text book of Microbiology, S.Chand and Co.Delhi.

Study of bacterial diversity from Rhizosphere Soil

M. D. Sonawane, H. G. Patil, R. R. Jain*
Department of Microbiology, Moolji Jaitha College, Jalgaon
reenajain512@gmail.com

ABSTRACT

Rhizosphere region is characterized by greater microbiological activity than the soil away from plant roots. These microorganisms influence in the rhizosphere region and provide nutrients for the plants. Some microorganism shows symbiotic relationship with plant root and help in nitrogen fixation. In the present investigation samples were collected from rhisosphere region of medicinal plants like Basil, Panphuti & Aloevera. The P^H of soil found to be near neutral and during the isolation, 35 different colonies were observed on plates indicating the fertile nature of the soil. Only one bacteria is lactose fermentative and shows typical result of IMViC test indicating possibility of belongs to coli form group. Based on primary morphological observations, the fungus isolated may belong to *Mucor* and *Aspergillus* spp.

Keywords: Rhizosphere region, medicinal plant

***Address to whom the correspondence should be made.**

INTRODUCTION

Soil is the natural growth medium for the microorganism which contains minerals, organic matter, water & air. Rhizosphere is the narrow region of soil influence by root secretion & associated with soil microorganism. These root release water soluble compounds such as amino acids, sugar & organic acids that supply food for the microorganisms. In return, microorganisms provide nutrients for the plants. All this activity makes the rhizosphere the most dynamic environment in the soil. The number of microorganisms associated with rhizospheric region, these are fungi species like *A. niger, Aspergillus flavus* & bacteria like *Pseudomonas, Micrococcus, Bacillus brevis, Agrobacterium* & some phosphate solublizing organisms. A wide range of enzymes of plant and microbial origin present in the rhizosphere catalyzes the breakdown of organic materials. These enzymes include oxidoreductases, hydrolases, lyases and transferases besides cellulose, dehydrogenases and ureases.

MATERIALS & METHODS

Collection of soil sample

Soil **s**amples were collected from medicinal plants (Basil, Panphuti & Aloevera) in botanical garden. The surface soil was removed and approximately 5 gm soil around the root region was collected in sterilized container.

Measurement of pH of soil sample

Soil was diluted to 1:5 with distilled water and shake well on cyclomixer. pH was determined after settling of soil in the beaker.

Total viable count

The soil was serially diluted up to 10^{-6} and aliquots from the dilution tube were transferred aseptically to sterile nutrient agar for bacteria and for Potato dextrose agar for fungus. The butts were poured in a sterile Petri plate and incubated at 37 ^{0}C for 24 hrs. After incubation the number of colonies observed on the plate was counted and was termed as Total Viable Count or TVC of bacteria/ fungus.

Enumeration of *Rhizobium* sp.

Presence of *Rhizobium* sp was enumerated using Yeast Extract Mannitol agar as a selective medium

Characterization of bacteria

The colonies were characterized with various morphological, colonial and biochemical tests such as sugar test, IMViC etc

RESULTS

The pH of different soils was listed in the table 1, it was noted that all the three type of samples were having pH around neutrality with slight deviation towards acidic side.

Table 1: pH of different soil samples

Soil sample collected from	pH
Basil	7.1
Panphuti	6.4
Alovera	6.9

As evident from table 2, all the soil samples were fertile in nature. The soil around Panphuti was found to be rich in *Rhizobium* sp where as all the sample shows good number of bacterial colonies and presence of fungal growth. Most of the bacteria are gram negative rods with few exception.

Table 2: Microbial count of different soil samples

Soil sample collected from	Colonies on Nutrient agar at 10^{-5} dilution	Fungal growth on PDA	Colonies on YEMA
Basil	44	Present	15
Panphuti	35	Present	55
Alovera	49	Present	41
Control	08	Present	02

The bacteria isolated are fermentative in nature however typical results of IMViC for coliform were observed in only one colony. The primary microscopic observations of fungi indicate the presence of *Aspergillus & Mucor* species.

CONCLUSION

The soil is fertile in nature and most of the bacteria found to be fermentative in nature. The sticky & mucoid colonies observed on YEMA plate shows Gram negative character indicating presence of *Rhizobium* sp. However further confirmation is needed in this

regard. Even though the soil contains large number of bacteria, based on biochemical tests only one colony showed the possibility of *E. coli* a bacteria from coliform group. The primary observation indicates the present of *Mucor* and *Aspergillus* however, further conformation is essential in this respect also..

REFERENCES

- Aneja K. R.,(1996) Experiments in microbiology,Plant pathology,Tissue culture and Mushroom cultivation, 2nd ed.,Wishwa Prakashan, New Dehli
- Dubey R. C. and Maheshwari D. K.(2005), A Textbook of Microbiology, S. Chand publication 561-574
- Subba Rao N. S., Soil Microbiology, (4th edition) Soil micro-organisms and plant growth.
- http://usda.gov/education/facts/soil.html
- http://en.wikipedia.org/wiki/soil
- http://www.soils.tfree.wsu.edu/mg/physical.html
- http://www.dpi.nsw.gov.au

Screening of Xylanase producing fungi from compost pile

B. K. Vankhede, P. Wani, Y. Thakare and M. L. Sushir *
Department of microbiology, Moolji Jaitha College, Jalgaon.

Abstract

Xylanase, a group of enzyme which degrade the linear polysaccharide β-1,4-xylan in to xylose. It is having greater demand in pulp & paper industry. Enzyme application improves pulp fibrillation & water retention & selective removal of xylan from dissolving pulps. The present investigation aims to isolate and screen xylanase producing fungi from compost pile. Fifteen fungal strains were isolated, out of that 5 were screened on the basis of xylanase activity using congo red staining protocol. Isolate *Apergillus* species has produced maximum enzyme activity with 348.43 mg/min/ml.

Key word: Xylanase, *Aspergillus spp.*

*Address to whom the correspondence should be made.

INTRODUCTION

Xylan the second most abundant polysaccharide, forms an association between lignin and other polysaccharide. Xylan is the major component in plant cell wall mainly composed of cellulose (35-50%) hemicelluloses (20-30%) lignin (20-30%). (Subryamaniyan and Prema 2002). It is an linear homopolymers mainly constituted by four types of sugars D-xylose, arabinose, arabinosyl and glucuronyl. Xylan is a branch heteropolysaccharide constituting a backbone of β-1,4-linked xylopyranosyl units substituted with arabinosyl, glucuronyl and acetyl residue, (Sridevi and Charya, 2011); Xylanase is an enzyme which degrade the linear polysaccharide β-1,4- xylan into xylose. It can be classified as endo and exo xylanase. Endo β-1,4- xylanase attack the main chain of xylan, while β-D xylosidase hydrolyse xylooligosaccharide into D-xylose. The potential applications of xylanase are in food industry. The enzyme treatment has favorable effect on dough handling, bread volume, texture & stability. The current & major applications of xylanase are in pulp & paper, feed & baking industries. Xylanase are used in the prebleaching of kraft pulp to reduce the use of harsh chemicals in the subsequent hemical bleaching stages. In feed formulation, co-operation of xylanases, glucanases, proteinases, & mylases reduces viscosity of the feed & increases the adsorption of nutrients. (Kavya and Padmavati, 2009).

MATERIAL AND METHODS

All chemicals and reagents were used of analytical grade. Bovine Serum Albumin, malt extract agar media potato dextrose agar and Xylan were obtained from Hi-media Mumbai, India Birch wood xylan was purchased from sigma chemicals co., USA.

Sampling

The compost samples were collected from local composting sites of Jalgaon. Then transfer the sample in to the sanitized dry bag. The samples collected from 5 to 6 places in an around local composting site of Jalgaon the collected samples were pooled (Tallatragada and Venkatesh 2011; Vuppu and Mishra 2011).

Isolation and Identification of Fungi

The fungal strains were isolated by the dilution plating technique with dilution up to 10^{-3}. The last two dilutions 0.1 ml was spreaded on the sterile Potato dextrose agar plate. Incubate all the plates at 28˚c for 3 to 7 days (Tallapragada and Venkatesh 2011; Maheshwari *et al*. 2000). The isolates were identified by their cultural characteristics and morphological characteristics observed, color and pattern of growth. Isolates were preserved on Sterile Potato dextrose agar plate as a pure culture for further studies.

Screening of xylanolytic activity

All fungal isolates were screened for the production of xylanase. For screening 6mm block of each actively growing fungi was placed on sterile 0.1% xylan containing Potato dextrose agar plate and incubated at 28˚c for 24-48 hrs. Plates were flooded with 0.1% Congo red solution for 15 minutes followed by de-staining with 1M NaCl solution. The diameter of zone of clearance around the growth was measured. Fungal strains A-2, A-5 & A-6 showing zone of clearance was selected for enzyme assay**.**

Xylanase assay

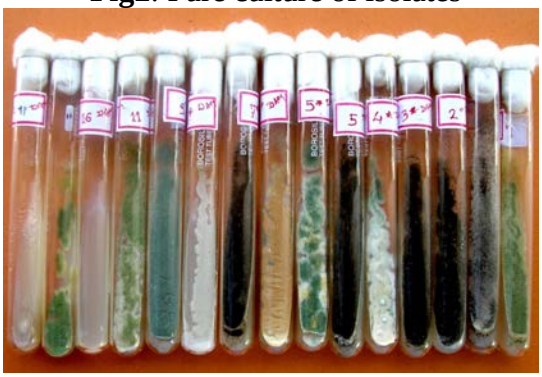
Xylanase activity was assayed using 1%(w/v) of birchwood xylan as a substrate. Reaction mixture contains 1ml of appropriately diluted enzyme and 1% xylan in citrate phosphate buffer. After predetermined periods the releasing sugars were estimated with 3,5-dinitrosalysilic acid using xylose as standard one unit of xylanase activity was defined as the amount of enzyme that released 1µmol reducing sugars equivalent xylose per min-1 (Ahmed et al., 2011).

RESULTS AND DISCUSSION:

Sample collection

Fig1: Compost sample

Fig2: Pure culture of isolates



Isolation and screening

About 14 fungal isolates were obtained from different sources which are designated as I,II,III etc, respectively and maintained on PDA slants as a pure culture during working.

Morphological study of potential isolates

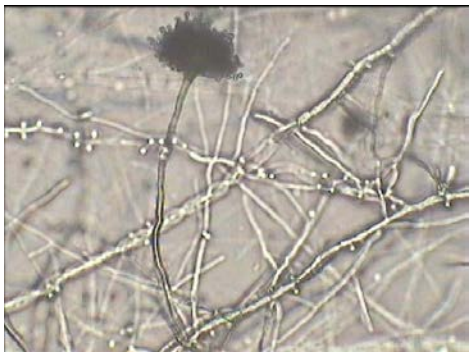


Fig 3 : Microscopic image (40X) of strain V showing conidiophores

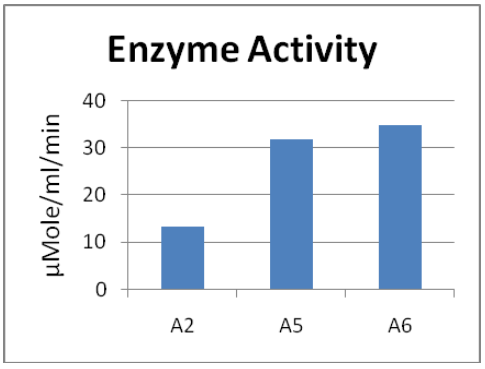
Screening of xylanase producing fungi

Fig 4:- Transparent zone around colony after addition of 1M NaCl destaining

Xylanolytic potential of fungal strains

FUNGAL ISOLATES	FUNGAL ISOLATES
AI	-
AII	+
AIII	-
AIV	-
AV	+
AVI	+
AVII	-
AVIII	-
AIX	-
BI	-
BII	-
BIII	-
BIV	-
BV	-

(+Strain having ability to hydrolysed xylan, -Strain which not having ability to hydrolysed xylan).



Enzyme Activity of Isolates

CONCLUSION:

Fourteen different fungal isolates screened from 4 compost samples. After screening with congo red test, 3 fungal strains shows positive results. Primary identification with morphological and microscopic observations, the potential isolate was fond to be *Aspergillus spp.* The maximum enzyme activity was found to be 348.43 mg/min/ml at 0.5% of substrate after 5 days.

REFERENCES:

1. Ahlawat,S., Mandhan, R.P., Dhiman, S.S., Kumar, R., and Sharma, J. (2007a). "Potential application of alkaline pectinase from *Bacillus Subtilis* ss in pulp and paper industry," *Appl. Biochem. Biotectnol*. doi: 10.1007/s12010-007-8096-9.
2. Ahlawat,S., Battan, B., Dhiman, S.S., Sharma, J., and Mandhan, R.P. (2007b)."Production of thermostable pectinase and xylanase for their potential application in bleaching of kraft pulp," J. Ind. Microbial. Biotechnol. 34, 763-770.
3. Bajpai,P. (1999). "Application of enzymes in the pulp and paper industry," Biotechnol.Prog.15, 147-156.
4. Bedford, M.R., and Classen, H.L. (1992). "The influence of dietary xylanase on intestinal viscosity and molecular weight distribution of carbohydrates in rye-fed broiler chick," In: Visser, J., Beldman, G., VanSomeren, M. A. K., and Voragen, A. G.J. (eds.). Xylan and Xylanases, Elsevier, Amsterdam., pp. 361-370.
5. Biely, P. (1985). Microbial xylanolytic systems. Trends Biotechnol. 3, 285-290.
6. Boddireddy Sridevi[1]* and M. A. Singara Charya[2] (2011) Isolation, identification and screening of potential cellulase-free xylanase producing fungi. African Journal of Biotechnology Vol. 10 (22), pp. 4624-4630.
7. Gilbert, H. J. and Hazlewood, G. P. (1993) Bacterial cellulases and xylanase. J. Gen.Microbiol. 139, 187-194.
8. Kuhad , R. C., and Singh, A. (1993). "Lignocellulosic Biotechnology: Current and future prospects," Crit, Rev. Biotechnol. 13, 151-172.
9. Kuhad, R. C., Singh, A., and Eriksson, K.E. L. (1997). "Microorganism and enzymes involved in the degradation of plant fibre cell wall. Special issue on 'Biotechnology in pulp and paper industry'," Adv. Biochem. Eng. 57, 45-127.
10. Maat, J., Rosa, M., Verbakel, J., Stam, H., daSilra, M.J.S., Egmond, M.R., Hagemans, M.L. D., VanGarcon, R.F.M., Hessing, J.G.M., VanDerhondel, C.A.M.J.J., and Vanrotterdam, C. (1992). "Xylanases and their application in bakery," In : Visser, J., Beldman, G., van Somren, M.A. K., and Voragen, A.G.J. (eds.), Xylan and Xylanases, Elsevier, Amsterdam.pp. 349-360.
11. Maheshwari, U., and Chandra, T.S. (2000). "Production and potential application of a xylanase from a new strain of *Streptomyces cuspidosporus*," World J. Microbiol. Biotechnol. 16., 256-263
12. Saha, B. C. (2000). "α-L-Arabinofuranosidases: Biochemistry, molecular biology and application in biotechnology," Biotechnol. Adv. 18,403-423.
13. Padmavati Tallapragada* and Kavya Venkatesh (2011) "Isolation, identification and optimization of xylanase enzyme produced by *Aspergillus niger* under submerged fermentation".

BIO-CHEMISTRY

Study of antibacterial activity of silver nanoparticles

P.S Bhandarkar, R.B Chavan and B.R. Kavimandan*
Department of Biochemistry, Moolji Jaitha College, Jalgaon

Abstract

Silver nanoparticles have received considerable attention in last decade due to their antibacterial, antifungal, UV filtering properties, high catalytic and photochemical activity. To study their antibacterial activity, the silver nanoparticles were synthesised in the laboratory by chemical method and characterised by XRD and SEM. Antibacterial activity of the nanoparticles were studied against *Escherchia coli* (NCIM 2931), *Staphylococus aureus* (NCIM 2079), *Pseudomonas aureginosa* (NCIM 5029), and *Basillus subtilis* (NCIM 2545) by Paper disc diffusion method and Borer well method. XRD and SEM characterisation revealed the nano size and shape of the synthesised particles. Ag nanoparticles had shown antibacterial activity against all four species of bacteria.

Key words: Silver nanoparticles, antibacterial activity, SEM

***Address to whom the correspondence should be made.**

INTRODUCTION:

Bionanotechnology is the integration between biotechnology and nanotechnology for developing biosynthetic and environmental friendly technology for the synthesis of nanomaterials. Nano scale particles have emerged as novel antimicrobial agents owing to the high surface area to volume ratio, which is coming up as the current interest in the researchers due to the growing microbial resistances against metal ions, antibiotics and the development of resistant strains(1).

Medicinal and preservative properties of silver have been known for over 2,000 years. Over the last decades silver has been engineered into nanoparticles, structures from 1 to 100 nm in size. Owing to their small size, the total surface area of the nanoparticles is maximized, leading to the highest values of the activity to weight ratio. Due to this property being distinctly different from that of the bulk metal, silver nanoparticles have attracted much attention and have found applications in diverse areas, including medicine (2), textile engineering (3), biotechnology and bioengineering (4), water treatment (2), electronics (5) and optics (6). Furthermore, currently silver nanoparticles are widely used as antibacterial/antifungal agents in a diverse range of consumer products: air sanitizer sprays, socks, pillows, slippers, respirators, wet wipes, detergents, soaps, shampoos, toothpastes, air filters, coatings of refrigerators, vacuum cleaners, washing machines, food storage containers, cellular phones, etc. (7). Numerous synthesis approaches were developed to obtain silver nanoparticles of various shapes and sizes, including laser ablation (8), gamma irradiation (9), electron irradiation (10), and chemical reduction by inorganic and organic reducing agents (11), photochemical methods (12), microwave processing (13), and thermal decomposition of silver oxalate in water and in ethylene glycol (14). Having compared minimum inhibitory concentration (MIC) values for bacterial cultures, one can see that the antimicrobial activity of silver nanoparticles strongly depends on the method of their synthesis.

Therefore we have selected present research work with objectives of synthesis, characterization and study of antibacterial activity of Ag nanoparticles.

MATERIALS AND METHODS:

1. Synthesis of silver nanoparticles:

Silver nanoparticles were synthesized by the method given by Ratyakshi and R.P. Chauhan 2009 (15) with slight modifications. To boiling 0.001M $AgNO_3$, 1% trisodium citrate was added drop by drop using separating funnel. Solution was allowed to cool at room temperature so that silver particles precipitated at the bottom. Precipitate was washed twice with distilled water. Then precipitate was washed with absolute ethanol. Precipitate was air dried so that silver particles were obtained.

Reaction:

$$4Ag^{+} + C_6H_5O_7Na_3 + 2H_2O \rightarrow 4Ag^{\circ} + C_6H_5O_7H_3 + 3Na^{+} + H^{+} + O_2\uparrow$$

2. Characterization of Ag nanoparticles:

Ag nanoparticles were characterized by X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM) from UDCT, North Maharashtra University, Jalgaon.

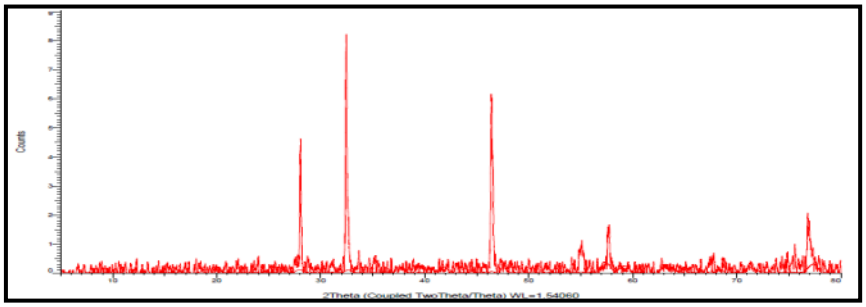
3. Antibacterial Activity:

Paper disc diffusion method and Borer well method were used to determine the antibacterial activity of silver nanoparticles (16). Antibacterial activity was checked against the bacteria *Escherchia coli* (NCIM 2931), *Staphylococus aureus* (NCIM 2079), *Pseudomonas aureginosa* (NCIM 5029), and *Basillus subtilis* (NCIM 2545). 20 mg/ml streptomycin and Ag nanoparticles were used in both methods.

RESULTS AND DISCUSSION:

Silver nanoparticles Characterization:

XRD characterization of Ag nanoparticles had shown 99.9% crystallinity, 00.1% Amorphous and 164 nm crystal Size.



Graph 1: XRD of Ag nanoparticles

SEM had shown particles size, shape and composition of Ag nanoparticles more accurately as compared to XRD. Figure 1 gives more clear idea regarding size and shape of Ag nanoparticles. Particles size ranges from 29.9 nm to 203 nm. Particle shape was roughly sperical.

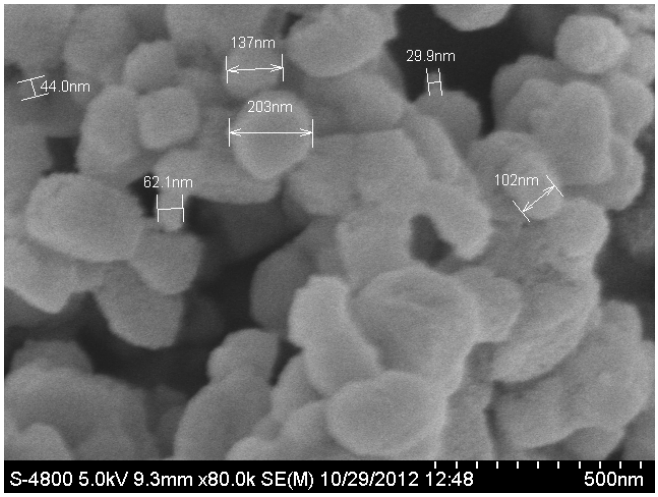
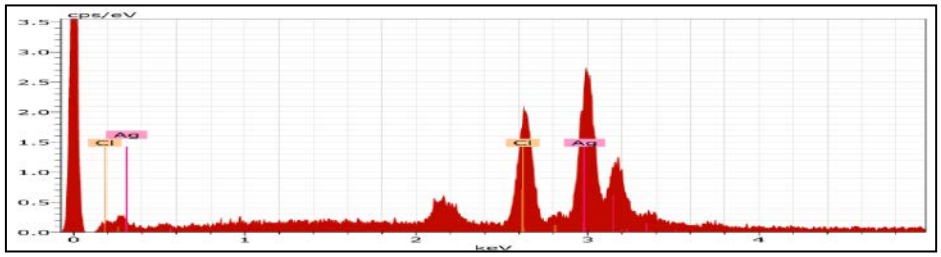


Figure 1: SEM picture of Ag nanoparticles showing particle size

Graph 2 and Table 1 obtained after SEM shows composition of Ag nanoparticles and their component weight percentages. From graph and table it is clear that Ag particles were made up of only Ag and there were traces of chlorine might be from water used.



Graph 2: SEM graph of Ag nanoparticles showing its composition

El	AN	Series	unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (1 Sigma) [wt.%]
Cl	17	K-series	7.15	18.24	40.43	0.30
Ag	47	L-series	32.07	81.76	59.57	1.09
		Total:	39.22	100.00	100.00	

Table 1: SEM calculated weight percentage of Ag and Cl

Antibacterial activity:

Antibacterial activity of Ag nanoparticles determined by Disc diffusion method and Borer well method are shown in the figure 2, and 3, and zone of inhibition is shown in table 2 and 3.

Disc Diffusion method:

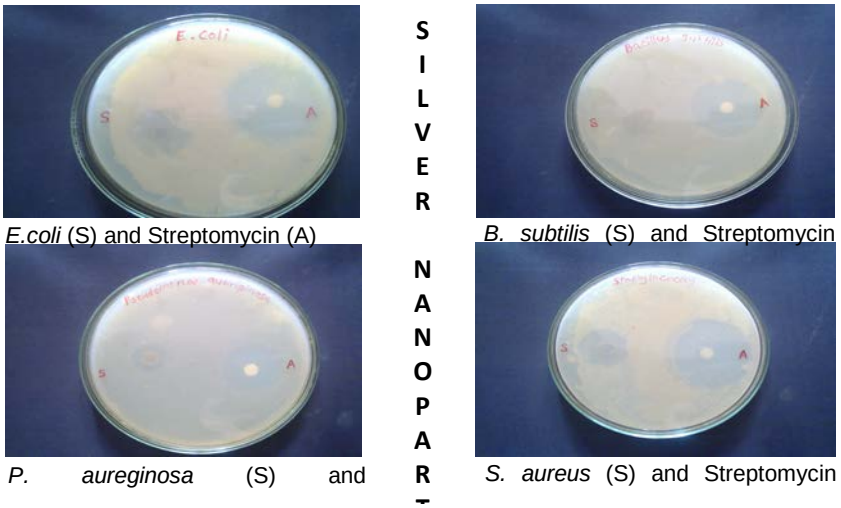


Figure 2: Antibacterial activity of Ag nanoparticles by disc diffusion method

Borer well method:

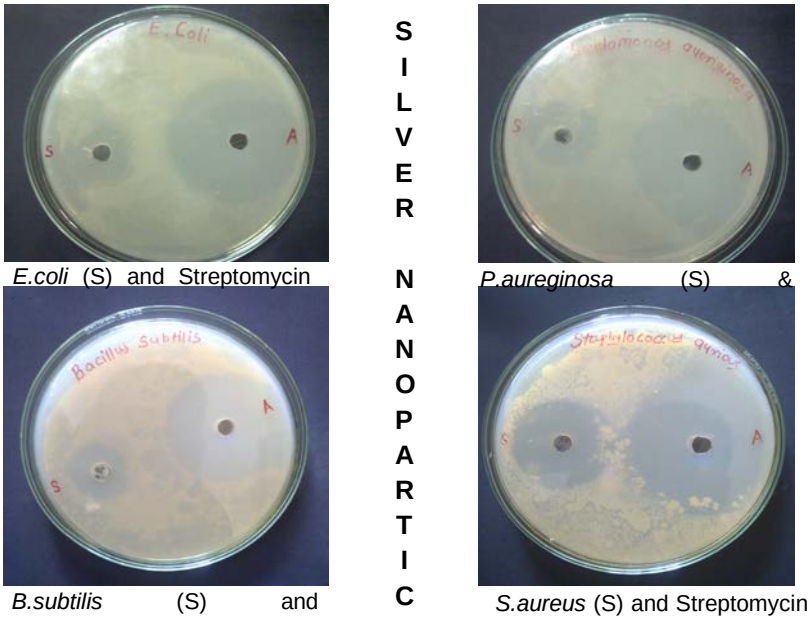


Figure 3: Antibacterial activity of Ag nanoparticles by borer well method

Table 2: Zone of inhibition obtained by disc diffusion

Sr. No.	Name of bacteria	Zone of inhibition (dia. in mm)	
		Ag nanoparticles	Streptomycin
1	*Escherchia coli*	17	30
2	*Staphylococus aureus*	19	27
3	*Pseudomonas aureginosa*	14	23
4	*Basillus subtilis*	12	28

Table 3: Zone of inhibition obtained by borer well method

Sr. No.	Name of bacteria	Zone of inhibition (dia. in mm)	
		Ag nanoparticles	Streptomycin
1	*Escherchia coli*	20	36
2	*Staphylococus aureus*	30	38
3	*Pseudomonas aureginosa*	19	30
4	*Basillus subtilis*	22	34

As seen in the above images and tables, Ag nanoparticles exhibited antibacterial activity. Antibacterial activity of Ag nanoparticles was compared with antibiotic-streptomycin. From the diameter of zone of inhibition, it is clear that streptomycin is more bactericidal as compared to Ag nanoparticles. Diameter of zone of inhibition of streptomycin was almost double as compared to the Ag nanoparticles. One of the reasons behind larger zone of inhibition for streptomycin and Ag nanoparticles is that bacteria are more susceptible to them.

Khaydarov *et al* (17) studied bactericidal effect of silver nanoparticles obtained by a novel electrochemical method on *Escherichia coli*, *Staphylococcus aureus*, *Aspergillus niger* and *Penicillium phoeniceum* cultures. The tests conducted had demonstrated that synthesized silver nanoparticles – when added to water paints or cotton fabrics – show a pronounced antibacterial/antifungal effect. It was shown that smaller silver nanoparticles have a greater antibacterial/antifungal efficacy.

Ag nanoparticles had shown lesser bactericidal activity as compared to streptomycin. The reason could be larger size of nanoparticles.

ACKNOWLEDGEMENT:
We are very grateful to our Hon'ble President of KCE Society Mr. N.G. Bendale and Principal Mr. A.G. Rao for their support and encouragement.

REFERENCES :

1. Chan H., Tsai M., (2008). Rev.Adv.Mater. Sci., 18, 734
2. Salata O.V., (2004). Application of nanoparticles in biology and medicine, J Nanobiotechnol, 2, pp 1–12.
3. Lewis L.N., (1993). Chemical catalysis by colloids and clusters, Chem Rev, 93, pp 2693–2730.
4. Niemeyer C.M., (2001). Nanoparticles, proteins, and nucleic acids: biotechnology meets materials science, Angew Chem Int Ed, 40(22), pp 4128–4158.
5. Lee H.J., Jeong S.H., (2005). Bacteriostasis and skin innoxiousness of nanosize silver colloids on textile fabrics, Text Res J, 75, pp 551–556.
6. Murphy C.J., Sau T.K., Gole A.M., *et al*., (2005). Anisotropic metal nanoparticles: synthesis, assembly, and optical applications, J Phys Chem B, 109, pp 13857–13870.
7. Buzea C., *et al*., (2007). Nanomaterials and nanoparticles: sources and toxicity, Biointerphases, 2(4), pp MR17–MR71.

8. Lee I., Han S.W., Kim K., (2001). Simultaneous preparation of SERS-active metal colloids and plates by laser ablation, J Raman Spectrosc, 32, pp 947–952.
9. Long D., Wu G., Chen S., (2007). Preparation of oligochitosan stabilized silver nanoparticles by gamma irradiation, Radiat Phys Chem, 76(7), pp 1126–1131.
10. Bogle K.A., Dhole S.D., Bhoraskar V.N., (2006). Silver nanoparticles: synthesis and size control by electron irradiation, Nanotechnology, 17, pp 3204–3208.
11. Bönnemann H., Richards R. (2001). Nanoscopic metal particles – synthetic methods and potential applications, Inorg Chem 10, pp 2455–2480.
12. Mallick K., Witcomb M.J., Scurrell M.S., (2004). Polymer stabilized silver nanoparticles: a photochemical synthesis route, J Mater Sci 39, pp 4459–4463.
13. Soto K.F., (2005). Comparative in vitro cytotoxicity assessment of some manufactured nanoparticulate materials characterized by transmission electron microscopy, J Nanopart Res, 7, pp 145–169.
14. Navaladian S., Viswanathan B., Viswanath R.P., (2007). Thermal decomposition as route for silver nanoparticles, Nanoscale Res Lett, 2, pp 44–48.
15. Ratyakshi, Chauhan.R.P., (2009). Colloidal synthesis of silver nanoparticles, Asian journal of chemistry, vol. 21 (10), pp – 113-116.
16. K.R. Aneja., (2003). Experiments in Microbiology Plant Pathology and Biotechnology. New Age International Publishers.Fourth Edition-2003, pp- 390-392.
17. Khaydarov R.R., Khaydarov R.A., Estrin Y.**,** Evgrafova S., (2009). Silver Nanoparticles Environmental and Human Health Impacts I. Linkov and J. Steevens (eds.), Nanomaterials: Risks and Benefits, 287 Springer Science + Business Media B.V. 2009

Study of antibacterial activity of zinc oxide nanoparticles

C. D. Magare, P.S. Suradkar and B.R Kavimandan*
Department of Biochemistry, Moolji Jaitha College, Jalgaon

ABSTRACT

ZnO nanoparticles have many significant features like chemical and physical stability, high catalysis activity, effective antibacterial, antifungal activity, UV filtering properties, high catalytic and photochemical activity etc. ZnO nanoparticles were synthesised in the laboratory by chemical method and characterised by XRD and SEM. Antibacterial activity of the nanoparticles were studied against *Escherchia coli* (NCIM 2931), *Staphylococus aureus* (NCIM 2079), *Pseudomonas aureginosa* (NCIM 5029), and *Basillus subtilis* (NCIM 2545) by Paper disc diffusion method and Borer well method. XRD and SEM characterisation revealed the nano size and shape of the synthesised particles. ZnO nanoparticles had shown antibacterial activity against all four species of bacteria.

Key words: ZnO nanoparticles, antibacterial activity, SEM

*Address to whom the correspondence should be made.

INTRODUCTION:

Nanoparticles are particles that have one dimension that is 100 nanometers or less in size. Nanoparticles have a greater surface area per weight than larger particles; this causes them to be more reactive to certain other molecules. Inorganic materials such as metal and metal oxides have attracted lots of attention over the past decade due to their ability to withstand harsh process conditions (1).

Among metal oxide nanoparticles, ZnO nanoparticles as one of the multifunctional inorganic nanoparticles has many significant features such as chemical and physical stability, high catalysis activity, effective antibacterial activity as well as intensive ultraviolet and infrared adsorption with broad range of applications as semiconductors, sensors, transparent electrodes, solar cells, etc. (2). Also in recent years ZnO has received considerable attention because of its unique optical, piezoelectric, and magnetic properties (3). In addition ZnO nanoparticles has the potential to impact many aspects of food and agricultural systems because of its antimicrobial efficacy especially with the growing need to find alternative methods for formulating new type of safe and cost-effective antibiotics in controlling the spread of resisted pathogens in food processing environment (4). Some data suggest the selective toxicity of the ZnO nanoparticles toward cancer cells (5). The anticancer effects of ZnO nanostructures on human brain tumor U87 and cervical cancer Hela were obtained and indicate promising activity that varies with the changes in the structure and the size (6).

Therefore, the present investigation was aimed to synthesize, characterize and to determine the antibacterial activity of ZnO nanoparticles against some bacteria.

MATERIALS AND METHODS:

1. Synthesis of zinc oxide nanoparticles:

Zinc oxide nanoparticles were synthesized by the method given by Haritha Meruvu *et al* (7) with slight modification. To the 250ml of 0.1 % starch solution, 7.437g of Zinc nitrate was added and stirred on magnetic stirrer at 30°C. Then 0.8% NaOH solution was added drop-wise for 40 minutes until the white precipitate of zinc hydroxide formed. Zinc hydroxide precipitate was washed twice with distilled water. Then precipitate was washed with absolute ethanol. Precipitate was air dried so that zinc hydroxide is oxidized to zinc oxide.

Reactions:

$$ZnNO_3 + 2NaOH \rightarrow Zn(OH)_2 \downarrow + Na_2NO_3 \uparrow$$

2. Characterization of Ag nanoparticles:

ZnO nanoparticles were characterized by X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM) from UDCT, North Maharashtra University, Jalgaon.

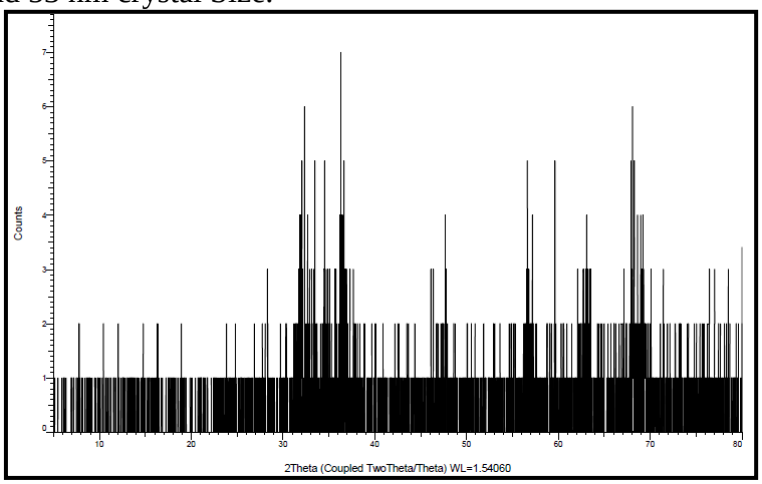
3. Antibacterial Activity:

Paper disc diffusion method and Borer well method were used to determine the antibacterial activity of ZnO nanoparticles (8). Antibacterial activity was checked against the bacteria *Escherchia coli* (NCIM 2931), *Staphylococus aureus* (NCIM 2079), *Pseudomonas aureginosa* (NCIM 5029), and *Basillus subtilis* (NCIM 2545). 20 mg/ml streptomycin and ZnO nanoparticles were used in both methods.

RESULTS AND DISCUSSION:

ZnO nanoparticles Characterization:

XRD characterization of ZnO nanoparticles had shown 100 % crystallinity, 0 % Amorphous and 53 nm crystal Size.



Graph 1: XRD of ZnO nanoparticles

SEM had shown particles size, shape and composition of ZnO nanoparticles more accurately as compared to XRD. Figure 1 gives more clear idea regarding size and shape of ZnO nanoparticles. Particles size ranges from 14 nm to 24.8 nm. Particle shape was roughly sperical.

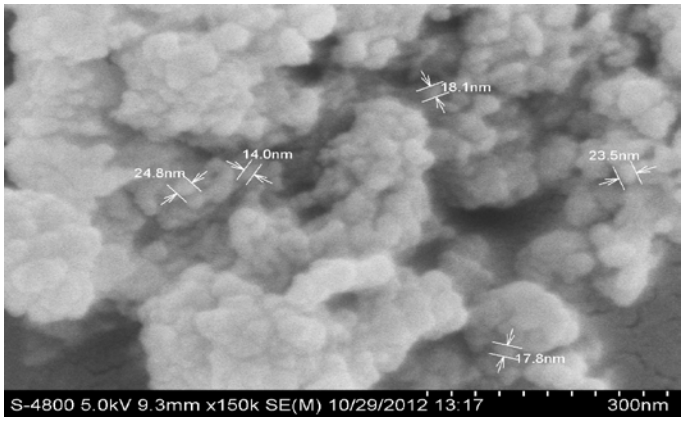
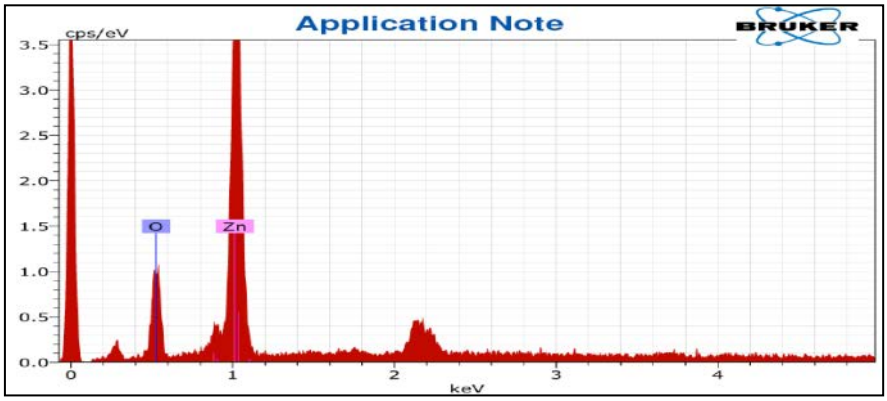


Figure 1: SEM picture of ZnO nanoparticles showing particle size

Graph 2 and Table 1 obtained after SEM shows composition of ZnO nanoparticles and their component weight percentages. From graph and table it is clear that ZnO particles were made up of only Zn and O and there was no contamination.



Graph 2: SEM graph of ZnO nanoparticles showing its composition

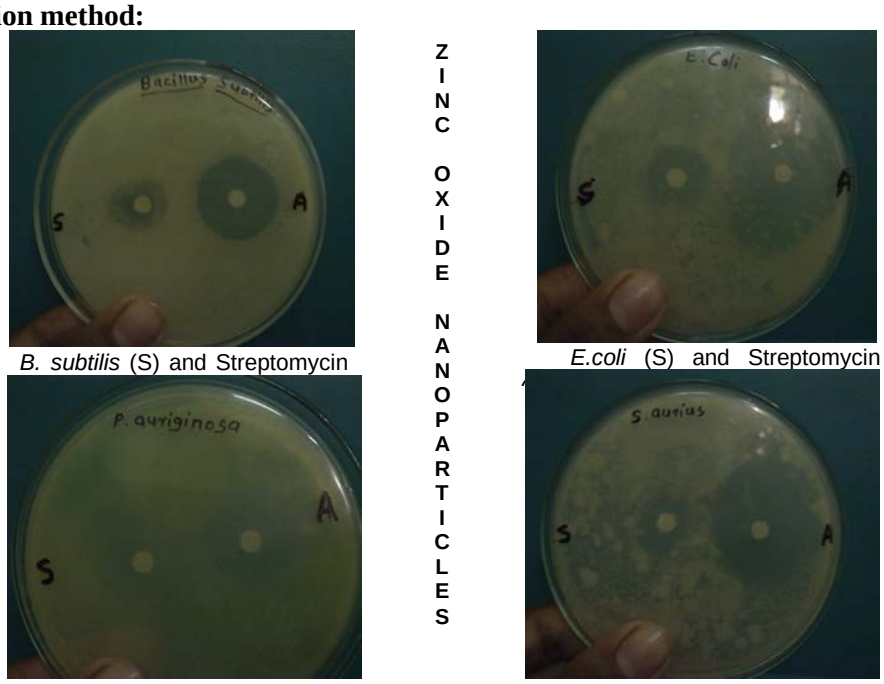
El	AN	Series	unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (1 Sigma) [wt.%]
O	8	K-series	7.81	17.28	46.06	1.47
Zn	30	K-series	37.36	82.72	53.94	1.53
		Total:	45.17	100.00	100.00	

Table 1: SEM calculated weight percentage of Zn and O

Antibacterial activity:

Antibacterial activity of ZnO nanoparticles determined by Disc diffusion method and Borer well method are shown in the figure 2, and 3, and zone of inhibition is shown in table 2 and 3.

Disc Diffusion method:



B. subtilis (S) and Streptomycin

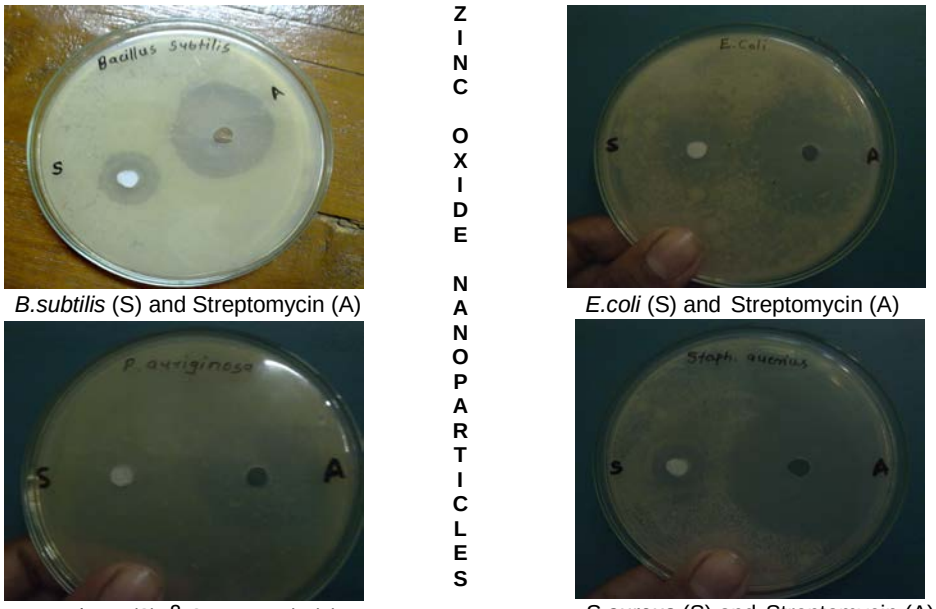
E.coli (S) and Streptomycin

P. aureginosa (S) & Streptomycin (A)

S. aureus (S) and Streptomycin (A)

Figure 2: Antibacterial activity of ZnO nanoparticles by disc diffusion method

Borer well method:



B.subtilis (S) and Streptomycin (A)

E.coli (S) and Streptomycin (A)

P.aureginosa (S) & Streptomycin (A)

S.aureus (S) and Streptomycin (A)

Figure 3: Antibacterial activity of ZnO nanoparticles by borer well method

Table 2: Zone of inhibition obtained by disc diffusion

Sr. No.	Name of bacteria	Zone of inhibition (dia. in mm)	
		ZnO nanoparticles	Streptomycin
1	*Echerchia coli*	12	28
2	*Staphylococus aureus*	15	32
3	*Pseudomonas aureginosa*	18	20
4	*Basillus subtilis*	11	26

Table 3: Zone of inhibition obtained by borer well method

Sr. No.	Name of bacteria	Zone of inhibition (dia. in mm)	
		ZnO nanoparticles	Streptomycin
1	*Echerchia coli*	15	27
2	*Staphylococus aureus*	15	40
3	*Pseudomonas aureginosa*	13	31
4	*Basillus subtilis*	12	32

As seen in the above images and tables, ZnO nanoparticles exhibited antibacterial activity. Antibacterial activity of ZnO nanoparticles was compared with antibiotic-streptomycin. From the diameter of zone of inhibition, it is clear that streptomycin is more bactericidal as compared to ZnO nanoparticles. Diameter of zone of inhibition of streptomycin was almost double as compared to the ZnO nanoparticles.

Haritha Meruvu *et al* (7) used disc diffusion method for the assessment of antibacterial activity of ZnO nanoparticles. They found larger zone of inhibition for antibiotics (nitrofurantoin, tetracycline, nalidixicacid, gentamicin, methicillin) as compared to the ZnO nanoparticles. They had seen antibacterial activity against *Bacillus subtilis* and *Escherichia coli.*

An inhibitory effect of ZnO nanoparticles on *Bacillus subtilis*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus pyogenes,* and *Enterococcus faecalis* has been reported by N. Jones *et al* (9).

Y. Xie (10) first investigated the antibacterial properties of ZnO nanoparticles against *C. jejuni*, the most common food borne pathogen. Results had shown that *C. jejuni* is extremely sensitive to ZnO nanoparticles, with a MIC 8- to 16-fold lower than those for *E. coli* O157:H7 and *Salmonella*. Antibacterial tests both on agar plates and in broth showed that 0.03 mg/ml of ZnO nanoparticles was sufficient to inactivate *C. jejuni*, whereas the concentration of nanoparticles needed for 100% inhibition of *E. coli* O157:H7 growth was between 0.24 and 0.98 mg/m, approximately 8 to 32 times higher than the lethal dosage for *C. jejuni*.

Zarrindokht Emami-Karvani and Pegah Chehrazi (11) studied the antibacterial property of ZnO nanoparticles. The results showed that ZnO nanoparticles have antibacterial inhibition zone of 29 and 19 mm at the concentration of 10 mg/ml against *E. coli* and *S. aureus,* respectively. Gram-negative bacteria seemed to be more resistant to ZnO nanoparticles than Gram-positive bacteria. They found that the antibacterial activity of ZnO nanoparticles increased with decreasing particle size and increasing powder

concentration. The antibacterial effect of ZnO nanoparticles was time dependent and takes effect gradually. ZnO bulk powder showed no significant antibacterial activity.

ACKNOWLEDGEMENT:
We are very grateful to our Hon'ble President of KCE Society Mr. N.G. Bendale and Principal Mr. A.G. Rao for their support and encouragement

REFERENCES :

1. Fu L., Liu Z., Liu Y., Han B., Hu P., Cao L. and Zhu D., (2005). Beaded Cobalt oxide nanoparticles along carbon nanotubes: towards more highly integrated electronic devices, Advanced Materials, 17, pp 217-221.

2. Matei A., Cernica I., Cadar O., Roman C., Schiopu V., (2008). Synthesis and characterization of ZnO – polymer nanocomposites, Int. J. Mater. Form., 1, pp 767-770.

3. Marcus C.N., Paul A.W., (2007). ZnO tetrapod nanocrystals, J. Mater. today, 10(5), pp 50-54.

4. Jin T., Sun D., Su J.Y., Zhang H., Sue H.J., **(**2009). Antimicrobial efficacy of zinc oxide quantum dots against *Listeria monocytogenes*, *Salmonella* Enteritidis, and *Escherichia coli* O157:H7, J. Food Sci., 74, pp M46–M52.

5. Shantikumar N., Abhilash S., VVDivya R., Deepthy M., Seema N., Manzoor K., Satish R., (2009). Role of size scale of ZnO nanoparticles and microparticles on toxicity toward bacteria and osteoblast cancer cells, J. Mater. Sci: Mater Med., 20, pp 235–241.

6. Rizwan W., (2010). Antibacterial activity of ZnO nanoparticles prepared via nonhydrolytic solution route. J. Appl. Microbial. Biotechnol., 87(5): 1917- 1925.

7. Meurvu H., Vangalapati M., (2011). Synthesis & characterization of ZnO nanoparticles and its Antimicrobial activity against Bacillus & E.coli, Rasayam J. chem., Vol.4 (1), pp 217-222.

8. K.R.Aneja., (2003). Experiments in Microbiology Plant Pathology and Biotechnology. New Age International Publishers.Fourth Edition-2003, pp- 390-392.

9. Jones, N., B. Ray, K. T. Ranjit, and A. C. Manna**.** 2008. Antibacterial activity of ZnO nanoparticle suspensions on a broad spectrum of microorganisms. FEMS Microbiol. Lett. 279,pp 71–76.

10. Xie Y., He Y., Irwin P., (2011). ZnO nanoparticles against Campylobacter jejuni, Applied & environmental microbiology, vol. 77 (7), pp– 2335-2331.

11. Emami-Karvani.Z and Chehrazi.P .(2011) Antibacterial activity of ZnO nanoparticle on grampositive and gram-negative bacteria African Journal of Microbiology Research Vol. 5(12), pp. 1368-1373,

BOTANY

Study of Anatomy, Phytochemical and Secondary metabolites of some Orchid species

U. M. Gavali, K. A. Sapkale, L. S. Vattakandy* and P. O. Pandey*
Post Graduate Research Center, Department of Botany, Moolji Jaitha College, Jalgaon. 425002.

ABSTRACT

The paper presents the structural features of the aerial root, stem, leaf and stomatal studies of ***Acampe rigida*** Roxb., ***Rhynchostylis retusa*** (Linn.) Blume and ***Vanda tessellate*** (Roxb.) Hook the three species of an epiphytic orchid which belongs to the same tribe Vandeae including the subtribe Aeridinae has been studied. The prominent characters of the epiphytes were notable – 4 to 5 layers of velamen cells, exodermis uniseriate with U-thickened cell walls and collateral vascular bundles were present in roots. While raphide bundles occurred in both roots and leaves. Endodermis cells are O-thickened and U-thickened. Sunken stomata with anisocytic, paracytic and stomatal chambers were observed. The vascular bundles in leaves occur in a single series alternating large and small. The leaf, root, stem and floral elements disclose the same structure both representing amphystomatic, homogenous mesophyll with aerial spaces.

Key words: anatomy, root, leaf, stomata, ***Acampe rigida*** Roxb., ***Rhynchostylis retusa*** (Linn.) Blume and ***Vanda tessellate*** (Roxb.) Hook.

*Address to whom the correspondence should be made.

INTRODUCTION:

Orchids the beautiful flowers in god's creation comprise a unique group of plants. Orchidaceae is a highly evolved and widely distributed monocotyledonous family with a large number of terrestrial, saprophytic and epiphytic species. Orchids exhibit an incredible range of diversity in size, shape and color of their flowers. They are most pampered of the plants and occupy top position among all the flowering plants value for cut flower production and as potted plants. They are widely known for their economic importance and medicinal value Recently in one study conducted at a Botanical Research Institute in India, scientists evaluated the species *Vanda tessellate* and discovered its role as a potent aphrodisiac and fertility booster **(Kumar *et al*, 2005)** not only medicinal uses of Orchids are present but also phytochemically some Orchids have been reported to contain alkaloids, flavonoids, turpenoids, reducing sugars, lignin, cellulose, cyanogenic glycosides etc.

MATERIALS AND METHODS:

The species of orchids were collected from different regions of India like coastal area of Goa, Kerala and Maharashtra. The species were identified using **Flora of Sawantwadi.** For the present study leaves and roots of the plants were cut from living plants and fixed in FAA 70% for at least 24 hours. Hand sections were taken with the help of blade and then stained with safranin and fast green.

Anatomical characters were observed under a microscope as well as photographs were taken using Motic Digital Photo microscope.

Stomatal studies are done by peeling method i.e. epidermal peels were taken and stained in Delafield's hematoxylin, washed in distill water and mounted in glycerine jelly.Stomatal index of each species is calculated as given by **Salisburry and Ross.**

For phytochemical test sections were taken and test of starch, cellulose, lignin,, flavonoids and alkaloids.

For study of secondary metabolites the leaf material of the plant was crushed in liquid nitrogen to make it in powdered form. Then the powdered plant material (10 g) was wetted with 15 ml of NH_4OH (25%, m/m) and room temperature solvent extraction method. Further with help of Mayer's reagent alkaloid test was carried out.

MORPHOLOGICAL IDENTIFICATION AND OBSERVATION

1. *Acampe rigida* Roxb.

An epiphytic Orchid. Stem sheathed with brown, woody, longitudinally striated sheaths. Leaves thick, coriaceous, oblong, emarginated, with two unequal, rounded lobes. Racemes corymbose. Flowers clustered at the apex of the peduncle, pedicellate. Sepal's creamy-yellow with dark brown-red transverse bands. Capsules longitudinally ribbed.

2. *Rhynchostylis retusa* (Linn) Blume

Epiphytes. Stems sheathed, stout. Leaves coriaceous, channeled, with sharply, pointed praemorse apex. Racemes dense, cylindric, drooping. Flowers pale pink, with deep coloured spots. lip pale purple, curved upwards. Spur laterally compressed. Capsule obovoid – oblong, winged

3. *Vanda tessellate* (Roxb.)Hook

Epiphytes with vermiform roots. Stem sheathed. Leaves 5-25*1-5cm, recurved, coriaceous, linear – oblong, unequally 2-lobed interposed with third acute one. Flowers in 2-10 flowered racemes, sepals white on outer surface, lip 3-lobed, bluish, dotted with purple, with a conical pointed spur. Column oblong, clavate, white, foot short, with a median groove and two yellowish patches on either side. Capsules clavate - oblong, ribbed, up to 9.5 cm long.

Anatomical observation:

Vandeae were homogenous in both leaf and root anatomy.The prominent characteristics of the epiphyte aerial roots were notable significant smaller perimeter, 4 to 5 layers of velamen cells. Exodermis is uniseriate with U – thickened cell walls. Cortical cells of aerial root generally have chloroplast. Raphide bundles occur in thin walled cortical idioblasts. Endodermis and pericycle are uniseriate. Endodermis cells are O- thickened and U- thickened. Many vascular bundles are present and may be embedded in thin walled parenchyma. Pith is reduced and generally parenchymatous.

In present investigation it has been observed that stomata are anisocytic, paracytic with stomatal chambers. The vascular bundles in leaves are collateral and occur in a single series alternating large and small. Sclerenchyma may or may not be associated with the vascular bundles.

OBSERVATION OF PHYTOCHEMICAL AND ALKALOID TESTS:

The leaf, root, stem and floral elements disclose the same structure, both representing amphystomatic, homogenous mesophyll with aerial spaces.

DISCUSSION:

Anatomy of Genus ***Acampe rigida*** shows, smooth thin cuticle as compared to genus ***Vanda tessellate*** and ***Rhyncostylis retusa***. Hypodermis absent. Mesophyll cell are large with 7-8 layers and homogenous with presence of chloroplast in it. At the midrib vascular bundles are large while others are small. Abundant presence of raphids is noted.

But anatomy of Genus ***Rhyncostylis retusa*** shows, thick layers of cuticle. Presence of hypodermis which is of 2 layered. Mesophyll cell are homogenous with presence of chloroplast and sub-stomatal chamber. Stomata on abaxial and adaxial surface. Raphides are also present. Mesophyll cells are 10-12 layers with abundant chloroplast.

Genus ***Vanda tessellate*** shows, cuticle smooth to ridged. Stomata restricted to the abaxial surface. Sub-stomatal chambers small, irregularly shaped. Cell walls are evenly thin walled. Hypodermis usually absent. Mesophyll homogenous, composed of thin walled chlorenchyma.

CONCLUSION:

The purpose of the present study is to reveal the significant taxonomic characters between the three studied species, which will be basic knowledge for future studies in orchid systematic.

Sr. No.	Name of the plant	Part used	Starch	Cellulose	Lignin	Flavonoid	Alkaloids
1.	*Acampe rigida*	leaf	+ + +	-	+	+	++
2.	*Rhyncostylis retusa*	leaf	+	+ +	+ +	-	+
3.	*Vanda tassellata*	leaf	+ + +	-	+	+	+

REFERENCES:

1. Dressler, R.L. (1993). Phylogeny and Classificationof the Orchid Family. Australia: Press Syndicate of the University of Cambridge
2. Dressler, R. L. & Dodson, C. H. 1960: Classification and phylogeny in the Orchidaceae.
3. 'Flora of Sawantwadi'. Mrs. S. M. Almeida
4. M.S. Mulgaonkar (2005) "Studies on dermal anatomy of three corticolous *orchids* from India." Int. J. Mendel, 22(3-4): 105-106.
5. M.S. Mulgaonkar (2005) "Dermal anatomy of some species of genus Aerides lour from Maharashtra." Int. J. Mendel, 22(3-4): 107-108.
6. M.S. Mulgaonkar (2005) "Studies on dermal anatomy of some terricolous *orchids* from Sahyadri (Western Ghats)." Int. J. Mendel, 21(1-2): 61-63.
7. 'Plant Physiology'. Frank B. Salisbury and Cleon W.Ross-2007.

Aeromycological Studies in the Library of Pratap Philosophy Center, Amalner, Dist.Jalgaon

N. S. Shaikh, G. M. Khan* and G. M. Rane*
Post Graduate Research Center, Department of Botany,
Moolji Jaitha College, Jalgaon, 425001.

ABSTRACT

Study of biologically significant materials that are transported in the atmosphere along with gases and other particles is called Aerobiology. Library of Pratap Philosophy Centre is Very old and found in July 1916. It has around 15,000 books and periodicals of which some are very old. To study the aeromycoflora of this library, two methods have been used. Petri plates containing nutrient media viz. Czapek Dox Agar and Lactose Yeast Extract Agar media are exposed inside the cupboards in Exposure Plate Method (EPM).Book surface are tapped on the surface of medium in the petri dish in Direct Isolation Method (DIM).Total 31 species of 12 genera were isolated by EPM while 18 species of 8 genera are isolated by DIM. Species of Deuteromycotina and species of *Aspergillus* were dominant. Valuable literature in the library needs proper methods of preservation.

Key words: Fungi**,** Aerobiology, aeromycology,

*Address to whom the correspondence should be made.

INTRODUCTION:

Study of biologically significant materials that are transported in the atmosphere along with gases and other particles is called **Aerobiology**.Jacobs (1951) elaborated the term and included dispersion of insect populations, fungal spores, pollen, bacteria, and viruses. Thus all forms of like that belong to both plants and animals which become Biological spores and materials present in air includes viruses Bacteria, fungi , algae, bryophytes, pteridophytes, gymnosperms, angiosperms, lichens, protozoan cysts, pollen grains, insects, and insects scales, mites, plant fragments, minutes seeds, nematodes etc. The impact and Aerobiology on other organisms includes infection, allergies and toxicosis in man and animals and plants. Fungi are important causative agents for different disease in animals, plants and human beings. Fungi are prevalent in both outdoor and indoor environment. Library is a rich collection of books and is important source of reference material. Fungi a specialized form of microorganism are dangerous a. gents responsible for paper deterioration and aging. many workers in India like Pande (1995), Singh (1995), Agashe and Anuradha (1996) , Shaney *et. al.,* (2001), Atuluri & Padmini (2002), Shabir *et. al*., (2003), Tiwari *et. al.*,(2004), Mujumdar and Hazara (2005), Rane and Gandhe (2005), Upadhyay and Sahu (2005).investigated aerobiological flora at various libraries. The library of Pratap Philosophy Centre, Amalner is very old & having collection of old valuable books. No systematic survey on aeromycology was done so far. Therefore, present investigation has been undertaken.

Study area: Pratap Centre of Philosophy, Amalner Dist. Jalgaon

Pratap centre of Philosophy was found in July 1916 as “The Indian Institute of Philosophy” by Shrimant Pratap Seth, a cotton-mill-owner in Amalner. Himself a lover

of philosophy and a believer in the philosophy of Shankarcharya, he decided to donate money for the setting up of an Institute for the pursuit of philosophy. The Institute stood upon 16 acres of land, consisting of three main buildings. The library building which has 1 library hall, a reading hall and ten cubicles for research scholars. The built up area of the library building is 588.86 sq.m over 15000 books periodicals are available in this library.

MATERIALS AND METHODS

Aeromyological studies had been carried out during the month of May and June 2012 by using exposed plate method {EPM} and Direct inoculation method {DIM} the books with dust has been tapped on the surface of pertidish containing nutrient medium fast growing species grows well on of Czapek Dox Agar medium while slow growing species grows on Lactose Yeast Extract Agar medium. Dust samples were collected from the books of different cupboards. The Petri plates were incubated at 28°C for 3-4days. The colonies are transferred on slants of Czapek Dox Agar medium. The slides were prepared using cotton blue and lacto phenol. The fungi were identified using relevant literature like Ellis 1971,Subramanian 1971etc.

RESULTS AND DISCUSSION

A total of 40 species belonging to 15 genera were isolated from the library air (Table)

Sr. No.	Name of the fungus	EPM	DIM
1	*Aspergillus alliaceous* Thom	+	+
2	*A. atropurpureus* Zimm	+	-
3	*A. awamori* Nakazawa	+	+
4	*A. carbonareus* (Bainier)Thom	+	-
5	*A. carneus* (Van Tiegh.) Blach	+	-
6	*A. delacroixii* (Sacc)Thom and church	+	-
7	*A. effusus Tiraboschi*	+	-
8	*A. flavus* Link	+	-
9	*A. foetidus* Thom and Raper	+	-
10	*A. fumigatus* Fresenius	+	-
11	*A. fumaricus* Wehmer	+	-
12	*A. humicola* Chaudhuri and Sachar	-	+
13	*A. janus* Raper and Thom	+	-
14	*A. micro-virido-citrinus* Cost and Lueet	+	-
15	*A. miyakoensis* Nak.	+	-
16	*A. niger V.Tiegh.* mut.*cinnamomeus* (schiem)n..	+	+
17	*A. ochraceus* Wilhelm	-	+
18	*A. oryzae* (Ahlburg) Cohn.	+	+
19	*A. phoenicis* (cda.) Thom	+	+
20	*A. quercinus* (Bainier)Thom & Church	+	-
21	*Curvularia brachyspora* Boedijn	+	+
22	*C. lunata* (wakker)	+	+
23	*C. prasadii* R.L. and B.L.Mathur	-	+
24	*Drechslera australiensis M.B. Ellis*	-	+

25	*Eurotium amstelodami* L.mangin	+	-
26	*E. chevalieri* Link	+	-
27	*Emericellopsis minima* Stolk	+	-
28	*Fennellia nivea* B.J.wWiley and E.G.Simmons	+	-
29	*Fusarium oxysporum* Schlecht. Var.*vasinfectum* (Atk.) Snyder and Hansen	+	+
30	*Monilia sitophila* (Mont.) Sacc	+	+
31	*Mucor racemosus* Fresen.	+	-
32	*Penicillium citrinum* Thom	-	+
33	*P. chrysogeum* Thom	+	-
34	*Rhizopus nigricans* E hrenb	-	+
35	*Sclerotium oryzae* Catt	+	-
36	*Scopulariopsis brumptii* Salv.-Duval	-	+
37	*Staphlylotrichum coccosporum* Meyer and Nicol.	+	-
38	*Trichoderma citrinoviride* Bisset	-	+
39	White Sterile mycelium	+	+
40	Yellow Sterile mycelium	+	-
	Total	31	18

Fungi Isolated by Exposure Plate Method (EPM)

Total 31 species of 12 genera were isolated. *The members of deuteromycotina were frequently isolated and this group of was dominant with 24 species of 7 ganera .The members of ascomycotina were represented by 4 species of 3 genera and only one species zygomycotina was isolated.* The dominant genus was *Aspergillus* with 18 species namely. *Aspergillus alliaceaus, A.atropurpureus, A.awamori, A.carbonareus, A.carneus, A.delacroixili, A.effusus, A.flavus, A.foetidus, A.fumigates, A.fumaricus, A.Janus, A.micro-viridoscitrinus, A.miyakoensis, A.niger, A.cinnamomeus, A.oryzae, A. phoenicis, A.quercinus. 2 specices of Curvularia ,C.brachyspora and C.lunata; Fusarium oxysporum, Monilia sitophila, Penicillium chrysogenum, Sclerotium oryzae, Staplylotrichum coccosporum were belonging to Deuteromycotina* Members of *ascomycotina namely Emericellopsis minima, Eurotium amstelodami, E.chevalieri and Fennellia nivea* were isolated from *Zygomycotina , Mucor racemosus* was isolated.

Fungi isolated by Direct Isolation Method (DIM)

Only 18 species belonging to 8 genera were encountered by this method. Again members of Deuteromycotina were dominant & represented by 16 species of 7 genera. *Aspergillus* was dominant genus & represented by *Aspergillus alliaceaes, A. awamori, A. niger, A. cinnamomes, A. Ochraceus, A. oryzae, A. Phoenicis.* Other members of Deuteromycotina are *Curvularia brachyspora, C. lunata prasadii, Drechslera australiensis, Fusarium Oxysporum, Scopularlopsis brumptetil, Monilia sitophila, Penicillium citrinum, Tricoderma citrinoviride,* white sterile mycelium. Only 1 member of zygomycotina i.e. *Rhizopus nigricans* is encountered. No members from Ascomycotina were isolated by this method.

There are some species which are encountered by both the methods. They are *Aspergillus alliaceaus, A.awamori, A.oryzae, A.phoenicis, Curvularia brachyspora, C.lunata, Fusarium oxysporum , Monilia sitophila* and White Sterile Mycelium.

DISCUSSION :

A combination of two techniques viz, Exposure Plate Method and Direct Isolation Method has been used in the present investigation to get a fairly complete picture of aeromycoflora of the library. Such combination for sampling indoors was suggested by Tilak (1982). More number of fungi isolated by Exposure Plate Method than by Direct Isolation Method. The results are different than the results obtained by Rane and Gandhe (2005) who isolated more number .of fungi by Direct Isolation Method than Exposure Plate Method. Otherwise the results of this study are in general similar with comparable to the studies conducted in various parts of the word dominance of *Aspergillus* species in library air is reported by many workers and these cause the decay of the book in the library.

Even though these many fungal species have been isolated from library air we were unable to visible mould growth on books.

CONCLUSION

Within just two months of studies we could isolate fairly good number of fungal species from the indoors of library at Pratap Philosophy Center Amalner. If the studies could be carried out for winter and rainy season we could get fairly clear picture of fugal species. On the basis of this study the following conclusions were made.

1) The indoor environment of this library is rich in fungal spores.
2) Among the species isolated group Deuteromycotina form a dominant part of airspora.
3) The dominant fungal genus is *Aspergillus.* This is appeared in both perfect and imperfect states.
4) The valuable literature available in library needs proper methods of preservation.

ACKNOWLEDGEMENT

We are thankful to Hon'ble Vice-chancellor North Maharashtra university Jalgaon for permitting us to work in the library of Pratap philosophy centre Amalner. Thanks are also due to Principal M.J. College Jalgaon and Coordinator Research Promotion Scheme for students for giving us this opportunity

REFERENCES

1. Agashe,S.N. &H.G. Anuradha 1996 Aero mycological Studies of a library in Banglore city Indian J. Aerobiol. 11:24-28.
2. Atuluri J.B.and V. Padmini 2002Aromycoflora of Andhra University Library Indian J. Aerobiol. 15:47-50.
3. G.M.Rane and R.V.Gandhe (2005) Air dust mycoflora of a library at Jalgaon. *IndianJ.of aerobiology Vol 18 No.2 pp 95 to 101.*
4. Muzumdar M R And Surendra Hazara 2005 Assessment of fungal Contaminants in libraries of Kolkata Ind.J .Aerobiol 16 Agashe,S.N. &H.G. Anuradha 1996 Aeromycological Studies of a library in Banglore city Indian J. Aerobiol. 11:24-28.

5. Pande B.N.(1995) Incidence of deterioration fungi in the ambient in side the library Dr.B.A.M.U.27:29-38.
6. Shabir et. al . (2003) Aeromycoflora of gulbarga university library . Ind. J. Aerobiol 16:28_32.
7. Shaney Manju and Purwar Aparna 2001 aeromycoflora inside a library and Allahabad university Ind .J of Aerobiology 14:20-23.
8. Singh (1995) fungal spores are important components of library air , aerobiologia . European J. of Aerobiology 11:231_237.
9. Tiwari (2004) Studies on aeromycoflora of library, botany department and Garden Research link 14. vol. III (4) Indore.
10. Upadhyay and Sahu (2005) Fungal Flora in side the library environment of fungi university Gwalior Indian J . Aerobiol 18:6_11.

Studies on diversity of soil fungi and their screening for secondary metabolites

J. R.Patil, J. D. Lokhande and G. M. Rane*
Post graduate Research Center Department of Botany,
Moolji Jaitha College, Jalgaon, 425001.

ABSTRACT

Soil is a rich habitat for all sorts of microorganisms. Fungi are present in soil in large numbers. They are capable of producing secondary metabolytes.8 different soils from different localities of Dhule district were collected and isolated during May 2012 for this study. Serial dilution plate method (Waksman1916) was used. Czapek Dox Agar and lactose Yeast Extract Agar media were used for isolation. 32 species of 12 genera were isolated from different soil types. Species of Deuteromycotina and *Aspergillus* were dominant. Maximum fungal diversity is seen in Sangvi forest soil while minimum fungal diversity is seen in Tapi river soil. 6 species of *Aspergillus* are produced Organic acid, 9 species of *Aspergillus* produced Catalase and 6 species of *Aspergillus* are produced both Organic acid and Catalase.

Key words: diversity, fungi, secondary metabolites

*Address to whom the correspondence should be made.

INTRODUCTION

Soil is a system composed of thousands of microorganisms like virus, bacteria, algae and several types of protozoa. All of them are maintaining a microhabitat with interrelationship and different associations. Fungi are highly specialized organisms and vary from soil to soil and also in the same soil with an increase in depth. Being saprophytic and parasitic in nature, fungi can grow in any climatic condition. Fungi are capable of producing primary metabolites viz. proteins, fats, mineral nutrients etc. & secondary metabolites viz. alkaloids, antibiotics, terpenoids. Thus screening of soil fungi and study of their utility is extremely necessary. Mycologist from different parts of the world like Adamtaz (1886), Paine (1927), Deshpande and Mantri (1956), Padhye (1961), Moustafa (1975), Wagh and Shankhpal (1979), Rane and Gandhe (2000) made important and significant contribution towards the soil micro flora of different habitats and made extensive bibliographies. Few studies have been made on secondary metabolites produced by fungi ex. Demain (1986), Barrior and Mejia (1996), Rossano et al (1999), Keietsu et al (2001), Hajjaj, et al (2006), Savitha & Srividya (2007), Nielsen et al (2009), Azad(2011)etc. From the literature studied up till now, it is clear that no work has been done on soil micro flora of Dhule district. So the present investigation is undertaken.

MATERIALS AND METHODS

Soil sample were collected during May 2012. Four different types of soils namely cultivated soil; uncultivated soil, river soil, and forest soil are considered for soil sample collection. Two soil samples of each soil type have been collected. Soil samples from 6 inches depth were collected in sterile polythene bags and brought to the laboratory. Waksman's (1916) serial dilution plate method was used for isolation. Czapek Dox Agar

and Lactose Yeast Agar media were used for isolation. Streptopenicillin was added to avoid bacterial contamination. The dilution plates are incubated at room temperature for 3 to 5 days and after incubation, fungal colonies were counted and identification done. The semi-permanent slides were prepared using cotton blue and lactophenol. Photomicrographs were taken. Identification of fungi was done using relevant literature. Harrigan (1998) method was used to detect organic acid and catalase producing fungi.

STUDY AREA

Dhule district is located in North Maharashtra comprises of 4 tehsil viz Dhule, Shirpur, Shindkheda and Sakri. The total geographical area of the district is 8063 sq km. Dhule district lies between 20.38 to 21.61 Latitude and 73.50 to 75.11 E longitudes. The Panzara and Tapi are the main rivers flowing through the district. The soils are mostly formed from igneous rocks and are black, shallow and calcareous types having different depths. The average normal rainfall of district is 592 mm, The highest temperature goes up to 45°c in summer whereas minimum temperature is observed up to 8°c in winter season. The cultivable land comes to be 4642.11 sq km. Main crops grown in the district are Bajara, Jowar, Groundnut, Mung, and Paddy. Sugarcane & Chilly, Cotton is mostly grown in the district.

RESULTS

From different localities of Dhule district 13 genera and 32 species were isolated.(Table No.1) Among the isolated species *Aspergillus* is widely distributed genera with 12 species. Hence it was found to be dominant. Some of its species gives positive response to test oraganic acid and catalase producing ability. (Table No.2)

Table1: Occurrence of Soil Fungi in different localities

Sr. No.	Name of Fungus	C1	C2	U1	U2	R1	R2	F1	F2
1	*Alternaria alternata* (Fr.) Keissler	+	-	-	-	+	-	-	-
2	*Aspergillus arenaceous* Smith.	-	-	-	-	-	+	-	-
3	*Aspergillus effusus* Tiraboschi	+	-	-	-	-	-	+	+
4	*Aspergillus fumigatus* Fresenius	-	+	+	-	-	-	-	-
5	*Aspergillus glaucus* Bloch	-	-	-	-	+	+	-	-
6	*Aspergillus itaconicus* Kinoshita	-	-	-	+	-	-	-	-
Sr. No.	**Name of Fungus**	**C1**	**C2**	**U1**	**U2**	**R1**	**R2**	**F1**	**F2**
7	*Aspergillus luchuensis* Inui	-	-	-	-	-	-	-	+
8	*Aspergillus nidulans* (Eidam) Wint	+	+	+	+	+	+	+	+
9	*Aspergillus niger* Van Tighem	+	+	+	+	+	+	+	+

10	*Aspergillus ochraceous* Wilhelm	+	-	-	-	-	-	-	-
11	*Aspergillus tamarii* Kita	-	+	-	-	-	-	+	+
12	*Aspergillus terreus* Thom	+	-	-	-	-	-	-	-
13	*Aspergillus wentii* Wehmer	+	+	+	+	+	+	+	+
14	*Botrytis cinerea* Pers	+	-	-	-	-	-	-	-
15	*Cheatomium osmaniae* Ram Rao and Ram Reddy1	+	-	+	-	-	-	-	-
16	*Cheatomium fusisporale* Rai and Mukarjee	-	-	+	+	-	-	-	-
17	*Cheatomium torulosum* Bainier	-	-	-	-	-	-	-	+
18	*Corynascus sepedonium* C.W.Emsmons	-	-	-	+	-	-	-	+
19	*Cuvularia lunata* (Wakker) Boedijil	-	-	+	-	+	+	+	+
20	*Cuvularia oryzae* Bugnicourt	-	-	+	+	+	+	-	+
21	*Cuvularia prasadii* R.L. and B.L. Mathur	-	+	-	+	-	-	-	+
22	*Doratomycetes microsporous* Schlecht ex. Fries	-	-	+	-	-	-	-	+
23	*Fusarium oxysporum* Schl. Ex Fries	+	+	-	-	+	-	-	+
24	*Humicola grisea* Traaen	-	-	-	+	-	-	-	+
25	*Mucor luteus* Gelditsh	+	+	+	-	+	-	+	+
26	*Mucor racemosus* Fresinius	+	+	+	+	+	+	+	+
27	*Penicillium decumbens* Thom.	-	+	-	-	-	-	+	+
28	*Rhizopus nigricans* Ehrenb.	+	-	+	+	+	-	+	+
29	*Stachybotrys parvispora* Hughes	-	-	-	-	-	+	-	-
30	Green sterile mycelium	-	-	-	-	-	-	+	-
31	White sterile mycelium	-	-	-	-	-	-	-	+
32	Yellow sterile mycelium	+	-	-	-	-	-	-	-
	Total	**14**	**10**	**12**	**11**	**11**	**09**	**11**	**19**

C1: Cultivated Soil1 - Raipur; U1: Uncultivated Soil1 - Balsane R1: River Soil1 - Panzara F1:Forest Soil - Laling
C2: Cultivated Soil2 - Shindkheda; U2: Uncultivated Soil2 - Chimthane; R2: River Soil2 - Tapi;
F2 : Forest Soil - Sangavi

Table2: Screening of *Aspergillus* species for Secondary Metabolites

Sr. No.	***Name of Fungus***	***Organic Acid***	***Catalase***
01	*Aspergillus effusus*	-	+
03	*Aspergillus fumigatus*	-	+
06	*Aspergillus luchuensis*	+	+
07	*Aspergillus nidulans*	+	+
08	*Aspergillus niger*	+	+
10	*Aspergillus tamarii*	+	+
11	*Aspergillus terreus*	+	+
12	*Aspergillus wentii*	+	+

Conclusion

1. Total 32 species belonging to 13 genera were isolated.
2. Species of Deuteromycotina and *Aspergillu*were dominant.
3. Sangavi forest soil show maximum fugal diversity while minimum fungal diversity was observed in Tapi river soil.
4.Even though during summer season good number of fungi isolated from these soils.
5. Aspergillus luchuensis, A. nidulans,A.niger, A.tamarii, A. terreus, A. wentii produced organic acids.
6. Aspergillus effusus, A.fumigatus, A. luchuensis, A.nidulans,A. niger,A.ochraceous, A. tamari. A. terreus, A. wentii, produced catalase.
7. *Aspergillus niger, A. wentii, A.luchuensis A. tamari,A. terreus* and *A. nidulans* produced both organic acid and catalase.

References

1. Adamtez, L., 1886 Untersuchgen uber die niedern pilze der Ackerkrume. Inaug. Diss. Univ. Leipzing, 78 P., 2 PL.
2. Azad Chandrashekar. P (2011) Isolation, Purification and Characterization of Catalase from Aspergillus Species Journal of Chemical, Biological and Physical Sciences Nov.2011-Jan.2012. Vol.2.No.1, 318-324
3. Cynthia Z. Blumenthal (2003) Production of toxic metabolites in Aspergillus niger, Aspergillus oryzae & Trichoderma reesei: Justification of mycotoxin testing in food grade enzyme preparations derived from the three fungi FEMS Microbilogy Letters Volume 164, Issue 1, pages 195-200.
4. J. Savitha, S. Srividya, R. Jagat, P. Payal, S. Priyanki, G. W. Rashmi, K. T. Roshini and Y. M. 2007 Identification of potential fungal strain(s) for the production of inducible, extracellular and alkalophilic Lipase , African Journal of Biotechnology Vol. 6(5), pp. 564-568, 5,.
5. Rane Gauri M. and Gandhe R. V. 2000 Root mycoflora of Rabi Sorghum from Jalgaon District, Maharashtra, BRI's JAST III (I and II) June, Dec. 23-28.
6. Waksman, S. A., 1916 Soil fungi and their activities. Soil Sci., 2: 103-155.
7. Warkenthin, F.C.,1916. Fungus flora of Texas soils. Phytopath., 6:241-253.

ZOOLOGY

Analgesic activity of methanolic extract and alkaloidal fraction of flower of *Sphaeranthus indicus* Linn. in rat

C. D. Neve and N. V. Nemade*
Department of Zoology, Moolji Jaitha College, Jalgaon

ABSTRACT :
Analgesics are those drugs that mainly provide pain relief. Plant has shown potential for used of in treatment of inflammatory. Thus, there is every possibility of developing new useful drugs from medicinal plants with a long history of human use. To search an ideal anti-inflammatory agent of plant origin and its comparison with standard drug to isolate and purify the acute ingredient from the flower of *Sphaeranthus indicus* Linn by advance technology. Albino rats were divided into seven groups, group III received ibuprofen (50 mg/kg b.w.p.o), groups IV and V received MeOHx (250 and 500 mg/kg b.w.p.o) and groups VI and VII received SiAF (50 and 100 mg/kg b.w.p.o.). Rats were placed individually on a thermostatically controlled Eddy's hot plate (Orchid, Nasik) maintained at 55 ± 0.2^{o}C. The pain threshold is considered to have reached when the animals lifted and licked their paws and time of reaction to pain stimulus of the rat was recorded at 0, 30 and 60 min, after the drug administration. At 60 min MeOHx at a dose 500 mg/kg body weight (11.66 ± 0.43 sec) significant (P<0.001) and SiAF at a dose 50 and 100 mg/kg body weight (16.27 ± 0.55 and 23.04 ± 0.80 sec) exhibited significant (P<0.001) high analgesic activity at both doses than standard. The alkaloids are known to possess analgesic activity. Thus, it can be concluded that, the analgesic activity of the *Sphaeranthus indicus* extracts is attributed due to the alkaloids present in it.
Key words: Analgesic activity, methanolic extract, alkaloid, *Sphaeranthus indicus* Linn.

---

*Address to whom the correspondence should be made.

INTRODUCTION

Analgesics are those drugs that mainly provide pain relief. The primary classes of analgesics are the narcotics, including additional agents that are chemically based on the morphine molecule but have minimal abuse potential; nonsteroidal anti-inflammatory drugs (NSAIDs) including the salicylates and acetaminophen. Other drugs, notably the tricyclic antidepressants and anti-epileptic agents such as gabapentin, have been used to relieve pain, particularly neurologic pain, but are not routinely classified as analgesics. Analgesics provide symptomatic relief, but have no effect on the cause, although clearly the NSAIDs, by virtue of their dual activity, may be beneficial in both regards.

It is well established that secondary metabolites obtained from plant material are Alkaloids, Cynogenic glycosides, Flavonoids, Tannins and Phenolic compounds possesses various biological activity. Plant has shown potential for used of in treatment of inflammatory. Research analysis during the last decade estimated that analgesics are one of the highest therapeutic categories on which research efforts are focused (Farouk et al., 2008). Analgesic compounds available in the market, still present a wide range of undesired effects (Katzung, 2001) leaving the door open for new and better compounds. Natural products are believed to be an important source of new chemical substance with

potential therapeutic applications. There are numerous reports about analgesic effects of medicinal plants in the literatures (Monsef et al., 2004). Several plant species are traditionally used as analgesics (Mills and Bone, 2000) and particularly gave a data on asteraceae family (Singh et al., 2008). Mythreyi et al., (2008) reported the analgesic activity of methanolic extract of another species of *Sphaeranthus* is *S. amaranthoides*. This is the aim of present experiment.

MATERIALS AND METHODS

Collection of plant

The plant is collected from North Maharashtra Region in the period of February 2012. The plant *Sphaeranthus indicus* is identified by Dr. Tanveer Khan, Department of Botany and deposited a voucher specimen in the Department of Zoology.

Preparation of extract

The plant material was collected from North Maharashtra Region Jalgaon District, Maharashtra State, India. Flowers were separated and dried. After complete drying the material was crushed and grinded to form coarse powder. One kg of dried powdered plant material was exhaustively extracted in Soxhlet apparatus with methanol. The solvent extract so obtained was then filtered to remove any suspended impurities. Extract was concentrated under reduced pressure and controlled temperature (55^0C to 60^0C). The extract of plant was preserved in dry, cool condition in desiccator. Thus the methanolic extract (MeOHx) was further proceeding for isolation of alkaloidal fraction (SiAF) through column chromatography. The MeOHx and SiAF obtained were screened for their anti-inflammatory activity in rat model.

Phytochemical study

MeOHx and SiAF were analyzed for its phytochemical investigation by qualitative methods (Harborne, 1998).

Animal used

The albino rat (*Ratus norvegicus)* of either sex and of approximately the same age, weighing between 180-200 gm were procured and they were individually housed, maintained in clean polypropylene cages under standard environmental conditions of temperature 27 ± 2^0c, 12 h light/dark cycle in a registered animal house of Moolji Jaitha College, Jalgaon. The animals were fed with standard pellet diet and water *ad libitum*. The experimental protocol have been permitted and approved by the Institutional Animal Ethics Committee (IAEC) and treated as per the guideline of Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA).

Eddy's Hot Plate Method

In order to check the temperature withstanding power of the animals, the hot plate reaction time was tested by modified method of Farouk et al., (2008). All animals were fasted for 18 h before the beginning of the experiment and access to water *ad libitum*. Albino rats were divided into seven groups, each consisting of six animals. Animals of group I received saline, group II received Tween-80 solution, group III received ibuprofen (50 mg/kg b.w.p.o), groups IV and V received MeOHx (250 and 500 mg/kg b.w.p.o) and groups VI and VII received SiAF (50 and 100 mg/kg b.w.p.o.). Rats were placed individually on a thermostatically controlled Eddy's hot plate (Orchid, Nasik) maintained at 55 ± 0.2^oC. The pain threshold is considered to have reached when the

animals lifted and licked their paws and time of reaction to pain stimulus of the rat was recorded at 0, 30 and 60 min, after the drug administration. In order to minimize damage to the animal paw, the cut-off time for latency of response was taken as 20 second (Shalheen et al., 2000).

STATISTICAL ANALYSIS

All data were expressed as mean ± SE and the ANOVA was applied to determine the significance of the difference between the control group and experimental groups.

RESULTS AND DISCUSSION

The phytochemical study of MeOHx and SiAF of *S. indicus* showed the presence of glycoside, phenolic compounds, flavonoids and alkaloids (Table 1). The analgesic activity was studied in Eddy's hot plate model. The MeOHx and SiAF at a dose of 250, 500 and 50, 100 mg/kg body weight respectively showed comparable activity and the results are given in Table 2.

Table 1 Phytochemical analysis MeOHx and SiAF of *Sphaeranthus indicus*

Phytochemical studies	MeOHx	SiAF
Alkaloids	+	+
Glycosides	+	+
Flavonoids	+	+
Tannins	+	--
Phenolic compounds	+	+
Anthocynins	--	--
Saponins	+	--
Terpenoids	--	--
Amines	--	--

+ Presence, - Absence

Table 2 Effect of MeOHx and SiAF of flower of *Sphaeranthus indicus* as Analgesic

Min / Group	Licking time (in sec)		
	0	30	60
Control	5.04 ± 0.54	5.27 ± 0.56	5.48 ± 1.08
Tween 80	6.89 ± 0.32	4.33 ± 0.15	12.15 ± 1.13
Ibuprofen	4.201 ±0.57	8.29 ± 0.98	14.11± 0.70
MeOHx I	6.27 ± 0.20	7.42 ± 0.31	7.94 ± 0.30
MeOHx II	6.16 ± 0.65	8.25 ± 0.18**	11.66 ± 0.43***
SiAF I	5.49 ± 0.32	14.11 ± 0.49***	16.27 ± 0.55***
SiAF II	5.57 ± 0.29	17.29 ± 0.26***	23.04 ± 0.80***

MeOHx I – 250, MeOHx II – 500, SiAF I - 50 and SiAF II - 100 mg / kg body weight, Each value expressed as Mean ± SE, n=6, **P<0.01, ***P<0.001

The Eddy's hot plate method showed analgesic activity in SiAF followed by MeOHx (Table 2). Oral administration of the MeOHx and SiAF resulted significant (P<0.001)

propagation of the latency time in licking response. The reaction time of MeOHx and SiAF treated animals after the treatment of 30 min was higher when compared with control and standard groups. At 30 min MeOHx at a dose 500 mg/kg body weight (8.25 ± 0.18 sec) significant ($P<0.01$) and SiAF at a dose 50 and 100 mg/kg body weight (14.11 ± 0.49 and 17.29 ± 0.26 sec) exhibited significant ($P<0.001$) high analgesic activity at both doses than standard (8.29 ± 0.98 sec). After 1 h SiAF at 50 and 100 mg/kg body weight exhibited more reaction time (16.27 ± 0.55 and 23.04 ± 0.80 sec) than standard group (14.11 ± 0.70 sec). Throughout the observation period, SiAF showed consistency.

The hot plate reaction test is used specifically to screen the central nervous system for analgesic activity of a drug. The hot plate test measures the complex response to a non-inflammatory, acute nociceptive input and is one of the models normally used for studying the central nociceptive activity. The opioid agents exert their analgesic effects via supra spinal and spinal receptors (Nemirovsky and Chen, 2001). In the hot plate test, MeOHx (250 and 500 mg/kg b.w.p.o) and SiAF (50 and 100 mg/kg b.w.p.o.) both showed a significant analgesic action, 30 min after its administration. Generally, plants showing the antipyretic effect vis-à-vis analgesic activity (Dewan et al., 2000). This holds true in *S. indicus* and it may be due to attributed inherent phytochemicals. Singh et al., (2008) reported alkaloidal extract of *Eclipta alba*, a plant of Asteraceae family, for its analgesic activity in a albino mice by using tail clip model. Recently, Nanda et al., (2009) investigated the analgesic activity of organic extracts of whole parts of *S. indicus* and they found that petroleum ether, chloroform and ethanol extracts showed significant analgesic activity. They neither isolate any active principle nor evaluate analgesic activity of it. Farouk et al., (2008) showed that the alkaloidal extract of *Peganum harmala* possess a analgesic activity. Very recently, the investigation was carried out by Meher et al., (2011) to found the analgesic effect of ethanolic extract of *Sphaeranthus indicus* in experimental animal models of pain. Therefore, the analgesic activity of the MeOHx and SiAF of flowers of *S. indicus* may be due to the alkaloidal components of the plants. In the present study, phytochemical investigation showed presence of an alkaloid in MeOHx and SiAF, hence we may conclude that it has the analgesic activity.

CONCLUSION

The phytochemical investigation of the plant revealed the presence of flavonoids, alkaloids and others. The alkaloids are known to possess analgesic activity. Thus, it can be concluded that, the analgesic activity of the *Sphaeranthus indicus* extracts is attributed due to the alkaloids present in it.

ACKNOWLEDGEMENT

The authors are also thankful to Principal A.G. Rao for providing necessary facilities to carry out experiment. Thank are also due to Dr. R.T. Mahajan for providing laboratory facility to complete the experimental work.

REFERENCES

1. Dewan S., Kumar S. and Kumar V.: Antipyretic effect of latex of *Calotropis proceara. Indian J Pharmacol*. 32: 252 (2000).
2. Farouk L., Laroubi A., Aboufatima R., Benharrel A. and Chait A.: Evaluation of the analgesic effect of alkaloid extract of *Peganum harmala* L.: Possible mechanisms involved. *J Ethnopharmacology*. 115: 449-54 (2008).
3. Harborne J. B.: *Phytochemical methods*. Chapmann and Hall London. 124, 168 (1998).
4. Katzung B. G.: Basic and clinical Pharmacology, 8th edition. *Appleton and Lange, USA*. 523-525, 602-605 (2001).
5. Meher B. R., Jena J. and Rath B. G.: Evaluation of analgesic activity of ethanolic extract of *Sphaeranthus indicus*. *Der Pharmacia Lettre*. 3(3): 357-360 (2011).
6. Mills S. and Bone K.: Principles and Practice of Phytotherapy. *Churchill Livingstone, Edinburgh*. 23-24, 31-34,229-231 (2000).
7. Monsef H. R., Ghobadi A., Iranshahi M and Abdollahi M.: Antinociceptive effects *Peganum harmala* L. alkaloid extract on mouse formaline test. *J Pharmacy and Pharmaceutical Sci*. 7: 65-69 (2004).
8. Mythreyi R., Sasikala E. and Geetha A.: Analgesic activity of Sphaeranthus ameranthoides. *Inter J Pharmacol Biol Sci*. 2(3): 81-83 (2008).
9. Nanda B. K., Jena J., Rath B. and Behera B. R.: Anagesic and Antipyretic activity of whole parts of *Sphaeranthus indicus* Linn. *J Chemical and Pharmaceutical Research*. 1(1): 207-212 (2009).
10. Nemirovsky A. and Chen L.: The antinociceptive effects of the combination of spinal morphine with systemic morphine or buprenorphine. *Anesthesia & Analgesia* 93(1): 197-203 (2001).
11. Shalheen H. M., Badreldin H. A., Alquarawi A. A. and Bashir A. K.: Effect of *Psidium guajava* leaves on some aspects of the central nervous system in mice. *Phytotherapy Research.* 14: 107-111 (2000).
12. Singh V., Patel J.R. and Tripathi P.: Evaluation of anti-inflammatory activity of stem bark of *Balanites roxburghii* Planch. *Adv. Pharmacol. Toxicol.* 9(3): 73-77 (2008).

Anti-inflammatory activity of methanolic extract and flavonoid fraction of root of *Ziziphus jujuba* Mill. in rat

G. A. Phalak and M. Z. Chopda*
Department of Zoology, Moolji Jaitha College, Jalgaon

ABSTRACT :

The term Anti-inflammation refers to the property of substance or treatment that reduces inflammation. On contrary many medicines of plant origin had been used since long time without any adverse effect. To search an ideal anti-inflammatory agent of plant origin and its comparison with standard drug to isolate and purify the acute ingredient from the root of *Ziziphus jujuba* Mill by advance technology. The MeOHx and flavonoid fraction (ZjFF) obtained were screened for their anti-inflammatory activity in rat model. Anti-inflammatory activity was assessed in rats. Seven groups of rat, out of these, test group received oral administration of the extracts at a dose 250 and 500 mg/kg for MeOHx and 50 and 100 mg/kg for ZjFF. Edema induced by injecting Carrageenin in its right hind paw. The paw volume was measured by Plethysmometer before and at 1, 2 and 3 h after Carrageenin administration. The MeOHx at the dose 250 and 500 mg/kg body weight exhibited inhibition of paw edema of 1.54 ± 0.25 and 1.54 ± 0.20 ml respectively at the end of the third hour. In this experiment, the lower dose 50 mg/kg of ZjFF showed significant ($p<0.01$) anti-inflammatory activity. The anti-inflammatory activity of the *Ziziphus jujuba* extract is attributed may be due to kinin and prostaglandin biosynthesis enzyme inhibiting property of flavonoids present in it.

Key words: Anti-inflammatory, *Ziziphus jujuba*, Flavonoids

*Address to whom the correspondence should be made.

INTRODUCTION

Inflammation is a complex localized response to foreign substances such as bacteria or in some instances to internally produced substances (Laupattarakasem et al., 2003).The term Anti-inflammation refers to the property of substance or treatment that reduces inflammation. On contrary many medicines of plant origin had been used since long time without any adverse effect. Plants represent still a large untapped source of structurally novel compounds that might serve as lead for the development of novel drugs. It is well established that secondary metabolites obtained from plant material are Alkaloids, Cynogenic glycosides, Flavonoids, Tannins and Phenolic compounds possesses various biological activity. Plant has shown potential for used of in treatment of inflammatory. Thus, there is every possibility of developing new useful drugs from medicinal plants with a long history of human use. *Ziziphus jujuba* is being used by tribal Adivasies in eastern parts of Jalgaon District (Maharashtra State) influencing injuries, small cuts and or animals bite, attack and wounds. Various activities like anti-inflammatory (Adzu and Haruna, 2007); sedative and hypnotic (Gong et al., 2000); anticancer, antiretroviral (Biswas and Mukharjee, 2003); anti-complementary (Sang et al., 2004) and antioxidant (Seong et al., 2008) has been reported. To search an ideal anti-inflammatory agent of plant origin and its comparison with standard drug to isolate

and purify the acute ingredient from the root of *Ziziphus jujuba* Mill by advance technology.

MATERIALS AND METHODS

Collection of plant

The plant is collected from North Maharashtra Region in the period of February 2012. The plant *Ziziphus jujuba* is identified by Dr. Tanveer Khan, Department of Botany and deposited a voucher specimen in the Department of Zoology.

Preparation of extract

The plant material was collected from North Maharashtra Region Jalgaon District, Maharashtra State, India. The plant root was shade dried. After complete drying the material was crushed and grinded to form coarse powder. One kg of dried powdered plant material was exhaustively extracted in Soxhlet apparatus with methanol. The solvent extract so obtained was then filtered to remove any suspended impurities. Extract was concentrated under reduced pressure and controlled temperature (55^0C to 60^0C). The extract of plant was preserved in dry, cool condition in desiccator. Thus the methanolic extract (MeOHx) was further proceed for isolation of flavonoid rich fraction through column chromatography. The MeOHx and flavonoid fraction (ZjFF) obtained were screened for their anti-inflammatory activity in rat model.

Phytochemical study

MeOHx and (ZjFF) were analyzed for its phytochemical investigation by qualitative methods (Harborne, 1998).

Animal used

The albino rat (*Ratus norvegicus)* of either sex and of approximately the same age, weighing between 180-200gm were procured and they were individually housed, maintained in clean polypropylene cages under standard environmental conditions of temperature 27 ± 2^0C, 12 h light/dark cycle in a registered animal house of Moolji Jaitha College, Jalgaon. The animals were fed with standard pellet diet and water *ad libitum*. The experimental protocols have been permitted and approved by the Institutional Animal Ethics Committee (IAEC) and treated as per the guideline of Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA).

Anti-inflammatory assay

Anti-inflammatory activity was assessed in rats using a modification (Nemade, 2011). Increase in paw volume was used to assess inflammation. Seven groups of rats (n=6) were deprived of food but not water for 18 hr and then received oral (p.o.) administration of the test sample at a dose 250 and 500 mg/kg for MeOHx and 50 and 100 mg/kg for ZjFF. Thirty minutes later, each animal received subplanter injection of Carrageenin (0.1 ml of 1% suspension) in its right hind paw. Paw volume was measured by Plethysmometer before and at 1, 2 and 3 h after Carrageenin administration. Control animals received either normal saline (5ml/kg). Ibuprofen was used as a standard anti-inflammatory drug (50 mg/kg body weight). Paw volumes were measured to a fixed marked area by Plethysmometer at an hourly interval up to 3 h.

STATISTICAL ANALYSIS

All data were expressed as mean ± SE and the ANOVA was applied to determine the significance of the difference between the control group and experimental groups.

RESULTS AND DISCUSSION

The phytochemical study of MeOHx and ZjFF of root of *Z. jujuba* showed the presence of phenolic compounds, glycosides and flavonoid (Table 1). Carragennin edema assay (an *in vivo* model) has been useful for the study of mediators found in developing edema associated with inflammation. The drug used for experimental study, with its anti-inflammatory property is able to prevent this inflammation. Induction of acute inflammation in control rats resulted in a prominent increase in paw thickness. Table 2 shows the results of anti-inflammatory activity. The methanolic extract at a dose of 250 mg/kg and 500 mg/kg body weight showed comparable activity and the results are given in table 2.

Table 1 Phytochemical analysis of MeOHx and ZjFF of root of *Z. jujuba* Mill.

Phytochemical studies	MeOHx	ZjFF
Alkaloids	+	--
Glycosides	+	+
Flavonoids	+	+
Tannins	+	--
Phenolic compounds	+	+
Anthocynins	--	--
Saponins	+	--
Terpenoids	+	--
Amines	+	--

+ Presence, - Absence

The magnitude of inhibition increased with time with the effect of the MeOHx and ZjFF comparing well with that of Ibuprofen (Table 2). Results showed that the MeOHx at the dose 250 and 500 mg/kg body weight exhibited inhibition of paw edema of 1.54 ± 0.25 and 1.54 ± 0.20 ml respectively at the end of the third hour. In this experiment, the lower dose 50 mg/kg of ZjFF showed significant antiinflammatory activity ($p<0.01$). Very recently, the investigation was carried out by Goyal et al., (2011) to found the hydroalcoholic extract of fruits of *Ziziphus jujuba* (ZJ) for its anti-inflammatory effect using acute and chronic models of inflammation in rat. They reported that, the presence of jujubosides, flavonoids and terpenes, which may produce the marked anti-inflammatory effect of ZJ fruit in acute and chronic inflammation, possibly by inhibiting nitric oxide expression. Therefore, the anti-inflammatory activity of the MeOHx and ZjFF of root of *Z. jujuba* may be due to the flavonoidal components of the plants. In the present study, phytochemical investigation showed presence of an flavonoid in MeOHx and ZjFF, hence we may conclude that it has the anti-inflammatory activity.

Table 2 Anti-inflammatory activity of the MeOHx and ZjFF of root of *Z. jujuba* on Carrageenan induced Paw Edema in rats

Change in Paw Volume (ml)				
Hours / Groups	**0**	**1**	**2**	**3**
Control	1.22±0.34	1.44±0.09	1.47±0.13	2.17±0.49
Placebo	1.06±0.12	1.06±0.05	1.06±0.04	1.71±0.30
Std.	0.81±0.15	1.68±0.17	1.27±0.14	1.61±0.26
MeOHx I	1.44±0.09	1.44±0.16	1.45±0.16	1.54±0.25**
MeOHx II	1.34±0.04	1.60±0.04	1.55±0.34	1.54±0.20*
ZjFF I	1.65±0.69	1.62±0.09	1.42±0.07	1.52±0.19**
ZjFF II	1.40±0.16	1.60±0.10	1.33±0.11	1.36±0.01***

Std. = 50, MeOHx I= 250, MeOHx II= 500, ZjFF I = 50 and ZjFF II = 100 mg/kg body weight, *****$p<0.05$, **$p<0.01$ and *** $p<0.001$ Vs control

CONCLUSION

The phytochemical investigation of the plant revealed the presence of flavonoids, alkaloids and others. The flavonoids are known to possess anti-inflammatory activity by inhibiting the cyclooxygenase responsible for synthesis of inflammatory prostaglandins. Thus, it can be concluded that, the anti-inflammatory activity of the *Ziziphus jujuba* extract is attributed due to kinin and prostaglandin biosynthesis enzyme inhibiting property of flavonoids present in it. The exact mechanism(s) of the analgesic and anti-inflammatory activities of the extracts is/are yet to be elucidated.

ACKNOWLEDGEMENT

The authors are also thankful to Principal A.G. Rao for providing necessary facilities to carry out experiment. Thank are also due to Dr. R.T. Mahajan for providing laboratory facility to complete the experimental work.

REFERENCES

1. Adzu B. and Haruna A.K.: Studies on the use of *Ziziphus spina-christi* against pain in rat and mice. *African J of Biotechnol*. 6(11):1317-1324, (2007).
2. Biswas T.K. and Mukherjee B.: Plant Medicines of Indian Origin for the wound healing Activity. A Review *Interna J Low Extre Wounds*. 2:25, (2003).
3. Gong Cheng, Yanjing Bai, Yuying Zhao, Jing Tao, Yi Liu, Guangzhong Tu, Libin Ma, Ning Liao and Xiaojie Xu.: Flavonoids from *Ziziphus jujuba* Mill var. *spinasa*. *Tetrahedron*. 56, 8915-8920, (2000).
4. Goyal R., Sharma P. and singh M.: Possible attenuation of nitric oxide expression in anti-inflammatory effect of *Ziziphus jujuba* in rat. *Journal of Natural Medicines*. 65(3-4):514-518 (2011).
5. Harborne J. B.: *Phytochemical methods*. Chapmann and Hall London. 124, 168 (1998).
6. Laupattarakasem P., Houghton P. J., Hoult J. R. and Itharat A.: An evaluation of the activity related to inflammation of four plants used in Thailand to treat arthritis. *J Ethnopharmacol.* 85: 207 – 215 (2003).
7. Nemade N.V.: Biological activities of asteracid weed *Sphaeranthus indicus* Linn. in different animals. A Thesis, North Maharashtra University, Jalgaon, (2011).

8. Sang Myung Lee, Jin Gyu PARK, You Hee LEE, Cheal Gyu LEE, Byung Sun MIN, Jung Hee KIM and Hyeong Kyu LEE.: Anti- complementary Activity of Triterpenoides from Fruits of *Zizyphus jujuba*. *Biol. Pharm. Bull*. 27(11):1883-1886, (2004).
9. Seong Hee Ko, Seong Won Choi, Sang Kyu Ye, Angho S. Yoo, Hyun Sook Kim and Myung Hee Chung.: Comparision of anti-oxidant activities of seventy herbs that have been used in Korean traditional medicine. *Nutrition Research and Practice*. 2(3):143-151, (2008).

Antipyretic activity of successive extract of root of *Ziziphus jujuba* Mill. in rat

J. P. Jangale and M. Z. Chopda *
Department of Zoology, Moolji Jaitha College, Jalgaon

ABSTRACT

Pyrexia or fever is caused as a secondary impact of infection, malignancy or other diseased states. Plant has shown potential for used of in treatment of inflammatory. Thus, there is every possibility of developing new useful drugs from medicinal plants with a long history of human use. To search an ideal antipyretic agent of plant origin and its comparison with standard drug to isolate and purify the acute ingredient from the root of *Ziziphus jujuba* Mill by advance technology. Animals with approximately constant rectal temperature were selected for the study. Rats of either sex were divided into seven groups of six animals each. Pyrexia was induced by injecting 20% aqueous suspension of Brewer's yeast 2 ml/kg body weight in normal saline, subcutaneously, below the nape of the neck. Rectal temperature was recorded by clinical thermometer immediately after Brewer's yeast injection, at -18 h and after 18 h that is 0 h. Ibuprofen (standard) (50 mg/kg b.w.p.o), acetone, chloroform, methanol and aqueous extracts at a dose 500 mg/kg b.w.p.o) in Tween-80 were administered orally. A control group was given 0.3 ml normal saline. The temperature was recorded at 1, 2 and 3 after drug administration. At the dose of 500 mg/kg body weight Chloroform, Methanol and Aqueous extract significantly reduce elevated rectal temperature, 37.77± 0.54,36.21 ± 0.25 and 37.87 ± 0.25^{0}C respectively compared to control (39.77 ± 0.66^{0}C) at 3th h. It can be concluded that, the antipyretic activity of the *Ziziphus jujuba* extract is attributed due to flavonoids present in it.

Key words: Antipyretic activity, *Ziziphus jujuba* Mill.

*Address to whom the correspondence should be made.

INTRODUCTION

Pyrexia or fever is caused as a secondary impact of infection, malignancy or other diseased states. It is the body's natural defense mechanism to create an environment where infectious agent or damaged tissue cannot survive (Chattopadhaya et al., 2009). Normally the infected or damaged tissue initiates the enhanced formation of pro-inflammatory mediator's (cytokines like interleukin 1β, α, β and TNF-α), which increases the synthesis of prostaglandin E2 (PGE2) near peptic hypothalamus area and thereby triggering the hypothalamus to elevate the body temperature (Khan et al., 2007). The temperature regulatory system is governed by a nervous feedback mechanism, so when body temperature becomes very high, it dilates the blood vessels and increases sweating to reduce the temperature, but when the body temperature becomes very low, hypothalamus maintains the internal temperature by vasoconstriction. High fever often increases faster disease progression by increasing tissue catabolism, dehydration and existing complaints, as found in HIV (Paschapur et al., 2009). Most of the antipyretic drugs inhibit cyclooxygenase (COX-2) expression to reduce the elevated body temperature by inhibiting PGE-2 biosynthesis (Cheng et al., 2005). Moreover, these

synthetic agents irreversibly inhibit COX-2 with high selectivity but are toxic to the hepatic cells, golmeruli, cortex of brain and heart muscles, whereas natural COX-2 inhibitors have lower selectivity with fewer side effects (Cheng et al., 2005). A natural antipyretic agent with minimal or no toxicity is need of time. *Ziziphus jujuba* is an old traditional medicament used for various diseases. Hence, the present study is designed to determine the antipyretic effect of successive extract of root of *Ziziphus jujuba* using animal model.

AIM AND OBJECTIVE

It is well established that secondary metabolites obtained from plant material are Alkaloids, Cynogenic glycosides, Flavonoids, Tannins and Phenolic compounds possesses various biological activity. Plant has shown potential for used of in treatment of inflammatory. Thus, there is every possibility of developing new useful drugs from medicinal plants with a long history of human use. To search an ideal antipyretic agent of plant origin and its comparison with standard drug to isolate and purify the acute ingredient from the root of *Ziziphus jujuba* Mill by advance technology.

MATERIALS AND METHODS

Ziziphus jujuba Mill. (Rhamnaceae); Vernacular name: Eng: Common jujube; Chinese date. A spiny deciduous shrub or small tree. Habitat: Commonly cultivated in India, Japan, China, Africa, Malaysia, Afghanistan and Australia. Propagation: By seeds and vegetative method. Part used: Fruit, Stem, Root, Leaves. In present study root is used. Chemical constituents: Carbohydrates, fat protein, amino acids, anthocyanins from fruit, seeds and leaves. Leucocyanidin from bark. Leucopelargonidin, betulinic and ceabothic acids from wood. Rutin from leaves. Mauritines A,B,C,D,E and F, frangufoline and amphbines B,D and F. Ziziphine A,B,C,D,E,------Q from stem and root bark (Mahajan and Chopda, 2009). Uses: The roots are bitter, useful in wounds and ulcers. The leaves are bitter and are useful in wounds, syphilitic ulcers. Fruits are useful in leprosy, skin diseases, pruritus, wounds and ulcers, hemorrhages and general debility. The seeds are acrid and are useful in wounds (Chopra 1996; Chopda and Mahajan, 2009). *Ziziphus jujuba* is being used by tribal Adivasies in eastern parts of Jalgaon District (Maharashtra State) influencing injuries, small cuts and or animals bite, attack and wounds. Various activities like anti-inflammatory (Adzu and Haruna, 2007); sedative and hypnotic (Gong et al., 2000); anticancer, antiretroviral (Biswas and Mukharjee, 2003); anti-complementary (Sang et al., 2004) and antioxidant (Seong et al., 2008) has been reported.

Collection of plant

The plant is collected from North Maharashtra Region in the period of May 2011. The plant *Ziziphus jujuba* is identified by Dr. Tanveer Khan, Department of Botany and deposited a voucher specimen in the Department of Zoology.

Preparation of extract

The plant material was collected from North Maharashtra Region Jalgaon District, Maharashtra State, India. The plant root was shade dried. After complete drying the material was crushed and grinded to form coarse powder. One kg of dried powdered plant material was exhaustively extracted in Soxhlet apparatus with successive solvents. The successive extracts so obtained were then filtered to remove any suspended

impurities. Extracts were concentrated under reduced pressure and controlled temperature (55^0C to 60^0C) and preserved in dry, cool condition in desiccator. Thus, the successive extracts obtained were screened for their antipyretic activity in rat model.

Animal used

The albino rat (*Ratus norvegicus)* of either sex and of approximately the same age, weighing between 180-200gm were procured and they were individually housed, maintained in clean polypropylene cages under standard environmental conditions of temperature 27 ± 2^0C, 12 h light/dark cycle in a registered animal house of Moolji Jaitha College, Jalgaon. The animals were fed with standard pellet diet and water *ad libitum*. The experimental protocols have been permitted and approved by the Institutional Animal Ethics Committee (IAEC) and treated as per the guideline of Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA).

Antipyretic assay

The antipyretic activity of successive extract of root of *Z. jujuba on* Brewer's yeast induced pyrexia in rats (Hajare et al., 2000). Animals with approximately constant rectal temperature were selected for the study. Rats of either sex were divided into seven groups of six animals each. Pyrexia was induced by injecting 20% aqueous suspension of Brewer's yeast 2 ml/kg body weight in normal saline, subcutaneously, below the nape of the neck. Rectal temperature was recorded by clinical thermometer immediately after Brewer's yeast injection, at -18 h and after 18 h that is 0 h. Ibuprofen (standard) (50 mg/kg b.w.p.o), Chloroform, Acetone, Methanol and Aqueous (500 mg/kg b.w.p.o) in Tween-80 were administered orally. A control group was given 0.3 ml normal saline. The temperature was recorded at 1, 2 and 3 h after drug administration.

Statistical analysis

All data were expressed as mean ± SE and the ANOVA was applied to determine the significance of the difference between the control group and experimental groups.

RESULTS AND DISCUSSION

The results of effect of successive extract of root of *Z. jujuba* on Brewer's yeast induced pyrexia in rats are given in Table 1. After the induction of pyrexia the control rats remained hyperpyretic throughout the duration of the experiment. At the dose of 500 mg/kg body weight Chloroform, Methanol and Aqueous significantly reduce elevated rectal temperature 36.21 ± 0.25^0C and 37.87 ± 0.25^0C and 37.77± 0.54^0C respectively compared to control (39.77 ± 0.66^0C) at 3^{th} h. Very recently similar type of work was carried out by Balakrishnan et al. (2012), they evaluated the anti pyretic activity of leaves of *Zizyphus jujuba* Lam. in rats with respect to control group. They found that the anti pyretic activity of the extract was comparable to the standard prototype, paracetamol.

Table 1 Antipyretic activity of the successive extract of root of the *Z. jujuba* in rat

Rectal temperature (^{0}C ± SE)					
Hours / Groups	-18	0	1	2	3
Control	37.64 ± 0.10	34.08 ± 0.64	33.70 ± 0.77	37.76 ± 0.53	39.77 ± 0.66
placebo	37.44 ± 0.19	34.22 ± 2.13	35.55 ± 1.82	39.01 ± 0.95	39.77 ± 0.66
Ibuprofen	37.57 ± 0.26	33.27 ± 0.99	33.63 ± 1.40	38.86 ± 0.88	37.59 ± 0.47
Chloroform	37.63 ± 0.40	35.32 ± 0.67	34.45 ± 1.15	37.35 ± 0.30	37.77 ± 0.54*
Acetone	37.12 ± 0.30	36.40 ± 0.52	35.35 ± 0.45	37.85 ± 0.96	38.05 ± 0.13
Methanol	37.00 ± 0.18	34.88 ± 1.92	34.23 ± 1.11	38.38 ± 0.69	36.21 ± 0.25***
Aqueous	37.14 ± 0.19	34.65 ± 1.35	31.45 ± 3.86	39.02 ± 0.15	37.87 ± 0.25*

Std. = 50, Chloroform, Acetone, Methanol and Aqueous = 500 mg / kg body weight, each value expressed as mean ± SE, n=6, *P<0.05 and ***P<0.001Vs Control.

CONCLUSION

The phytochemical investigation of the plant revealed the presence of flavonoids, alkaloids and others. It can be concluded that, the antipyretic activity of the *Ziziphus jujuba* extract is attributed due to flavonoids present in it.

ACKNOWLEDGEMENT

The authors are also thankful to Principal A.G. Rao for providing necessary facilities to carry out experiment. Thank are also due to Dr. R.T. Mahajan for providing laboratory facility to complete the experimental work.

REFERENCES

1. Adzu B. and Haruna A.K.: Studies on the use of *Ziziphus spina-christi* against pain in rat and mice. *African J of Biotechnol*. 6(11):1317-1324, (2007).
2. Balakrishnan, Anbarasi; Balasubramaniyam, Parimala Devi; Natesan, Senthil Kumar.: Antipyretic Activity of *Zizyphus jujuba* lam. Leaves. *J. Advanced Scientific Research*. 3(3): 40 (2012).
3. Biswas T.K. and Mukherjee B.: Plant Medicines of Indian Origin for the wound healing Activity. A Review *Interna J Low Extre Wounds*. 2:25, (2003).
4. Chattopadhyay D., Arunachalam G., Ghosh L., Rajendran K., Mandal A. B., and Bhattacharya S. K.: Antipyretic activity of *Alstonia macrophylla* Wall ex A. DC: An ethnomedicine of Andaman Islands. *J Pharmacy and Pharmaceutical Sci*. 8: 558-564 (2005).
5. Cheng L., Ming-liang H. and Lars B.: Is COX-2 a perpetrator or a protector? Selective COX-2 inhibitors remain controversial. *Acta Pharmacological Sinica*. 26: 926-933 (2005).
6. Chopda M.Z. and Mahajan R.T.: Wound healing plants of Jalgaon District, Maharashatra state, India" ethanobotanical leaflets, 2009, 13:1-32 (2009).
7. Chopra R. N., Nayar S. L. and Chopra I. C.: Glossary of Indian Medicinal Plants. 1 st Edition. New Delhi: *National Institute of Science Communication*. p. 232 (1996).
8. Gong Cheng, Yanjing Bai, Yuying Zhao, Jing Tao, Yi Liu, Guangzhong Tu, Libin Ma, Ning Liao and Xiaojie Xu.: Flavonoids from *Ziziphus jujuba* Mill var. *spinasa. Tetrahedron*. 56, 8915-8920, (2000).

9. Hajare S. W., Chandra S., Tandan S. K., Sharma J. and Lal J.: Analgesic and antipyretic activities of *Dalbergia Sissoo* leaves. *Indian J Pharmacology*. 32: 357-60 (2000).
10. Khan A., Baki Md. A., Al-Bari M. A. A., Hasan S., Mosaddik M. A., Rahman M. M. and Haque M. E.: Antipyretic Activity of Roots of *Laportea crenulata* Gaud in Rabbit. *Research J Medicine and Medical Sciences.* 2(2): 58-61 (2007).
11. Mahajan R.T. and Chopda M.Z.: Phyto-Pharmacology Of *Ziziphus jujuba* Mill – A Plant Review, *Phcog Rev.* 3 (6): 1-14 (2009).
12. Paschapur M. S., Patil S, Patil S. R., Kumar R. and Patil M. B.: Evaluation of the analgesic and antipyretic activities of ethanolic extract of male flowers (inflorescences) of *Borassus Flabellifer* (Arecaceae). *Inter J Pharmacy and Pharmaceutical Sci.* 1(2): 98-106 (2009).
13. Sang Myung Lee, Jin Gyu PARK, You Hee LEE, Cheal Gyu LEE, Byung Sun MIN, Jung Hee KIM and Hyeong Kyu LEE.: Anti- complementary Activity of Triterpenoides from Fruits of *Zizyphus jujuba*. *Biol. Pharm. Bull*. 27(11):1883-1886, (2004).
14. Seong Hee Ko, Seong Won Choi, Sang Kyu Ye, Angho S. Yoo, Hyun Sook Kim and Myung Hee Chung.: Comparision of anti-oxidant activities of seventy herbs that have been used in Korean traditional medicine. *Nutrition Research and Practice*. 2(3):143-151, (2008).

Analgesic activity of methanolic extract and flavonoidal fraction of root of *Ziziphus jujuba* Mill. in rat

V. J Patil*, N. V. Nemade and M. Z. Chopda****
*Department of Biotechnology, P.G.C.S.T.R. College, Jalgaon
**Department of Zoology, Moolji Jaitha College, Jalgaon

ABSTRACT

Analgesics are those drugs that mainly provide pain relief. The primary classes of analgesics are the narcotics, including additional agents that are chemically based on the morphine molecule but have minimal abuse potential; nonsteroidal anti-inflammatory drugs (NSAIDs) including the salicylates; and acetaminophen. To search an ideal analgesic agent of plant origin and its comparison with standard drug to isolate and purify the acute ingredient from the root of *Ziziphus jujuba* Mill by advance technology. The methanolic extract (MeOHx) and flavonoid fraction (ZjFF) were screened for their analgesic activity in rat model. Animals of group I received saline, group II received Tween-80 solution, group III received ibuprofen (50 mg/kg b.w.p.o), groups IV and V received MeOHx (250 and 500 mg/kg b.w.p.o) and groups VI and VII received ZjFF (50 and 100 mg/kg b.w.p.o.). The pain threshold is considered to have reached when the animals lifted and licked their paws and time of reaction to pain stimulus of the rat was recorded at 0, 30 and 60 min, after the drug administration. At 60 min MeOHx at a dose 500 mg/kg body weight (12.64 ± 1.23 sec) significant ($P<0.001$) and ZjFF at a dose 50 and 100 mg/kg body weight (15.10 ± 1.24 and 19.23 ± 1.08 sec) exhibited significant ($P<0.001$) high analgesic activity at both doses than standard (14.11 ± 0.70 sec).

Key words: Analgesic activity, *Ziziphus jujuba* Mill, Flavonoid

**Address to whom the correspondence should be made.

INTRODUCTION

Salicylates are the class of compounds that are widely valued for their pain killing, antipyretic and anti-inflammatory properties (Moncada and Vane 1979; Insel, 1991). The most commonly known and used salicylates are salicylic acid (also called 2-hydroxybenzoic acid), aspirin (acetylsalicylic acid -ASA) and sodium salicyclates. They are used extensively for the relief of headache, inflammation, arthritis pain, and some are employed in the treatment of heart attacks and strokes in the elderly (Rainsford, 1984). Their mode of action is the inhibition of the synthesis of prostaglandin and its derivatives that cause inflammation, pain, rise in temperature and related diseases (Moncada and Vane, 1979; Meade et al., 1993). Recently, salicylic acid has been used primarily as an intermediate in the production of agrochemicals, dyes and colorants products (Cremlyn, 1991; Raskin, 1992). Extractive from the leaves are also employed traditionally for relieve of headache and inflammations (Owoyele et al., 2004). There is a dearth of information on the biological activity of *Ziziphus jujuba*. We have therefore carried out a preliminary screening for its anti-inflammatory and analgesic activities of the leave extracts of this plant.

MATERIALS AND METHODS

Ziziphus jujuba Mill. (Rhamnaceae) Eng: Common jujube; Chinese date. A spiny deciduous shrub or small tree. Commonly cultivated in India, Japan, China, Africa, Malaysia, Afghanistan and Australia. By seeds and vegetative method. Carbohydrates, fat protein, amino acids, anthocyanins from fruit, seeds and leaves. Leucocyanidin from bark. Leucopelargonidin, betulinic and ceabothic acids from wood. Rutin from leaves. Mauritines A,B,C,D,E and F, frangufoline and amphbines B,D and F. Ziziphine A,B,C,D,E,------Q from stem and root bark (Mahajan and Chopda, 2009). The roots are bitter, useful in wounds and ulcers. The leaves are bitter and are useful in wounds, syphilitic ulcers. Fruits are useful in leprosy, skin diseases, pruritus, wounds and ulcers, hemorrhages and general debility. The seeds are acrid and are useful in wounds (Chopra 1996; Chopda and Mahajan, 2009). Part used in present study: Root. *Ziziphus jujuba* is being used by tribal Adivasies in eastern parts of Jalgaon District (Maharashtra State) influencing injuries, small cuts and or animals bite, attack and wounds. Various activities like anti-inflammatory (Adzu and Haruna, 2007); sedative and hypnotic (Gong et al., 2000); anticancer, antiretroviral (Biswas and Mukharjee, 2003); anti-complementary (Sang et al., 2004) and antioxidant (Seong et al., 2008) has been reported.

Collection of plant

The plant is collected from North Maharashtra Region in the period of February 2012.
The plant *Ziziphus jujuba* is identified by Dr. Tanveer Khan, Department of Botany and deposited a voucher specimen in the Department of Zoology.

Preparation of extract

The plant material was collected from North Maharashtra Region Jalgaon District, Maharashtra State, India. The plant root was shade dried. After complete drying the material was crushed and grinded to form coarse powder. One kg of dried powdered plant material was exhaustively extracted in Soxhlet apparatus with methanol. The solvent extract so obtained was then filtered to remove any suspended impurities. Extract was concentrated under reduced pressure and controlled temperature (55^{o}C to 60^{o}C). The extract of plant was preserved in dry, cool condition in desiccator. Thus the methanolic extract (MeOHx) was further proceeding for isolation of flavonoid rich fraction through column chromatography. The MeOHx and flavonoid fraction (ZjFF) obtained were screened for their analgesic activity in rat model.

Column chromatography

Packing of column

The glass column (30 X 1.8 cm) with cinter was partially filled with chloroform. Fifty gram silica gel was placed in a beaker and slurry was prepared in chloroform. This slurry was poured into the above column at a constant speed. The excess of solvent was simultaneously allowed to drain off.

Preparation of sample loading

Three gram of MeOHx of root of *Z. jujuba* was added with two gram of silica gel into china dish and kept in a vacuum desiccator over anhydrous calcium chloride for drying. After complete drying it was macerated so as to get fine particles. Chloroform was added to it, stirred vigoursly and immediately loaded on the column avoiding cracking of adsorbent.

Fractionation

Elution and fractionation of MeOHx of root of *Z. jujuba* was by adsorption column chromatography using silica gel as adsorbent. Proportion of different solvents was done on the basis of separation pattern of secondary metabolites obtained on the TLC and homogeneity tried to maintain on it. The column was eluted successively with chloroform and methanol and their graded mixtures. The different fractions were collected. Strong positive flavonoid test was observed at 60:40 methanol: chloroform solvent system. Hence, this fraction was selected and carries for its analgesic activity. The fraction was concentrated by evaporating the organic solvents on water bath at $50^oC – 60^oC$ and preserved in desiccator.

Phytochemical study

MeOHx and ZjFF were analyzed for its phytochemical investigation by qualitative methods (Harborne, 1998):

Animal used

The albino rat (*Ratus norvegicus)* of either sex and of approximately the same age, weighing between 180-200gm were procured and they were individually housed, maintained in clean polypropylene cages under standard environmental conditions of temperature 27 ± 2^0C, 12 h light/dark cycle in a registered animal house of Moolji Jaitha College, Jalgaon. The animals were fed with standard pellet diet and water *ad libitum*. The experimental protocols have been permitted and approved by the Institutional Animal Ethics Committee (IAEC) and treated as per the guideline of Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA).

Eddy's Hot Plate Method

In order to check the temperature withstanding power of the animals, the hot plate reaction time was tested by modified method of Farouk et al., (2008). All animals were fasted for 18 h before the beginning of the experiment and access to water *ad libitum*. Albino rats were divided into seven groups, each consisting of six animals. Animals of group I received saline, group II received Tween-80 solution, group III received ibuprofen (50 mg/kg b.w.p.o), groups IV and V received MeOHx (250 and 500 mg/kg b.w.p.o) and groups VI and VII received ZjFF (50 and 100 mg/kg b.w.p.o.). Rats were placed individually on a thermostatically controlled Eddy's hot plate (Orchid, Nasik) maintained at 55 ± 0.2^0C. The pain threshold is considered to have reached when the animals lifted and licked their paws and time of reaction to pain stimulus of the rat was recorded at 0, 30 and 60 min, after the drug administration. In order to minimize damage to the animal paw, the cut-off time for latency of response was taken as 20 second (Shalheen et al., 2000).

Statistical analysis

All data were expressed as mean ± SE and the ANOVA was applied to determine the significance of the difference between the control group and experimental groups.

RESULTS AND DISCUSSION

The phytochemical study of MeOHx and ZjFF of root of *Z. jujuba* showed the presence of phenolic compounds, glycosides and flavonoids (Table 1). The analgesic activity was studied in Eddy's hot plate model. The MeOHx and ZjFF at a dose of 250, 500 and 50,

100 mg/kg body weight respectively showed comparable activity and the results are given in Table 2.

Table 1 Phytochemical analysis of MeOHx and ZjFF of root of *Z. jujuba* Mill

Phytochemical studies	MeOHx	ZjFF
Alkaloids	+	--
Glycosides	+	+
Flavonoids	+	+
Tannins	+	--
Phenolic compounds	+	+
Anthocynins	--	--
Saponins	+	--
Terpenoids	+	--
Amines	+	--

+ Presence, - Absence

The Eddy's hot plate method showed analgesic activity in ZjFF followed by MeOHx (Table 2). Oral administration of the MeOHx and ZjFF resulted significant ($P<0.001$) propagation of the latency time in licking response. The reaction time of MeOHx and ZjFF treated animals after the treatment of 30 min was higher when compared with control and standard groups. At 30 min MeOHx at a dose 500 mg/kg body weight (9.95 ± 0.77 sec) significant ($P<0.01$) and ZjFF at a dose 50 and 100 mg/kg body weight (10.88 ± 0.66 and 15.23 ± 1.16 sec) exhibited significant ($P<0.001$) high analgesic activity at both doses than standard (8.29 ± 0.98 sec).

Table 2 Effect of MeOHx and ZjFF of root of *Ziziphus jujuba* as Analgesic

	Licking time (in sec)		
Min / Group			
	0	**30**	**60**
Control	5.04 ± 0.54	5.27±0.56	5.48 ± 1.08
Tween 80	6.89 ± 0.32	4.33± 0 .15	8.29 ± 0.72
Ibuprofen	4.20 ± 0.57	8.29 ± 0.98	14.11 ± 0.70
MeOHx I	4.69 ± 0.34	6.22 ± 0.26	8.29 ± 0.57
MeOHx II	5.63 ± 0.65	9.95 ± 0.77**	12.64 ± 1.23***
ZjFF I	5.47 ± 0.64	10.88 ± 0.66***	15.10 ± 1.24***
ZjFF II	7.45 ± 0.81	15.23 ± 1.16***	19.23 ± 1.08***

MeOHx I- 250, MeOHx II - 500, ZjFF I - 50 and ZjFF II - 100 mg / kg body weight,
Values expressed as Mean ± SE, n=6, **P<0.01, ***P<0.001

After 1 h, ZjFF at 50 and 100 mg/kg body weight exhibited more reaction time (15.10 ± 1.24 and 19.23 ± 1.08 sec) than standard group (14.11 ± 0.70 sec). Throughout the observation period, ZjFF showed consistency.

Very recently similar type of work was carried out by Adzu and Haruna (2007) on the two fractions isolated from *Z. spina christi*. They studied for anti-inflammatory and analgesic activity and showed promising results, however they have not mentioned which phytoconstituent was responsible for the activity. Our observations provide the evidence for anti-inflammatory and analgesic activity of MeOHx and ZjFF of the root of *Z. jujuba* as the primary component of the plant material that exhibits pain relief action. At this stage, it is difficult to consider which of the phytochemical component is responsible for the activity of the extract.

CONCLUSION

The phytochemical investigation of the plant revealed the presence of flavonoids, alkaloids and others. The flavonoids are known to possess analgesic activity. Thus, it can be concluded that, the analgesic activity of the *Ziziphus jujuba* extracts is attributed due to the flavonoids present in it.

ACKNOWLEDGEMENT

The authors are also thankful to Principal Dr. G.S. Chaudhari for providing necessary facilities and financial support to carry out experiment. Thank are also due to Dr. R.T. Mahajan for providing laboratory facility to complete the experimental work.

REFERENCES

1. Adzu B. and Haruna A.K., Studies on the use of *Ziziphus spina-christi* against pain in rat and mice, *African J of Biotechnol*, 6(11), 1317-1324, (2007).
2. Biswas T.K. and Mukherjee B.: Plant Medicines of Indian Origin for the wound healing Activity. A Review *Interna J Low Extre Wounds*. 2:25, (2003).
3. Chopda M.Z. and Mahajan R.T., Wound healing activity of *Terminalia arjuna* Roxb. stem bark in albino rat, *Bionano Frontier* (science special issue), 36-39, **(**2009**).**
4. Chopra R. N., Nayar S. L. and Chopra I. C.: Glossary of Indian Medicinal Plants. 1 st Edition. New Delhi: *National Institute of Science Communication*. p. 232 (1996).
5. Cremlyn R. J.: Agrochemicals: Preparation and Mode of action John Wiley and Sons, Chichester, England. (1991).
6. Farouk L., Laroubi A., Aboufatima R., Benharrel A. and Chait A.: Evaluation of the analgesic effect of alkaloid extract of *Peganum harmala* L.: Possible mechanisms involved. *J Ethnopharmacology*. 115: 449-54 (2008).
7. Gong C., Yanjing B., Yuying Z., Jing T., Yi L., Guangzhong T., Libin M., Ning L. and Xiaojie X., Flavonoids from *Ziziphus jujuba* Mill var. *spinasa*. *Tetrahedron*, **56**, 8915-8920, (2000).
8. Harborne J.B.: Phytochemical methods, a guide to modern techniques of plant analysis, second edition, Chapman and Hill, London. (1998).
9. Insel P. A.: Analgesic, antipyretics and anti-inflammatory agents: drugs employed in treatment of rheumatic arthritis and gout. In: Goodman AG and Gilman, AG (Eds), 'The Pharmacological Basis of Therapeutics', 9th Edn, Pergamon Press, Oxford, 638-681, (1991).
10. Mahajan R.T. And Chopda M.Z., Phyto-Pharmacology Of *Ziziphus jujuba* Mill – A Plant Review, *Phcog Rev.*, **3**(6), 1-14, (2009).

11. Meade EA, Smith WL, DeWitt DL, (1993). Differential inhibition of prostaglandin endoperoxide synthetase (cyclooxygenase) isoenzymes by aspirin and other non-steroidal anti-inflammatory drugs. J. Biol. Chem 268: 6610-6614.
12. Moncada S. and Vane J. R.: Mode of action of aspirin-like drugs. Adv. Inter. Med 24: 1-22, (1979).
13. Owoyele B.V, Olaleye S.B, Oke J.M. And Elegbe R.A.: Anti - inflammatory and analgesic activities of *Nothospondias staudtii*. *Nigerian Journal of Physiological Sciences*. 19(1-2): 102-105. (2004).
14. Rainsford KD (1984). Aspirin and the Salicyclates. Butterworth, London.
15. Raskin I (1992) Role of Salicyclic acid in plants. Plants. Mol. Biol, 43: 439-463.
16. Sang Myung Lee, Jin Gyu PARK, You Hee LEE, Cheal Gyu LEE, Byung Sun MIN, Jung Hee KIM and Hyeong Kyu LEE.: Anti- complementary Activity of Triterpenoides from Fruits of *Zizyphus jujuba*. *Biol. Pharm. Bull.* 27(11):1883-1886, (2004).
17. Seong Hee Ko, Seong Won Choi, Sang Kyu Ye, Angho S. Yoo, Hyun Sook Kim and Myung Hee Chung.: Comparision of anti-oxidant activities of seventy herbs that have been used in Korean traditional medicine. *Nutrition Research and Practice*. 2(3):143-151, (2008).
18. Shalheen H. M., Badreldin H. A., Alquarawi A. A. and Bashir A. K.: Effect of *Psidium guajava* leaves on some aspects of the central nervous system in mice. *Phytotherapy Research.* 14: 107-1

BIO-TECHNOLOGY

Phytosterol quantitation of some marketed medicinal plant samples

C. K. Narkhede, S.S. Sonar, H.R. Chaudhari, S. M. Gajare*
Department of Biotechnology, Moolji Jaitha College,Jalgaon
Swapanligajare81@rediffmail.com

ABSTRACT

Phytosterol are important as it possess cholesterol lowering and anticancer activity. Phytosterol estimation was done by Zak method. *Zingiber spp.* is the rich source of secondary metabolites among the studied plant samples whereas cardiac glycosides are absent in *Phyllanthus* and *Terminalia spp*. The richest source of phytosterol is *Phyllanthus spp.*

Key words: Phytosterol, secondary metabolite, cholesterol, antibacterial activity.

*Address to whom the correspondence should be made

INTRODUCTION

Medicinal plants are of great importance to the health of individuals and communities. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. (Edeoga et al, 2005). The main Indian traditional systems of medicine namely Ayurveda, Siddha and Unani are primarily plant based systems. The WHO estimated that by 2020 stress will rank highest because of disabilities in developed countries. Phytosterols (plant sterols) as secondary plant metabolites are structural and biological counterparts of cholesterol, the main sterol in mammalian cells. Plant sterols are responsible for permeability and fluidity of cell membranes. Further they act as precursors of brassinosteroids, thus regulating storage and transport processes, and of numerous other metabolites such as glycoalkaloids and saponins (Piironen et al., 2000). To date over 250 different phytosterols and related compounds have been identified in plant and marine materials (Salo et al., 2003).

MATERIAL AND METHOD

Plant material

The plant samples were purchased from Kogta Ayurvedic shop. The plant samples were identified from Dr. Suhasini Mahajan, Dr. Tanvir Khan, Department of Botany, Moolji Jaitha College, Jalgaon. The plant materials used in this study are *Phyllanthus sp* (AVC), *Terminalia spp* (BHC), *Zingiber spp*(SUC).

Processing of the plant material

The plant samples were powdered using grinder. The powders were subjected to standardization according to pharmacopoeia and WHO standardization book tabulated in table 1a,1b. The powders were further macerated and extracted with chloroform for 5 days. Aqueous extracts and chloroform extracts were concentrated and filtered, stored at 4^0C.

Phytochemical screening

The extracts of root were subjected to phytochemical screening for the presence of chemical constituents such as alkaloids, saponins, flavonoids, tannins, cardiac

glycosides, and carbohydrates according to Horborne's 'Modern techniques of Phytochemical analysis tabulated in table 2.

Phytosterol quantitation

Dilutions of samples were prepared as 1:1, 1:2, 1:5. 10 microliters of these was pipette in wells. 30 microlitre $FeCl_3$ COH reagent was added to each well. 20 microlitre concentrated H_2SO_4 was added. The reaction mixture was incubated for 30 minutes. The intensity was measured at 620nm against blank. Similar protocol is followed for standard. Standard used was cholesterol (Table 3).

RESULT AND DISCUSSION

The present study reveals that the marketed sample *Zingiber spp*. *Phyllanthus spp w*as the richest source of secondary metabolites among the studied plant samples. Highest phytosterol content was estimated in *Phyllanthus spp.* 0.52mg/100 microlitre in 1:5 dilution of the chloroform extract of rhizome.

Table 1 a Characteristics of plant powder samples

Parameter	***Phyllanthus spp***	***Terminalia spp***	***Zingiber spp***
Colour	Greyish	Light Brown	White
Colour (UV long wavlength)	Dark purple	Dark purple	Ash
Colour(UV short)	Grey	Brown	Yellow
Odour	Charactaristic	Characteristic	hot
Taste	Sour	Sour	Spicy
Foreign matter	Absent	Absent	Absent

Table 1b Biological standardization of chloroform extracts

Bacteria	***Phyllanthus spp***	***Terminalia spp***	***Zingiber spp***
Escherchia coli	-	-	-
Pseudomonas spp	-	-	-
Salmonella typhi	-	-	-

Table 1c Chemical analysis of powder samples

Sample code	**Powder+5%NaOH**	**Powder + 1N KOH**	**Powder+ 5%FeCl3**
Zingiber spp.	Faint Yellow	Yellow	Orange
Phyllanthus spp.	Yellowish brown	Dark brown	Black
Terminalia spp.	Dark	Dark brownish	Dark brown

Table 2 Phytochemical screening chloroform extract of plant samples

Name of the compound	*Phyllanthus spp*	*Terminalia spp*	*Zingiber spp*
Flavonoids(Shinoda test)	-	+	+
Cardiac Glycosides (Keller killiani test)	-	-	+
Saponins (Hemolytic test)	+	-	+
Tannin & phenolic compounds	+	+	+
Terpenoids	-	+	+
Alkaloids (Mayer test)	+	-	+
Steroids (Salkowaski test)	+	+	+

Table 3 Quantititation of phytosterols in marketed plant samples

Sr.No	SUC (mg/100ul)	BHC (mg/100ul)	AVC(mg/100ul)
1:1	**8.57**	**28.08**	**35.22**
1:2	**2.69**	**4.30**	**13.97**
1:5	**0.05**	**0.33**	**0.52**

REFERENCES

1. Edeoga H.O., Okwu D.E. and Mbaebie B.O. Phytochemical constituents of some Nigerian medicinal plants *African Journal of Biotechnology*, 2005, 4(7): 685-688

2. Piironen, V., Lindsay, D.G., Miettinen, T.A., Toivo, J., Lampi, A.-M. : Plant sterols: biosynthesis, biological function and their importance to human nutrition. *Journal of the Science of Food and Agriculture*, 2000,80 (7): 939-966.

3. Salo, P., Wester, I., Hopia, A., Gunstone, F.D. Phytosterols. In: Lipids for functional foods and nutraceuticals. Ed. Anonymous. Bridgwater, England: The Oily Press, 2003, 13:183-224.

4. Lutjohann, D. (2004): Sterol autoxidation: from phytosterols to oxyphytosterols. *British Journal of Nutrition* ,91 (1): 3-4.

5. Christiansen, L.I., Lähteenmäki, P.L.A, Mannelin, M.R., Seppänen-Laakso, T.E., Hiltunen, R.V.K. and Yliruusi, J.K.. Cholesterol-lowering effect of spreads enriched with microcrystalline plant sterols in hypercholesterolemic subjects. *Eur. J. Nutr*. ,2001,40: 66-73.

6. Gill S.S.,Tutaja N. Reactive oxygen species & antioxidant machinery in abiotic stress tolerance in crop plants *Plant Physiology & Biochemistry*2010,*48*:909-930.

7. A.J.Horborne Phytochemical methods a guide to modern techniques of plant analysis *Springer* 1998

Isolation and screening thermo and osmo-tolerant ethanalogenic yeast from fruit waste from Jalgaon region

D. S. Kolhe, N. N. Patil, T. R. Chaudhari, R. Khan and Y. V. Narkhede*
Deaprtment of Biotechnology, Moolji Jaitha College, Jalgaon.

ABSTRACT

The biggest thirst of bioethanol production is devolpment of potential strain which will satisfy thermo and osmo-tolerancy with high ethanol yield. Present work is focused to isolate such potential ethanolic yeast from naturally stressed environment like friut waste and waste dumping soil. Six yeasts isolateed were obtained from natural environment out of which two starins were found as osmo and thermo-tolerent yeast.

Keywords:

*Address to whom the correspondence should be made

INTRODUCTION

The increasing demand for ethanol for various industrial purposes such as alternative source of energy, industrial solvents, cleansing agents and preservatives, has necessitated increased production of this alcohol. Ethanol production is usually accomplished by chemical synthesis of petrochemical substrates and microbial conversion of carbohydrates present in agricultural products. Owing to the depleting reserves and competing industrial needs of petrochemical feed stocks, there is global emphasis in ethanol production by fermentation process. Increased yield of ethanol production by microbial fermentation depends on the use of ideal microbial strain, appropriate fermentation substrate and suitable process technology (Brook, A, 2008).

Bioethanol is an alcohol made by fermenting the sugar components of the biomass. Currently, it is made mostly from sugar and starch crops. The economics of ethanol production by fermentation is significantly influenced by the cost of raw materials, and hence, current research interests deals with cellulosic biomass, which can be used as the feedstock. Cellulosic biomass from cash crops and grasses are potential cheap and renewable fuel source. These renewable sources contain significant lignocellulose fraction that cannot be degraded easily, and requires implementation of strategies for process development in areas like pretreatment, use of recombinant strains of bacteria, yeast and fungi, scale-up, process-design and recovery. Ethanol is inhibitory at high concentration and ethanol tolerance of microorganisms is critical for high yields. Variety of microorganisms including bacteria like *Zymomonas mobilis, Clostridium sporogenes,* and yeast like *Candida pseudotropicalis, Candida stellata, Kluyveromyces fragilis, Kluyveromyces lactis, Pichia stipitis, Saccharomyces cerevisiae* and fungi like *Fusarium oxysporum* are capable of ferment different sugars to produce ethanol (Bonciu et al, 2010, Jeppsson et al, 1996). Yeasts are eukaryotic unicellular, micro-fungi widely distributed in natural environment. Around 800 yeast species are known but these represent only a fraction of yeast biodiversity on earth. Yeasts are well known for efficiently fermenting an array of simple and complex sugars to biotechnological products (Walker, 1998).

MATERIALS

All the reagents used for preparation of following media / chemicals were A.R. grade and were manufactured by Hi-media, Mumbai and Qualigens, India.

MGYP medium containing (gL-1): malt extract- 3.0, glucose- 50 to 350, yeast extract- 3.0 and peptone- 5.0, pH- 6.8.(Aneja , 2005)

Fermentation medium containing (gL-1): glucose- 100, yeast extract- 1.0, ammonium sulphate-2.0, pH- 4.5 (Bergey *et.al,* 2005)

Dinitrosalicylic acid (DNSA) Reagent containing:

Solution I: Sodium-potassium tartarate- 3gm, distilled water- 50ml.

Solution II: 2M NaOH- 20ml, DNSA - 1gm.

Solutions I and II were mixed and volume was made up to 100ml with distilled water (Sawhney, 2001)

Potassium Dichromate Reagent containing: K2Cr2O7- 33.33gm dissolved in 300 ml distilled water with gentle stirring on ice bath and slowly added 521 ml concentrated HCl. The reagent was cooled to room temperature and finally diluted to 1 L with distilled water and stored in glass stopper bottle (Guymon *et al,* 1953)

METHODS

Ecological sampling from fruit waste of Jalgaon region

To isolate potential yeast useful for ethanol production, sampling was done from fruit waste of Jalgaon region. Samples were collected in pre-sterilized bottles and transported to laboratory in sterile condition.

Primary screening to select ethanol producing strains

Samples were subjected for dilution to reduce microbial load per ml and inoculated 1ml of aliquot of it to 99 ml of sterile MYP broth containing 5% glucose. After 72 hrs, loopful aliquot of medium was inoculated on sterile MGYP agar medium to isolate single yeast colony by using streak plate technique.

Assessment of sugar utilization spectrum of isolates

Sterile MYP Agar plates containing sugars in different concentrations viz. Arabinose (5%), Lactose (5%), Starch (1%), Sucrose (5%), Cellulose (1%), Maltose (5%) and Xylose (5%) were prepared and positive results were noted as appearance of pure culture of organism on the plates after incubation at 370C for 48 h.

Optimization of culture conditions

Organism tolerant to highest concentration to sugar was selected for assessment of optimal physiochemical parameters for growth in synthetic medium viz. pH and temperature.

Assessment for optimal pH for growth

Aliquots of 20 ml sterile synthetic medium comprising of (gL-1) yeast extract-0.1, glucose-
100 and urea- 2 with varying pH (1-14) were inoculated with 0.1ml of suspension of the selected organism and incubated at 370C for 48 h. Tolerance to the respective pH was recorded as positive growth by measuring optical density at 620 nm against

uninoculated broth as reference on a Shimadzu UV-Visible Spectrophotometer model UV-1601.

Assessment for optimal temperature for growth

Aliquots of 20 ml sterile synthetic medium comprising of (gL-1) yeast extract-0.1, glucose-
100 and urea- 2, pH 6.5 were inoculated with 0.1ml of suspension of the selected organism and incubated at varying temperatures (25, 37, 40, 45 and 600C) for 48 h. Tolerance to the respective temperature was recorded as positive growth by measuring optical density at 620 nm against un-inoculated broth as reference on a Shimadzu UV-Visible Spectrophotometer model UV-1601.

Preparation of standard graph for reducing sugars

Glucose stock solution (1000µg/ml) was used for standard graph preparation. 1ml aliquot of DNSA reagent was added to 1ml aliquot of a sample dilution and kept in a boiling water bath for 10 min. After cooling at room temperature 10 ml distilled water was added and absorbance was measured at 540 nm on Simadzu UV 1601 spectrophotometer. Reading blank and standards of glucose solutions were run simultaneously and in triplicates. A standard graph of A540 was plotted against glucose concentrations. The contents of total reducing sugars in sample were calculated as glucose equivalent.

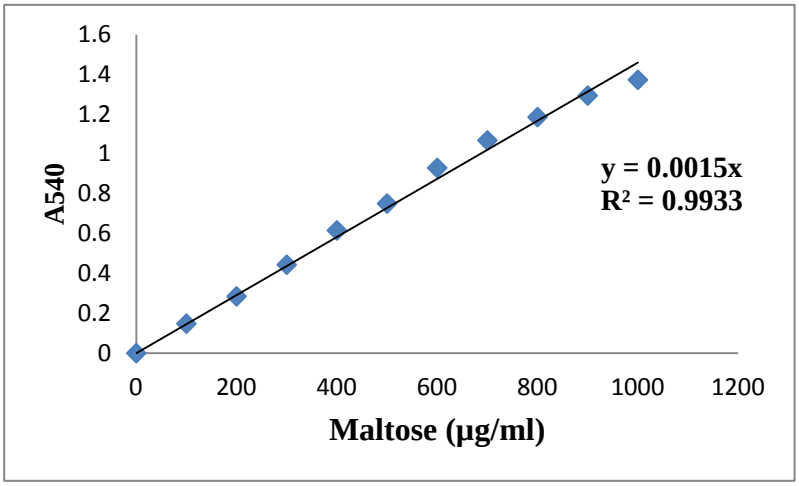


Figure 1 Standard graph of reducing sugar

Preparation of standard graph for ethanol estimation

Using double distilled ethanol, dilutions were prepared in gm% ethanol (1gm ~ 1.282ml). Then 1ml of potassium dichromate reagent was added following the addition of 5ml of 98% H2SO4. Tubes were incubated at water bath adjusted at temperature 25^0C for 20 min and absorbance was recorded at 640nm on *Simadzu UV 1601* spectrophotometer.

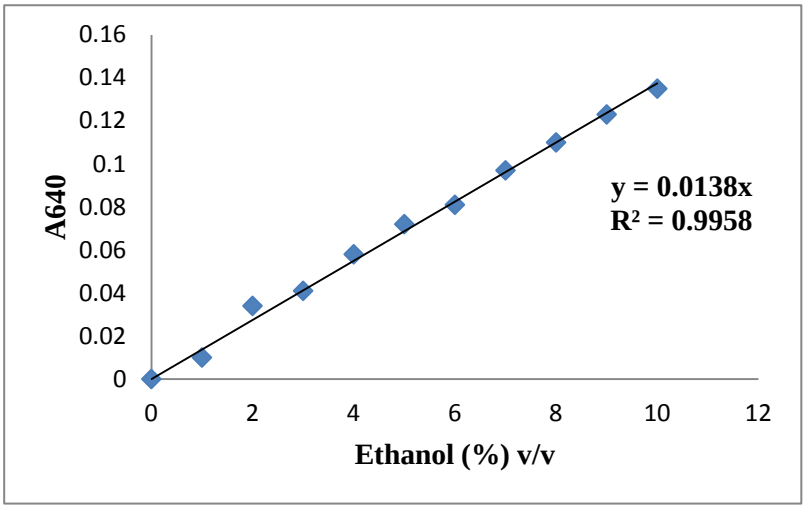


Figure 2 Estimation of ethanol by dichromate method

RESULTS AND DISCUSSION

Ethanol being a better energy alternative, an array of attempts were made to enhance its productivity utilizing numerous strategies. A large number of innate and recombinant yeast and bacteria have been proposed for improved production process.

In order to meet the objectives set, experiments were focused primarily on screening and selection of a potential ethanologen from environment and to study tolerance to stress conditions.

Primary screening of ethanalogenic yeast from fruit waste

A serially diluted fruit waste sample was inoculated in sterile MYP broth containing 5% glucose up to 72 h to enrich growth of ethanol producing strains of yeast. Ethanol production of those mixed culture was calculated by using potassium dichromate assay.

Isolation of ethanol producing yeast on MGYP agar plate

Ethanol producing yeast were isolated on MGYP agar plate and 4 isolated colonies of different morphology were selected as different isolate and their morphology was discussed as colony characteristics.

Table 1 Morphology of isolate on MGYP agar plate

Isolate capt-ion	Size	shape	color	margin	Elevation	Opacity	Consistency	Gram Characteristics
A_1	1 mm	Irregular	Creamish	Serrate	Flat	Opeque	Smooth	Gram Positive
A_2	Pin point	Circular	White	Entire	Convex	Opeque	Smooth	Gram Positive
A_3	0.5 mm	Circular	Creamish	Entire	Convex	Opeque	Smooth	Gram Positive
A_4	1mm	Circular	Faint Yellow	Entire	Flat	Opeque	Smooth	Gram Positive

Assessment of sugar utilization spectrum

Broad sugar utilization spectrum of any fermentative organism is beneficial for conversion of complex biomass e.g. cellulose and starch to fermentative end-products, such as ethanol. A broad substrate utilization spectrum facilitates reduction in fermentation costs and direct conversion of complex biomass with little or no pretreatment in addition to effective conversion of the organic carbon content to ethanol or biomass.

In order to assess the carbohydrate utilization and fermentative capability of the characterized yeast strain, the organism was plated on MYP medium fortified with respective carbohydrate in different concentrations.

Table 2 Assessment of Sugar utilization spectrum

Isolate	Carbohydrate						
	Arabinose	Lactose	Sucrose	Cellulose	Maltose	Xylose	Starch
A_1	Negative	Negative	Positive	Positive	Positive	Positive	Negative
A_2	Negative	Positive	Positive	Positive	Positive	Negative	Negative
A_3	Positive	Positive	Positive	Positive	Positive	Positive	Positive
A_4	Positive	Positive	Positive	Negative	Positive	Negative	Positive

Out of 4 isolate, A_3 was found to be efficient to assimilate wide range of carbohydrate, it was selected for the further assessment of temperature and pH tolerance.

Thermotolerance

As ethanol production is a thermodynamically exothermic reaction, there is significant increase in temperature of the fermentation vessel and has a profound effect on thermo-sensitive enzymes. Such conditions lower down the productivity of ethanol due to enzyme inactivation and increases cooling costs. Thermo-tolerant organisms are significantly beneficial in ethanol production, as it possess faster reaction rates owing to the presence of thermo-tolerant enzymes.

In order to assess the thermo-tolerance and optimum growth temperature of the selected isolate, it was inoculated in MGYP broth and incubated at different temperatures and growth was measured at A620 on a Shimadzu UV-Visible Spectrophotometer model UV- 1601 using sterile MGYP broth as reference. Optimum temperature for ethanol production was found to be 400C, and growth was observed up to 60^0C. This implied that the yeast is thermo-tolerant.

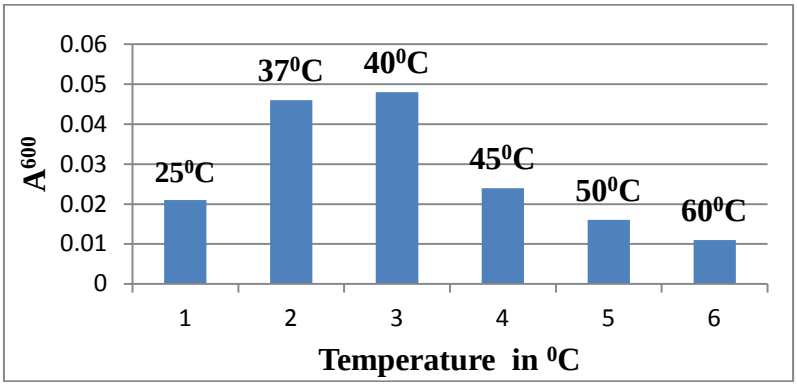


Figure 3 Temperature tolerance

pH Tolerance

Yeasts usually grow optimally in an acidic range of 6-6.5, and during the course of ethanol production, pH gradually decreases and the broth becomes acidic- as low as 3.0. lowering of pH favors faster breakdown of polymeric sugar and hence increases sugar uptake rate and ultimately product formation. Acidic pH also facilitates prevention of contamination by spoilage organisms, and hence, pH tolerance is also a significant parameter in selection of potential ethanologen. To study the pH tolerance of the selected isolate, it was inoculated in a series of MGYP broth with varying pH range, and growth was measured as OD values at 620 nm wavelength on a Shimadzu UV-Visible Spectrophotometer model UV-1601 using sterile MGYP broth as reference.

The organism was found to grow optimally at neutral pH, however, it was found to be tolerant to a wide range of pH (2.0-12.0) for growth. The selected organism may therefore be useful for fermentation of cellulosic hydrolysate pretreated with both acid and alkali. However, the organism may have a different optimal pH for maximum ethanol production.

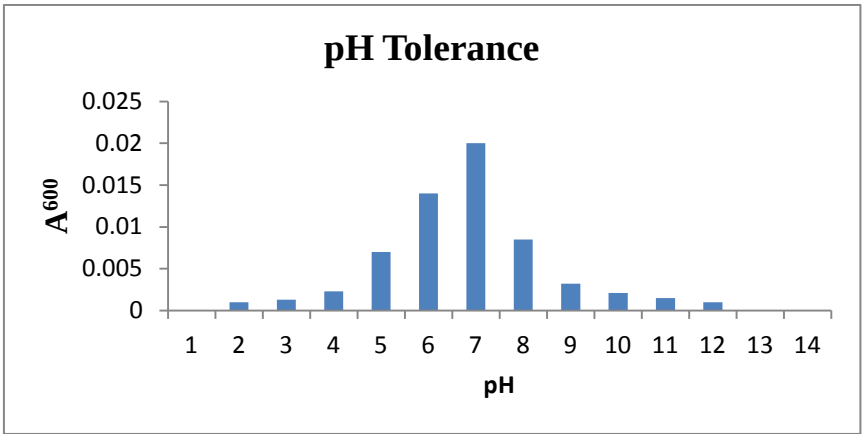


Figure 4 pH Tolerance

CONCLUSION

In order to meet objectives set, 4 ethanalogenic yeasts were isolated from fruit waste samples of Jalgaon region. Morphological analysis was concluded all four isolates were Gram positive yeast having similar colony characteristics as *Saccharomyces species.* However further biochemical and molecular investigation is needed for identification of isolates. All four isolates were subjected to assess the sugar utilization spectrum by using different sugars in various concentrations. Out of all four isolates, A3 was found to have wide sugar utilization spectrum and hence selected for the further analysis i.e. thermo- and osmo- tolerance. This yeast species was found have wide thermo tolerance. However it has temperature optima at 40^0C. It also has wide range osmo- tolerance and pH optima were found at neutral pH. However for fermentation, it would have different temperature and pH optima and further investigation is needed in this context.

BIBLIOGRAPHY

1. Brooks A. A., (2008), Ethanol production potential of local yeast strains isolated from ripe banana peels, *Afr. J. Biotechnol*, Vol. 7(20), pp.3749-3752.
2. Walker G. M., Yeast- physiology & nutrition, 1998, Pp-298-300, 1102, John Wiley Publication, 1st edn.

3. Bonciu Camelia, Tabacaru Cristiana, and Bahrim Gabriela (2010), Yeast isolation and selection for bioethanol production from inulin hydrolysate, *Innovative Romanian Food Biotechnology*, Vol. 6, pp. 29-34.
4. Jeppsson Helena, Yu Shiyuan and Hagerdal Rbelhahn-Ha, (1996), Xylulose and Glucose fermentation by *Saccharomyces cerevisiae* in chemostat culture, *Appl. Enviorn. Microbiol.*, Vol. 62, No.5, pp. 1705-1709.
5. Cinthya Guerreo, (2009), Biofuel Development in Latin American Caribbean: Risks and Opportunities, GRIN Verlag, pp. - 11.
6. Badger P. C., (2002), Ethanol from Cellulose: A General Review, *Trends in new crops and new uses,* J. Janick and A. Whipkey (eds.). ASHS Press, Alexandria, VA. pp 17-21.
7. Wyman Charles E., (1999), Biomass Ethanol: Technical progress, opportunities, and commercial Challenges, *Annu. Rev. Energy Enviorn.*, pp. 189-226.
8. Prasad S., Singh Anoop, and Joshi H. C., (2007), Ethanol as an alternative fuel from agricultural, industrial and urban residues, *Resource, Conservation and Recycling*, Vol 50 pp. 1-39.
9. National Planning Commission Report, 2003, Government of India
10. Brethauer Simone., Wyman Charles E., (2010), Review: Continuous hydrolysis and fermentation for cellulosic ethanol production, *Bioresource Technology*, pp. 4862–4874.
11. Howard R.L., Abotshi E., Jansen Van Rensburg E. L. and Howard S., (2003), Lignocellulose biotechnology: issues of bioconversion and enzyme production, *African Journal of Biotechnology* Vol. 2 (12), pp. 602-619.
12. Soni S.K., 2007, Microbes: A source of energy for 21st century, New India Publication, pp 574.
13. Aneja K.R., 2005, Experiments in Microbiology, Plant Pathology and Biotechnology, 4th edn., New Age International Ltd. Publi, India, pp-383-387.
14. Bergey D.H., Brenner D.J. and Garrity G.M., 2005, Bergey's Manual of Systematic Bacteriology, vol. 2, 2nd edn., Springerlink-Verlag Berlin Heidelberg Publ., pp-245, 284-287.
15. Sawhney S.K., Singh R., 2001, Introductory Practical Biochemistry, 1st edn., Narosa Publ House, pp 16-25.

Webliography

1. Renewable Fuel Association (R.F.A.) http://www.ethanolrfa.org/pages/statistics

Preliminary phytochemical analysis of aqueous extract of *Linum usitatissimum*

K.R. Badgujar, Y.P. Chirmade, Chaudhari G.S and K.K. Hire*
Dept. of Biotechnology, KCE Society's PGCSTR, Jalgaon
kushal.hire@gmail.com

ABSTRACT

The aim of the study was to investigate the Flax *Linum usitatissimum* phytochemical compounds. The phytochemical compounds screened by qualitative Tannic acid test, Hagers test, Bromine water test, Alkaline reagent test, Salkowski test, Ninhydrin test. Qualitatively analysed give positive results.The proteins and amino confirmed with thin layer chromatography test.The pressence of this phytochemical may be useful in various medicinal formulations.

Key word: *Linum usitatissimum*, phytochemical

*Address to whom the correspondence should be made

INTRODUCTION:

Flax (*Linum usitatissimum*) is an annual herbaceous plant, grown as either oil crop or as fiber crop, with fiber (Linen) derived from the stem of fiber varieties and oil from the seed of linseed varieties , cultivated through out the plains of India. Depending on the cultivars an growing conditions,flax seed contains 40-60% oil and meal,comprised of 23-34% protein,4% ash,5%viscous fibers(mucilage) and lignan precursors(9-30mg/gm) of defatted meal (Axelson M.Sjovall J,Gustaisson BE,1982.Origin of lignans in mammals and identification of precursor from plants). Annual world production of flax was 3.06 million metric tones in 1999-2000 with Canada the world's largest producers of flax(about 38% of total production) (Anonymous 2000).flax is making its mark in the world's food supply as a functional food (Daun JK,Barthet JV,Chornic TL ,Duguid S.2003,Structure,composition and varities development of flaxseed.) .It delivers a health boost beyond what might be expected from their traditional nutrient content. Flax flits this description perfectly,being rich in alpha linolenic acid(ALA),the essential omega-3 fatty acid and phytochemicals such as lignans (Cunnane SC Thompson LU,editors. Flaxseed in human nutrition 2nd edition Champaign,III,AOCS press.)

Flaxseed has been the focus of increased interest in the field of diet and disease, research due to the potential health benefits associated with some of its biologically active components :oil containing approx. 59% a-linolenic acid and the presence of plant lignan secoisolariciresinol diglucoside (SDG) (Kamal Eldin A.Peerlkamp N,Johnson P, An oligomer from flaxseed composed secoisolariciresinol diglucoside and HMGA).Lignans are found in most fiber rich plants but occuring high amount in flaxseed.

The major lignan in flaxseed is secoisolariciresinol (SECO) which is present in the form of diglucoside.SDG (a plant lignan) is converted by bacteria in the colon of humans(and other animal also) to mammalian lignans known as Enterodiol(ED) and Enterolactone(EL). SECO is the aglycone (non sugar)portion of SDG.Due to growing popularity of flaxseed for food components ,this may provide health benefits associated

with flaxseed are decreased risk of cardiovascular disease,decreased risk of cancer,particularly of the mammary and prostate gland,anti-inflammatory activity,laxative effect and alleviation of menopausal symptoms and osteoporosis also reduces serum cholesterol levels.(Lemay A,Dodin S,Kadri N.2002. Flaxseed dietary suppliment versus hormone replacement therapy in hypercholesterolemic menopausal women).

MATERIAL AND METHODS:

Collection of Plant material (seed) :

Seeds of *Linum ustitatissimum* was obtained from field of Vidarbha region, India and it was identified by Taxomomist Dept of Botany, M J College Jalgaon, India.

Preparation of Extract:

Seed mateerial of *Linum ustitatissimum* was grind with Double distilled water then obtained semi-liquid paste was subjected to Alkaline hydrolysis with 1N NaoH prepared in Methanol and upto its pH ranges from 10-13 although 11.8-12.5 is preferd range.

After hydrolysis , the sample was centrifuge at 5000 rpm for 8-10 minutes then supernatent was taken for acidification.The acidification was carried out with 0.1 N HCL. Acidified plant extract was concentrated by using rotary evaporator (Evator).The lignan enriched concentrate obtained was subjected to chromatographic separation to isolate its purity. Thin Layer Chromatography was carried out using solvent system (Chloroform : Ethyl acetate : Methanol) in the proportion of (20:30:50).

Methods for phytochemical analysis:

A. Test for Alkaloids :

1. Tannic acid test:

Alkaloids gives buff color precipitate with 10% Tannic acid solution.

2. Hagers test:

Alkaloids gives yellow color precipitate with Hagers reagent (saturated solution of picric acid).

B. Test for Glycosides :

1. Bromine water test

Test solution when treated with bromine water gives yellow precipitate.

C.Test for Flavonoids :

1. Alkaline reagent test: In test solution,add a few drops of sodium hydroxide solution appears yellow colour which turns to colourless in addition of few drops of dil HCL,disappears colour.

D. Test for Proteins and Amino acid :

1. Ninhydrin test: When Amino acid and proteins boiled with 0.2% solution of ninhydrin,it appears violet colour.

E. Test for sterols and Triterpenoids :

1. Salkowski test: Prepare the extract in chloroform with few drops of conc.sulfuric acid,shake well and allow standing for some time,red colour appears at the lower layer indicates the presence of steroids and formation of yellow colored lower layer indicates the presence of triterpenoides.

F. Test for saponins :

1. About 0.2gm of extract was shaken with 5ml of distilled water and then heated to boil. Frothing (appearance of creamy miss of small bubbles) shows the presence of saponins.

G. Test for Tannins :

1. Alkaline reagent test :

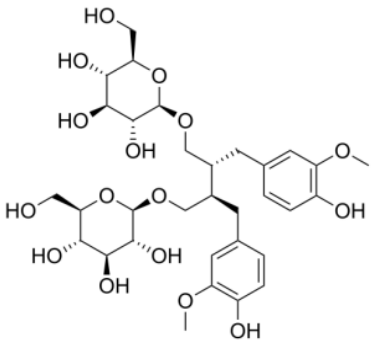
Test solution with sodium hydroxide solution gives yellow to red precipitate within short time.

RESULT AND DISCUSSION:

About 80% of the world population relies on the use of traditional medicine which is predominantly based on plant material. Medicinal plants have been used for centuries as remedies for human diseases because they contain components of therapeutic values. The results of phytochemical reveled the presence of Flavonoids, Glycosides, Alkaloids, Saponins. The presence of Sterol and Terpenoids was determined by Salkiwaski test. The positivity in Ninhydrin test indicated pink coloration which confirms the presence of Proteins and amino acids.

Phytochemical Screening for Aqueous Extract of

Phytochemicals	Tests	Result
1) Alkaloids	Hager's test	++
2) Glycosides	Bromine water test	++
3) Tannins	Alkaline reagent test	--
4) Flavonoids	Alkaline reagent test	+-
5) Proteins and Amino acids	Ninhydrin test	++
6) Sterol and Terpenoids	Salkiwaski test	++
7) Saponin	Saponin test	++



Both SDG and SECO have a UV absorption maximun at 280nm,which is characteristics for lignan. Flax also contain small amount of lignans matairesinol (MAT) (11µg/gm of full fat flaxseed),pinoresinol,pinoresinol diglucoside,isolariciresinol and diastereomer of SDG.This SDG further polymerised (or oligomerised) existing as a part of a larger complex composed of five SDG residues interconnected by ester linkages to four 3-hydroxy -3 methyl glutaric acids.This lignan

complex(SDG oligomers/polymers) typically contains SDG(35%),cinnamic acid glycoside and hydroxymethylglutaric acid (HMGA).

When flaxseed is consumed as a part of the human diet,increased levels of enterolactone and enterodiol are found in urine. As a precursors of the mammalian lignan enterolactone and enterodiol,flaxseed lignan are classified as phytoestrogens (Rickard SE.Thompson LU.1997,Phytoestrogens and lignans effects on reproduction and chronic disease).

In addition flaxseed lignans demonstrate antioxident activities. Thus, Secoisolariciresinol diglucoside (Molecular wt - 686.3), simply be used as a natural antioxident additive to foods given the growing interest in finding alternative antioxident food preservatives and also have potential to provide health benefits due to their antioxident properties.

CONCLUSION

In present research work the preliminary phytochemical and Antioxidant analysis indicates the Alkaloids, Flavonoids and high amount of glycosides are present. The plant ***Linum usitatissimum*** **contains** Secoisolariciresinol diglucoside (Molecular wt - 686.3) which have potent antiosidant activity which is proved in present wotk so aqueous extract of ***Linum usitatissimum*** might be useful in diseases related with liver and heart disorders.

REFERENCES:

1. Muir, A.D., N.D. Westcott, and K. Prasad (1997): **Extraction, purification and animal model testing of an anti-atherosclerotic lignan secoisolariciresinol diglucoside from flaxseed (*Linum usitatissimum*).** In *Second World Congress on Medicinal and Aromatic Plants (WOCMAP II),* Mendoza, Argentina, Acta Horticulturae, 245-248.
2. Yuan, Y.V., S.E. Rickard, and L.U. (1998): **Thompson. Plasma insulin-like growth factor I (IGF-I) im methylnitrosourea (MNU)-treated rats fed flaxseed or secoisolariciresinol diglucoside (SDG).** *Proc. Soc. Exp. Biol. Med.* 12: 18-22
3. Muir, A.D., N.D. Westcott, and A.A. Aubin (1996) :**Detection of lignans in α-Linolenic acid enriched Eggs.** In *11th Ann. meeting Canadian Section. Amer. Oil Chem. Soc.*, Saskatoon, AOCS, 25 4. Anonymous. Oil World Statistics Update. In *Oil World*, 31, pp. 9-10 (2000).
4. Cunnane, S.C., S. Ganguli, C. Menard, A.C. Liede, M.J. Hamadeh, Z.-Y.Chen, T.M.S. Wolever, and D.J.A. Jenkins(1993**): High α−linolenic acid flaxseed(*Linum usitatissimum*): some nutritional properties in humans**. *Br. J. Nutr.* 49: 443-453 (1993).
5. Bhatty, R.S.(1995): **Nutritional Composition of Whole Flaxseed and Flaxseed Meal.** In *Flaxseed in Human Nutrition*, (S.C. Cunnane and L.U. Thompson, Eds.), AOCS Press, Champaigne, Il, pp. 22-42
7. Oomah, B.D. and G. Mazza. (1999) :**Health benefits of pytochemicals from selected Canadian crops.** *Trends. Food Sci. Technol.* 10: 193-198
8. Morris, D.H. Flax - A Health and Nutrition Primer. www.flaxcouncil.ca (accessed Sep 2004).

9. Mazza, G. and B.D. (1995).: **Oomah. Flaxseed, Dietary Fiber, and Cyanogens.** In *Flaxseed in Human Nutrition*, (S.C. Cunnane and L.U. Thompson, Eds.), AOCS Press, Champaign, IL, pp. 56-81
10. Mazza, G. and C.G. Biliaderis (1989): **Functional Properties of Flax seed Mucilage.** *J. Food Sci.* 54: 1302-1305.
11. Westcott, N.D. and A.D. Muir. (2003). **Chemical studies on the constituents of *Linuum* spp. In *Flax, The genus Linum***, London, pp. 55-73
12. Harris, R.K., J. Greaves, D. Alexander, T. Wilson, and W.J. Haggerty.(1994), **Development of stability-indicating analytical methods for flaxseed lignans and their precursors**. *Food Phytochemicals for Cancer Prevention II. Teas, Spices, and Herbs.*, , American Chemical Society, Washington D.C., pp. 295-305
13. Setchell, K.D., A.M. Lawson, F.L. Mitchell, H. Adlercreutz, D.N. Kirk, and M. Axelson. **Lignans in man and in animal species**. *Nature*. 287: 740-742.

COMPUTER and IT

Use of Information and Communication Technology in Higher Education in Moolji Jaitha College Jalgaon: A Survey

A. A. Bute, B. P. Shimpi , K.B. Mahajan*, H. B. Patil*
Department of Computer Science and IT, Moolji Jaitha College, Jalgaon-425001

ABSTRACT

Information and Communication Technology (ICT) is a key driver for developing countries in higher education. With the help of ICT applications, students and teachers can search and view information regarding teaching, learning, evaluation and research. To assess the use of ICT in the education in the Moolji Jaitha College, Jalgaon Maharashtra of India, over 200 students were surveyed. This paper presents the survey followed by a detailed analysis of the obtained results.

Keywords: Education, Research, Survey, Information Communication Tools

*Address to whom the correspondence should be made.

INTRODUCTION

India is a developing country and has shown prominent presence in the field of ICT. The education industry is one of the major industries in India and it is expected to grow with recent developments in the technology and adoption of ICT. In order to understand the education in Moolji Jaitha College Jalgaon and at the same time to study the use of ICT in their teaching, learning, evaluation and research a comprehensive survey has been made. This survey has been conducted through hours of discussion and questionnaire based interviews with students of MooljiJaithaCollege, Jalgaon.

LITERATURE REVIEW

Mrs.Tank M. demonstrates the use of ICT & found that ICT makes the teaching elaborative and student friendly. The different complicative concepts are easily demonstrated using different ICT tools. Thus use of ICT in teaching is a demand of new education scenario. Neeru S. in 2009 presents their work on “Management & Change” in which they found that Diffusion of ICTs in Indian universities and colleges would respond to the twenty-first century demands. The contemporary higher education systems are aiming for acquisition of ICT skills as part of the core education system, provision of infrastructure/ fully equipped labs, professional assistance and other support needed to enhance quality of education. Bal Subramanian K.& et. al. in 2009 concluded that the integration of ICTs in higher education is inevitable. The very high demand for higher education has stimulated significant growth in both private and public provision. Open universities, which depend on technology-mediated learning, are expanding & multiplying and many conventional HEIs are adopting dual-mode or blended program delivery systems, creating a new dynamic in flexible and lifelong learning. In 2010 TahBabilaMbah studied “impact of ICT on students’ study habits” and found that ICT is considered to exploit the flexibility of training. The rhythm of study, the allocation of time and the availability of teachers can allow better articulation between private life/professional life (studies) as well as a better allocation of time between the various uses. Nadira A.R.& et. al.in 2010 said that as we move into the 21st century, many factors are bringing strong forces to bear on the adoption of ICTs in

education and contemporary trends suggest we will soon see large scale changes in the way education is planned and delivered as a consequence of the opportunities and affordances of ICT. In the year of 2011 Fisseha Mikre found that the computer and the internet are especially useful to enhance student engagement in learning and positively impact student performance and achievement. Moreover, their usefulness is more apparent in the 21 century, where the time is an era of information rich that the conventional modes of teaching learning could hardly handle it. MudasiruOlalere Y. in 2005demonstrates that Success in the implementation of an ICT policy will be dependent on the recognition of the importance of sectoral application to education and sustainable implementation. Maximizing ICT potentials will involve quality ICT policy, greater involvement of private and public in the funding of the implementation, and proper implementation and monitoring. Stephan P.& et. al.in 2012 shows that students rate their own ICT skills quite high, apart from the dimensions legal and technical issues. An individual item analysis clearly indicated that students are most confident with file management activities, and that students are convinced that they are well aware of the traces they leave on the internet (posting information and using social network sites). Ndume, V. in 2008 developed model for social networked learning adoption in developing countries of Africa. The time is now for developing countries like Africa to realize the potential of social software tools and use them formally in the learning process.

RESEARCH METHODOLOGY

This section presents the research approach, data collection and data analysis methods, sample selection and the problems and limitations of the methodology.

Approach of research work

We have started our work as positivistic research. After in depth study, we analyzed the background of the research problem to create a base for the questionnaires. This was followed by a two months field work which consisted of identifying and interviewing students of various faculties in Moolji Jaitha College Jalgaon and made observations in a constructive approach to understand the situation. The questionnaires were made available and filled by the students.

Collection and analysis of data

We used the methods like questionnaires, simple observation and the literature survey to capture both qualitative and quantitative data which are essential for an accurate approach**.** With the qualitative data method, it was possible to grasp a holistic picture and obtained a better overview of the problem, as the interviewed students were given a chance to share their views and opinion on the issue. The quantitative approach allowed us to receive precise facts that could be measured and compared to distinguish different factors and to see trends. The qualitative data measures the extent of the use of the resources and the awareness about the benefits, potentials and problems, where as the quantitative data was measured mainly by the multiple choice-questions in the questionnaire, where questions about the infrastructure, organization, and the extent of use of hardware and software were asked. The quantitative data consists of the currently used computers, software systems, internet facility etc. **[Badnjevic J., Padukova L., 2006, Creswell J. W., 2008]**

Selection and details of survey sample

The selection of the participants was made by considering the various streams in which they are studying. The selected students were expected to be from Moolji Jaitha College Jalgaon only. The college is divided basically into three different sections viz. Arts, Commerce and Science. To distribute the survey evenly we identified 300 different students belong to each of these sections. Out of these a total of two hundred students responded and actively participated in our survey and cooperated with us for filling up the questionnaire and sparing time for the interviews. The criteria for the selection of participants of the survey were the following:

- Participant is to be from Moolji Jaitha College only.
- Participant is to be from different section of the college.
- Participants may be male or female student.

Streams / Gender	Science	Commerce	Arts	Total
Male	124	23	9	**156**
Female	43	1	0	**44**
Total	**167**	**24**	**9**	**200**

Table 1: Streams and Gender wise participants of the survey

Table 1 shows the Streams and Gender wise participants for which the survey is conducted. As it is observed in the table out of the 200participants, 167 were from faculty of Science, 24 were from faculty of commerce and 9 were from faculty ofArts.

Questionnaires

The questionnaires were structured containing multiple choice questions where questions are predetermined and the data from different respondents is easy to analyze and compare. The two hundred questionnaires carried out in the study are used to make the analysis of the use of ICT in the Moolji Jaitha College Jalgaon.

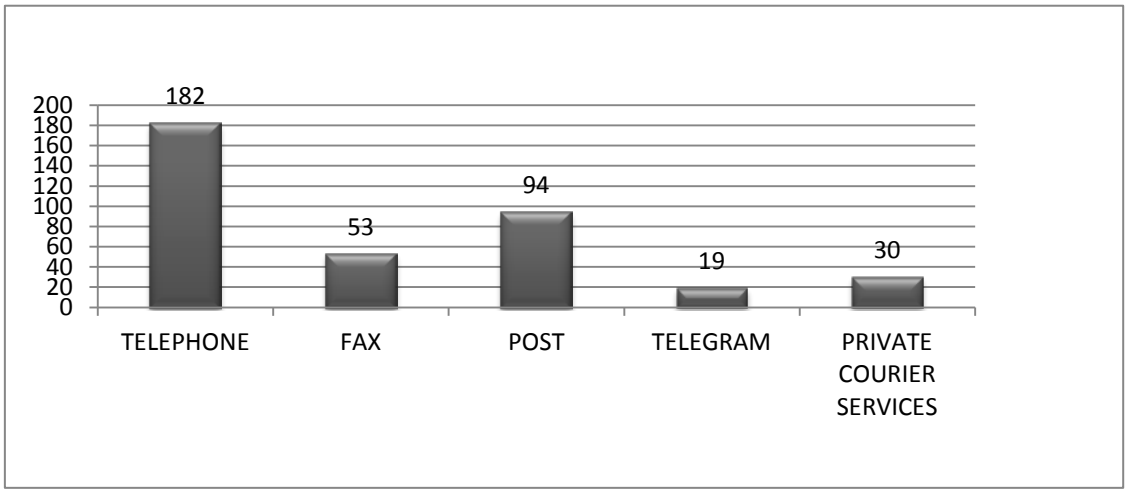
Problems and limitations of the methodology

Since we have applied both quantitative and qualitative method to our work, the possibility of performing a large number of interviews and observations was limited. Hence there was a risk that the results would not be representative for all students of Moolji Jaitha College Jalgaon but only for the students that we have interviewed, especially when considering the different streams of the college.

Another risk with the chosen method is that the students we have performed interviews with could have felt a pressure to some degree and therefore have not been totally honest with their statements. Others were too stressed to answer immediately and to be able to think and consider the answer. Many times, we also perceived that some respondents had an attitude that made them too proud to say anything that goes against them. We are therefore aware of the fact that a high grade of subjectivity could have made some negative effects on the result.

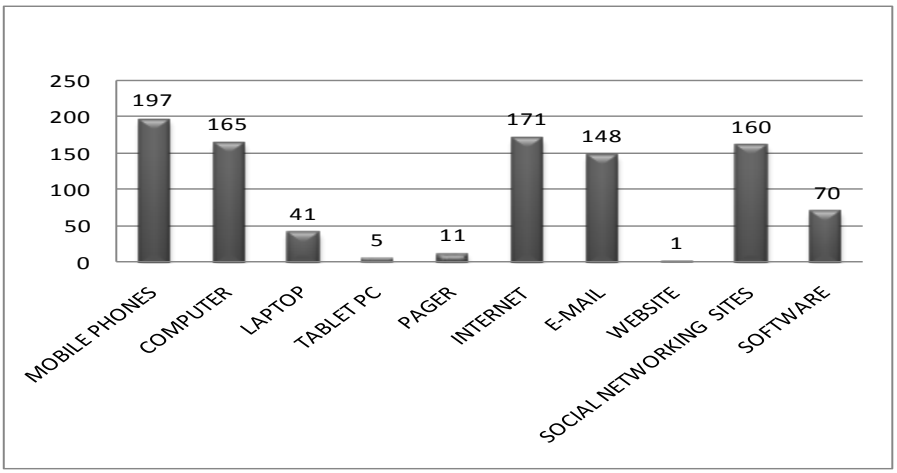
RESULTS AND ANALYSIS

Information and communication technology tools can be broadly classified into two categories viz., traditional and modern tools. The traditional tools consist of the various print media and communication using post, courier and devices like telephones. The modern ICT tools are mostly configured around computers and consist of internet, email, websites, databases, portals, etc. We have surveyed both these type of categories and emphasized mainly on the use of modern ICT tools. Graph 1 depicts the use of traditional ICT tools and it can be seen that the students are mostly relying on the electronic media like telephone followed by post, fax and telegrams for instant data transmission. As private courier agencies are offering fast and reliable communication it is also treated as par with the traditional postal system. The results show that depending on the urgency of transfer of documents fax, courier and postal services are used.

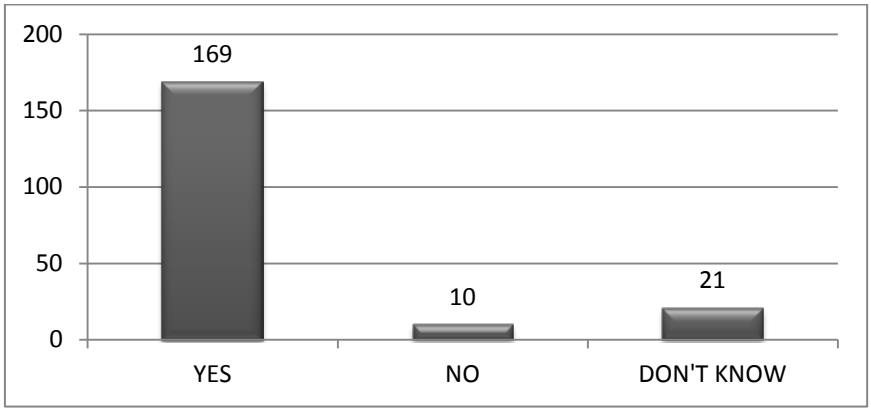


Graph 1: Use of traditional ICT tools

In the case of use of modern tools (graph 2) like computers, internet, email, website and software it was observed that nearly all students i.e., 98.50% have mobiles, about 82.50% students have computers, 20.5% have laptops,2.5% have tablet pc and5.5% have pagers.It is seen that 85.5% of the students had internet facility, 74% are using email facility, 80% are using social networking sites,0.5% of the students had websites, whereas 35% used some kind of software on their computers.



Graph 2: Use of modern ICT tools



Graph 3: Use of ICT tools in study

From the graph 3 we can conclude that 84.5% students are agreed for usage of ICT tools in the education.

CONCLUSION

From result & discussion it can be concluded that near about 84.5% students are agreed for use of ICT tools in teaching & learning mechanism. They also found that ICT tools are helpful for studying as well as collecting study material. The teaching learning process becomes more efficient when ICT tools are used.Day to day the information appearing on internet is growing faster & internet is one of the ICT tool used by many students, it is found to be very useful for understanding & studying various concepts.

REFERENCES

1. Tank M.:"Application of ICT in teaching and learning at higher educationlevel", Golden Research Thoughts, Vol.1,Issue.IX/March, ISSNNO: 2231-5063.
2. Neeru S. [2009] Management & Change, Volume 13, Number 2.
3. Balasubramanian K., Willie Clarke-Okah, J. Daniel, Frances Ferreira, A. Kanwar, A. Kwan, J. Lesperance,J. Mallet, A. Umar, Paul West,[2009] "ICTs for Higher Education", Background paper from the Commonwealth of LearningUNESCO World Conference on Higher Education, Paris, 5 to 8 July 2009
4. TahBabilaMbah [2010] "The impact of ICT on students' study habits. ", Case study: University of Buea, Cameroon,Journal of Science and Technology Education Research Vol. 1(5), pp. 107 - 110, October 2010, http://www.academicjournals.org/JSTER .
5. Nadira A.R., Banu K. and A. ThahiraBanu [2010] "ICT in Higher Education" – A Study Canadian Journal on Data, Information and Knowledge Engineering Vol. 1, No. 1, April 2010
6. FissehaMikre[2011] "The Role of Information communication", Ethiop. J. Educ. & Sc. Vol. 6 No 2

7. MudasiruOlalere Y. [2005] "Information and communication technology and education: Analysing the Nigerian national policy for information technology ", Department of Science Education, University of Ilorin, Nigeria lereyusuf@yahoo.comInternational Education Journal, 2005, 6(3), 316-321. ISSN 1443-1475 5
8. Stephan P., FrederikTruyen, C. Stockman[2012] "ICT skills and computer self-efficacy of higher education students", Proceedings of INTED2012 Conference.5th-7th March 2012, Valencia, Spain.1123ISBN: 978-84-615-5563-5
9. Ndume, V. [2008] ''Challenges of adaptive e-learning at higher learning institutions: a case study in Tanzania'', International Journal of Computing and ICT Research, Vol. 2 No. 1, pp. 47-59.

MATHEMATICS

On Ideals in Semirings

P. K. Mahajan, S. A. Wani, J. P. Bhamre, K. J. Ingale* and J. N. Chaudhari*
Department of Mathematics, M. J. College, Jalgaon. (M.S.), India
E-mail: jnchaudhari@rediffmail.com

Abstract: In this paper, we obtain a characterization of prime ideals in the semiring $(P(X), \cup, \cap)$. Also we prove : 1) Let I, J be subtractive ideals of a semiring R and A be a subsemiring of R. Then $A \subseteq I \cup J$ if and only if $A \subseteq I$ or $A \subseteq J$. 2) Let $I_1, I_2, I_3,\ldots, I_n$ be subtractive prime ideals of a semiring R. If A is a subsemiring of R such that $A \subseteq \bigcup_{i=1}^{n} I_i$, then $A \subseteq I_i$ for some i.

Key words: Semiring, subtractive ideals, prime ideals, subsemirings.

---

*Address to whom the correspondence should be made (Supervisor)

INTRODUCTION:

The concept of semirings was first defined by H. S. Vandiver in 1934 in his research paper namely *"Note on a simple type of algebra in which cancellation law of addition does not hold"*. We refer [4] for the definition of semirings, ideals, finitely generated ideals, subtractive ideals and prime ideals. In this paper, we obtain a characterization of prime ideals in the semiring $(P(X), \cup, \cap)$. Also we prove 1) Let I, J be subtractive ideals of a semiring R and A be a subsemiring of R. Then $A \subseteq I \cup J$ if and only if $A \subseteq I$ or $A \subseteq J$. 2) Let $I_1, I_2, I_3,\ldots, I_n$ be subtractive prime ideals of a semiring R. If A is a subsemiring of R such that $A \subseteq \bigcup_{i=1}^{n} I_i$, then $A \subseteq I_i$ for some i.

MAIN RESULTS:

Lemma 1.1: Let X be a non-empty set and $P(X)$ be the collection of all subsets of X. A non-empty subset I of the semiring $R = (P(X), \cup , \cap)$ is ideal if and only if $I = \langle A \rangle$ for some $A \subseteq X$.

Theorem 1.2: Let X be a non-empty set and $P(X)$ be the collection of all subsets of X. An ideal I of the semiring $R = (P(X), \cup , \cap)$ is prime if and only if $I = \langle X - \{x\} \rangle$ for some $x \in X$.

Lemma 1.3: A subset I of the semiring $R = (Z^+, + , \cdot)$ is an ideal if and only if I is a subsemiring of R.

Theorem 1.4: Let I, J be subtractive ideals of a semiring R and A be a subsemiring of R. Then $A \subseteq I \cup J$ if and only if $A \subseteq I$ or $A \subseteq J$.

Corollary 1.5 [5]: Let I, J be subtractive ideals of a semiring R and A be an ideal of R. Then $A \subseteq I \cup J$ if and only if $A \subseteq I$ or $A \subseteq J$.

Theorem 1.6: Let I, J be subtractive ideals of a semiring R. Then $I \cup J$ is a subsemiring of R if and only if $I \subseteq J$ or $J \subseteq I$.

Corollary 1.7: Let *I, J* be subtractive ideals of a semiring *R*. Then $I \cup J$ is an ideal of *R* if and only if $I \subseteq J$ or $J \subseteq I$.

Example 1.8: In the semiring $R = (Z^+, +, \cdot)$, $I = \{0, 2, 4, 5, 6, 7 \ldots\}$ and $J = \{0, 3, 6, 9 \ldots\}$. Then *I, J* are ideals of *R* and hence *I, J* are subsemirings of *R*. By [2, Proposition 2.19], *I* is not a subtractive ideal of *R* and *J* is a subtractive ideal of *R*. Then $I \cup J = \{0, 2, 3, 4, 5, 6, 7, 8, 9\ldots\}$ is a subsemiring of *R*. But $I \not\subset J$ and $J \not\subset I$.

The following Theorem is "**Prime Avoidance Theorem for subsemirings of a semiring**".

Theorem 1.9: Let $I_1, I_2, I_3, \ldots I_n$ be subtractive prime ideals of a semiring *R*. If *A* is a subsemiring of *R* such that $A \subseteq \bigcup_{i=1}^{n} I_i$, then $A \subseteq I_i$ for some *i*.

Corollary 1.10[5]: Let $I_1, I_2, I_3, \ldots I_n$ be subtractive prime ideals of a semiring *R*. If *A* is an ideal of *R* such that $A \subseteq \bigcup_{i=1}^{n} I_i$, then $A \subseteq I_i$ for some *i*.

CONCLUSION:

As the additive inverse is absent in the algebraic structure semiring, it is a big challenge to work in the theory of semirings. Since the theory of semirings is not too old topic and have wide applications in Mathematics and theoretical computer science, the researchers have wide scope to study theory of semirings and then to give applications in theoretical computer science.

REFERENCES:

[1] Paul J. Allen, J. Neggers and H. S. Kim, *Ideal theory in commutative A-semirings*, Kyungpook Math. Journal, 46 (2006), 261 - 271.

[2] J. N. Chaudhari and V. Gupta, *Weak primary decomposition theorem for right Noetherian semirings*, Indian J. of Pure Appl. Math. 25 (1994), no. 6, 647 - 654.

[3] J. S. Golan, The Theory of semirings with applications in Mathematics and Theoretical computer science, John wiley and sons, New York, 1992.

[4] J. S. Golan, semiring and their Applications, Kluwer Academic publishers, Dordrecht, 1999.

[5] Gursel Yesilot, *On prime and maximal k-subsemimodules of semimodules*, Hacettepe Journal of Mathematics and Statistics 39(3)(2010), 305 - 312.

PHYSICS

To study the Structural Properties of Basic Cubic Crystal Structures and Prepare the Models

Jayratna S. Adakmol, Sumedh V. Kamble and O. H. Mahajan
Department of Physics, M. J. College, Jalgaon, JALGAON-425002

ABSTRACT

In the present work a theoretical study of different crystal structures was undertaken and attempt was made to prepare the crystal structure models using plastic balls and other suitable materials. The important parameters of crystal structure such as Coordination Number (CN), Atomic Packing Factor or Packing Fraction (APF) were also studied and were calculated for the prepared crystal structure models.

Key words: Cubic Crystal, solid state, co-ordination number

---

*Address to whom the correspondence should be made (Supervisor)

INTRODUCTION

A crystal's structure and symmetry play a role in determining many of its physical properties, such as cleavage, electronic band structure, and optical transparency. A crystal is a regular, repeating arrangement of atoms or molecules. The unique arrangement of constituents is termed as crystal structure. In crystallography, a Bravais lattice is an infinite set of points generated by a set of discrete translation operations. In two dimensions there are five distinct Bravais lattices, while in three dimensions there are fourteen. A crystal structure is composed of a pattern, a set of constituents arranged in a particular way, and a lattice exhibiting long-range order and symmetry. Patterns are located upon the points of a lattice, which is an array of points repeating periodically in three dimensions. There are mainly four different types of crystal viz. Metallic Crystals, Ionic Crystals, Covalent Crystals, Molecular Crystals. Crystal structure can be obtained by attaching atoms, groups of atoms or molecules which are called basis (motif) to the lattice sites of the lattice point. The unit cell of a general 3D lattice is described by 6 numbers $\rightarrow$ 6 lattice parameters i.e. 3 Axial Distances/edge lengths (a, b, c) and ,3 Axial Angles (α, β, γ). A cell is a finite representation of the infinite lattice. It is a parallelogram (2D) or a parallelopiped (3D) with lattice points at their corners. If the lattice points are only at the corners, then it is primitive cell .And if there are lattice points in the cell other than the corners, the cell is non-primitive. A unit cell is a spatial arrangement of the smallest component of the crystal (group of atoms, ions or molecules) which is tiled in specified-dimensional space to describe the crystal, which when stacked together with pure translational repetition reproduces the whole crystal. In crystallography, a **Bravais lattice** is an infinite set of points generated by a set of discrete translation operations. The finite representation of space lattices is done using **unit cells** which show maximum possible symmetries with the smallest size, considering maximum symmetry and minimum size. In two dimensions there are five distinct Bravais lattices, while in three dimensions there are fourteen. (or Unit Cells to represent them). There are only seven different shapes of unit cell which can be stacked together to completely fill all space (in 3 dimensions) without overlapping. This gives the seven crystal systems, in which all crystal structures can be classified. These seven

crystal systems are nomenclatured as Cubic, Hexagonal, Triclinic, Monoclinic, Orthorhombic, Tetragonal, Trigonal/Rhombohedral.

Cubic lattices are the most simple and of interest since a large number of materials have a cubic lattice. There are only three cubic Bravais lattices. All other cubic crystal structures can be formed by adding an appropriate base at each lattice point to one of those three lattices. The three cubic Bravais lattices are the simple cubic lattice, the body centered cubic lattice and the face centered cubic lattice.

METHODOLOGY

The main motto behind of the present work is to prepare the models of the crystal structures. We have fabricated all the models of seven crystal systems using the plastic balls and other available materials. Different crystallographic parameters were measured for the cubic structures. The photographs of prepared model are shown along with the respective lattice and structure.

The simple cubic lattice consists of the lattice points identified by the corners of closely packed cubes. The simple cubic lattice contains one lattice point per unit cell. The unit cell is the cube connecting the individual lattice points. The maximum packing density occurs when the atoms have a radius, which equals half of the side of the unit cell. The corresponding maximum packing density is 52 %.

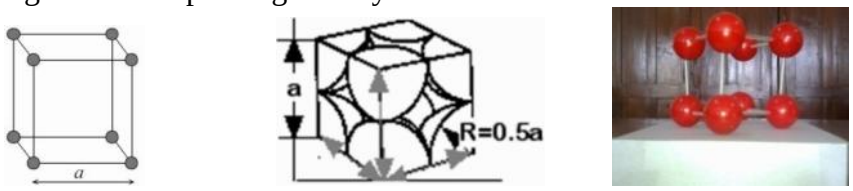


Fig. 1: Simple cubic lattice, structure, and Photograph of prepared model

The body-centered lattice equals the simple cubic lattice with the addition of a lattice point in the center of each cube. The body centered cubic lattice contains two lattice point per unit cell. The maximum packing density occurs when the atoms have a radius, which equals one quarter of the body diagonal of the unit cell. The corresponding maximum packing density is 68 %.

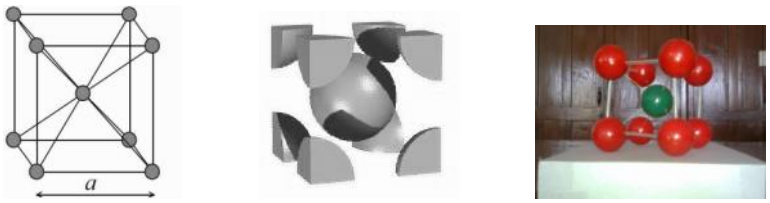


Fig.2:Body centered cubic lattice and structure,and Photograph of prepared model

The face centered lattice equals the simple cubic lattice with the addition of a lattice point in the center of each of the six faces of each cube. The face centered cubic lattice contains four lattice points per unit cell. The maximum packing density occurs when the atoms have a radius, which equals one quarter of the diagonal of one face of the unit cell. The corresponding maximum packing density is 74 %. Following table shows the ideal parameters of three cubic structures.

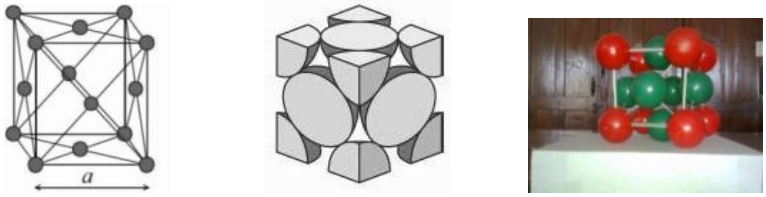


Fig. 3:Face centered cubic lattice and structure, and Photograph of prepared model

CONCLUSION

The prepared crystal structure models will be very effective in the study and understanding of real crystal structures of the existing materials as they resemble with each other.

REFERENCES

1. Ashcroft, N. W. and Mermin, N. D., Solid State Physics, Saunders, 1976.
2. Blackwood, O H, Kelly, W C, and Bell, R M, General Physics, 4th Edition, Wiley, 1973
3. Blatt, Frank J., Modern Physics, McGraw-Hill, 1992
4. Fishbane, Paul M., Gasiorowicz, Stephen, and Thornton, Stephen, Physics for Scientists and Engineers, 2nd Ed extended, Prentice Hall, 1996
5. Halliday & Resnick, Fundamentals of Physics, 3E, Wiley 1988
6. Halliday, Resnick, Walker, Fundamentals of Physics 4th Ed, Jones, Edwin R (Rudy) and Childers, Richard L, Contemporary College Physics, Addison-Wesley, 1990. Kittel, Charles, 7. Introduction to Solid State Physics, 7th Ed., Wiley, (1996).
8. Myers, H. P., Introductory Solid State Physics, 2nd. Ed., Taylor & Francis, 1997.
9. Rohlf, James William, Modern Physics from a to Z0, Wiley 1994.
10. Thornton, Steven T. and Rex, Andrew, Modern Physics for Scientists and Engineers, Saunders College Publishing, 1993.

GEOLOGY
(JalaSRI)

Geological Mapping and Hydrogeological Studies of Model Watershed Pathri-Samner, Jalgaon

Patil T. S., Jagdale D. I., Shimpi S. S.*, Mahajan C. D.
Department of Geology and JalaSRI, Watershed Surveillance and Research Institute, M. J. College, Jalgaon

ABSTRACT

Padmalaya Model Watershed of Pathri-Samner, Jalgaon, Maharashtra, which is the area developed by ICRISAT as a watershed. For the hydrological and hydro geological study of any watershed, we should know the geology of the area. The whole area is covered by basaltic flows. This basalt is work as good water conducting geological formation.

Water level measurements from observation wells are the principal source of information about the hydrologic stresses acting on aquifer. Water table is the level at which the groundwater pressure is equal to the atmospheric pressure. In the form of water table may change and vary due to seasonal changes, topography and structural geology. From 2009 ICRISAT is developing this area as a model watershed, so it just an attempt to understand the water level fluctuation of the area.

Keywords : Geological mapping, hydrogeology.

*Address to whom the correspondence should be made

INTRODUCTION

Pathri-Samner villages are located at the boundary of the Jalgaon and Pachora Tehsils in the Jalgaon District, Maharashtra, India. It is about 25km from the Jalgaon city. This area is characterized by the hot summer and general dryness throughout the year except the south-west monsoon season ranging from June to September. The study area is dominated by the clayey soil which is very good for the agriculture and we can see the agriculture is the main economic activity in the region. Main crop taken in the area is the Cotton, Sorghum, Pigeonpea, Chickpea, Pearl Millet and Soybean.

- **Deccan Trap**

The Deccan Traps are a large igneous province located on the Deccan Plateau of west-central India (between 17°–24°N, 73°–74°E) and one of the largest volcanic features on Earth. They consist of multiple layers of solidified flood basalt that together are more than 2,000 m (6,562 ft) thick and cover an area of 500,000 km2 (193,051 sq mi) and a volume of 512,000 km3(123,000 cu mi).. The Deccan Traps formed between 60 and 68 million years ago, at the end of the Cretaceous period. The bulk of the volcanic eruption occurred at the Western Ghats (near Mumbai) some 65 million years ago. This series of eruptions may have lasted less than 30,000 years in total. Deccan trap in North Maharashtra region shows alternate simple and compound flows.

- **Ground Water Level Fluctuation**

The ground water level fluctuation is controlled by recharge and draft of groundwater and the diverse influence on ground water level include meteorology, tidal phenomenon, earthquake and external load stress and strain in water level due to ground

water recharge, discharge and intensity of rainfall are reflected in ground water level fluctuation with time (Gopinath and Seralanath, 2008).

Lowering of groundwater level has resulted in reduction in individual well yield, growth in well population, failure of bore well, drying up of dug wells and increase in power consumption (Imtiyaz and Rao, 2008).

PREVIOUS WORK

- **Geologic Fieldwork Techniques of Mapping**

A geological map of a region exhibit the outcrops of the different rock types of the area, superimposed upon its topography. A geological map is expected to offer all possible data about the geology of the area. Before going to field, preparations to field study is very important. The field work should be pre-plan to avoid problems on the actual field.

- **Identification of Pahoehoe and A'a A'a Flow in Deccan Trap**

Basalt is a common extrusive volcanic rock in Maharashtra. It is usually grey to black and fine-grained due to rapid cooling of lava at the surface. It may be porphyritic containing larger crystals in a fine matrix, or vesicular, or frothy scoria. Unweathered basalt is black or grey. By definition, basalt is as "an aphanitic igneous rock that contains, by volume, less than 20% quartz and less than 10% feldspathoid and where at least 65% of the feldspar is in the form of plagioclase".

- **Lava Flow Types**

Mafic lava flows have been classically divided into two categories: pahoehoe and aa (e.g., Dutton, 1884; Macdonald, 1953). Pahoehoe is characterized by having a smooth surface, and aa has a spinose autobreccia surface.

AIM

Aim of our study is to prepare the geological map and study the hydrogeological parameter of model watershed area, Pathri - Samner, Jalgaon, Maharashtra.

OBJECTIVES

1. The primary objective is to prepare geological map of the study area.
2. To prepare the well location map of the area.
3. To analyses the ground water level fluctuation of the area.

STUDY AREA

The study area is the Hatti hill and Pathri-Samner villages which located at the boundary of the Jalgaon and Pachora Tehsil, Maharashtra State, India. It is about 25km from the Jalgaon District. For this study we use Survey of India Toposheet No. is 46 P/5, having 1:50000 scale. It comprises of parts of 2 villages, Pathri & Samner with population of 6477. Average rainfall in the study area is 690.2 mm and the average temperature ranges from maximum of 48°C and minimum of 7°C.

MATERIAL

To reach the aim through various objectives we use various types of datasets like SOI (Survey of India) toposheet with 1:50000 scale, cadastral map of village and IRS P6 LISS-IV image dated Dec. 2009 with 5.3 resolutions. For the hydrological studies of the area on pre and post monsoon variation of ground water level, we used the well monitoring data, meteorological and rainfall data, which were collected by JalaSRI, watershed surveillance and research institute, Jalgaon.

METHODOLOGY

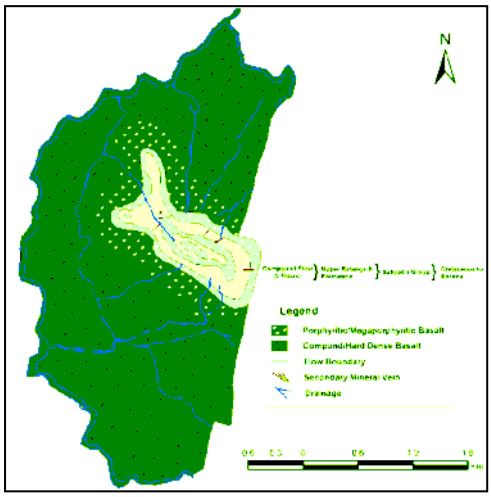
For the methodology, we generated the base map by using toposheet and LISS-IV satellite image dated Dec.2009 having 5.3m resolution. After the basemap generation, we were started to collect field data. In field, first we were started with geological mapping of the area. In which we collect the information about all geological aspect i.e. rock type, thickness, location of secondary mineral veins, fractures, joints etc. In field, we were also mark the well location on toposheet. On the basis of field data we generate the geological map and a well location map of the study area.

After that we collected the well monitoring and meteorological data from JalaSRI, watershed surveillance and research institute, Jalgaon. On the basis of collected data, we calculate and analyses the ground water level fluctuation of the Padmalaya Model Watershed area of Pathri- Samner.

FIELD OBSERVATION

In view of the generation of primary geological data on very local scale, it was planned to make detail geologic study of the area. Field studies in this area confirm the presence of compound lava flows reported by scientist of Geological Survey of India (1994) in their Ajanta quadrangle geological map. On the basis of field mapping we generate the geological map (fig. 1) of Padmalaya Model Watershed of Pathri-Samner, Jalgaon.

Fig. 1 Geological Maps of Study area



For Geological mapping following particular characters are consider:

i) Rock type
ii) Identification feature associated with different flow type
iii) Nature of flow contact
iv) Structural data.
v) Megascopic characters
vi) Secondary minerals

CONCLUSION

As per the Geological map of the study area, it covered by the basaltic flows. The basalt comprises one single compound type of flow, which vary in thickness from less than meter to several meters. Each unit shows a basal section with vertical pipe vesicles, filled with zeolite. The hilly region of the area shows megaporphyritic compound basalt with several joints and secondary mineral vein (Zeolite). There are five flows mapped in this region which showing the megacryst compound flow. Most of the watershed area thickly covered by black cotton soil below that up to few meters highly weathered rock material is present.

After the ground water level analysis, we can conclude that the watershed area, depth to water level is not uniform in the period of January 2010 to December 2011. Hydrological graphs shows ground water level of watershed area decreased in (April - July) and it increased in post monsoon period (August -December). It shows the slight increase in the water level of the watershed area. In period January 2010 to December 2010 watershed area having average ground water level 11.58 meter depth. In the period of January 2011 to December 2011 watershed area having average ground water level 11.44 meter depth. 24

REFERENCES

- A.K.Wells, petrology of igneous rock. Deccan trap pp 129.
- D. V. Ramana et al.: Deep bore well water level fluctuations in the Koyna region.
- Gopinath, G and Seralathan, P (2008), Studies on Long term Variability of Groundwater Level in the Hard Rock Crystalline Terrains of a Central Kerala River Basin, IE (I) Journal AG - river. June.2008. Vol.89, pp 4753.
- Government of India, Ministry Of Water Resources, Central Ground Water Board (2009) - Ground Water Information Jalgaon District Maharashtra.
- http://www.jalgaon.nic.in/
- P.K. Mukharjee Textbook of Geology- pg.552-590

GEO-INFORMATICS

(JalaSRI)

Assessment and Change Detection of Morphometric Analysis of the Bori, Ajani, Bhokad and Mor Watersheds using Toposheet and Satellite Data

Borse S. S., V. S. Zope* and Mahajan C. D.**
*Department of Chemistry, **Department of Geoinformatics and
**JalaSRI, Watershed Surveillance and Research Institute, M. J. College, Jalgaon

ABSTRACT

The study area is a part of Tapi basin in Jalgaon district of Maharashtra, India. It has been further subdivided into 2 sub-basins namely Upper and Lower sub watersheds of Tapi river. Morphometric analysis of Bori, Ajani, Bhokad & Mor rivers have been carried out, which are tributaries of the Tapi river using Remote sensing and Geographic Information System (GIS) techniques. An evaluation of morphometric parameters requires preparation of drainage map, length of drainage channels, ordering of various streams and measurements of catchment area, drainage density, bifurcation ratio, drainage frequency which help to understand the nature of drainage basin. In the present study update the drainages using LISS IV (5.8 mt. Resolution) image and calculate morphometry. GIS (Geographical information system) & RS (Remote sensing) have been proved to be efficient tools in drainage delineation and updation. On the basis of study, Drainage density of upper and lower has been detecting the change from 2.15 to 1.82 and 1.85 to 1.62 respectively.

Key words: Morphometric analysis, Watershed, GIS, RS.

**Address to whom the correspondence should be made

INTRODUTION

Watershed is defined as a" geohydrological unit draining to a common point by a system of drains". All lands on earth are part of one watershed or other. Watershed is thus the land and water area, which contributes runoff to a common point. A watershed is an area of land and water bounded by a drainage divide within which the surface runoff collects and flows out of the watershed through a single outlet into a lager river or lake. Morphometric analysis of a watershed provides a quantitative description of the drainage system which is an important aspect of the characterization of watersheds (Strahler, 1964). "Remote sensing (RS) is defined as" the science and art of obtaining information about an object, area, or phenomenon through the analysis of data acquired by a device that is not in contact with object, area, or phenomenon under investigation." A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

STUDY AREA

Jalgaon District is located in western India, in the north-west region of the state Maharashtra on the northern Deccan Plateau. The study area is situated between 20° 16'

32" to 21° 24' 56" N latitude and 75° 45' 30" to 76° 24' 2" E longitude and total study area is 11,765 sq. km.

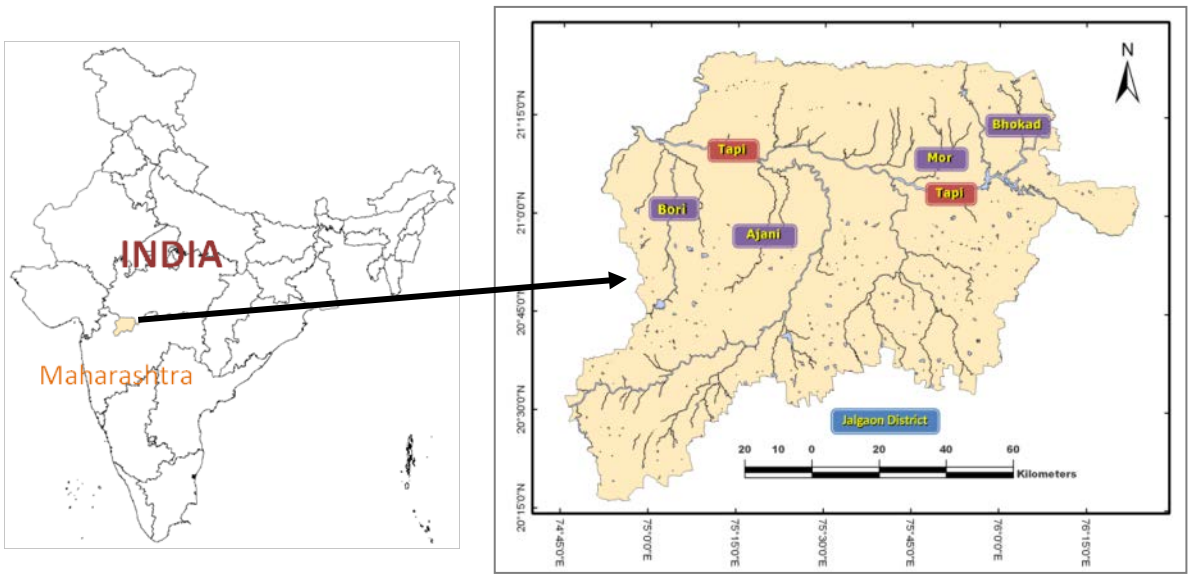


Figure 1. Location Map of Study Area

OBJECTIVES

Against the above background, the present work attempts to study the Assessment and Change Detection of Morphometric Analysis of Bori, Ajani, Bhokad and Mor River and their watersheds. The broad objectives of the study are.

1. Understanding the morphometric behavior of the Bori, Ajani, Mor and Bhokad drainages.
2. Morphometric analysis of drainages using GIS software and find out the morphometric difference between upper and lower region of Tapi basin.
3. Find out the changing pattern of drainage using Toposheet and LISS IV satellite Image.
4. Comparison of data obtained from LISS IV satellite image with SOI Toposheet.

DATABASE AND METHODOLOGY

1. Primary database

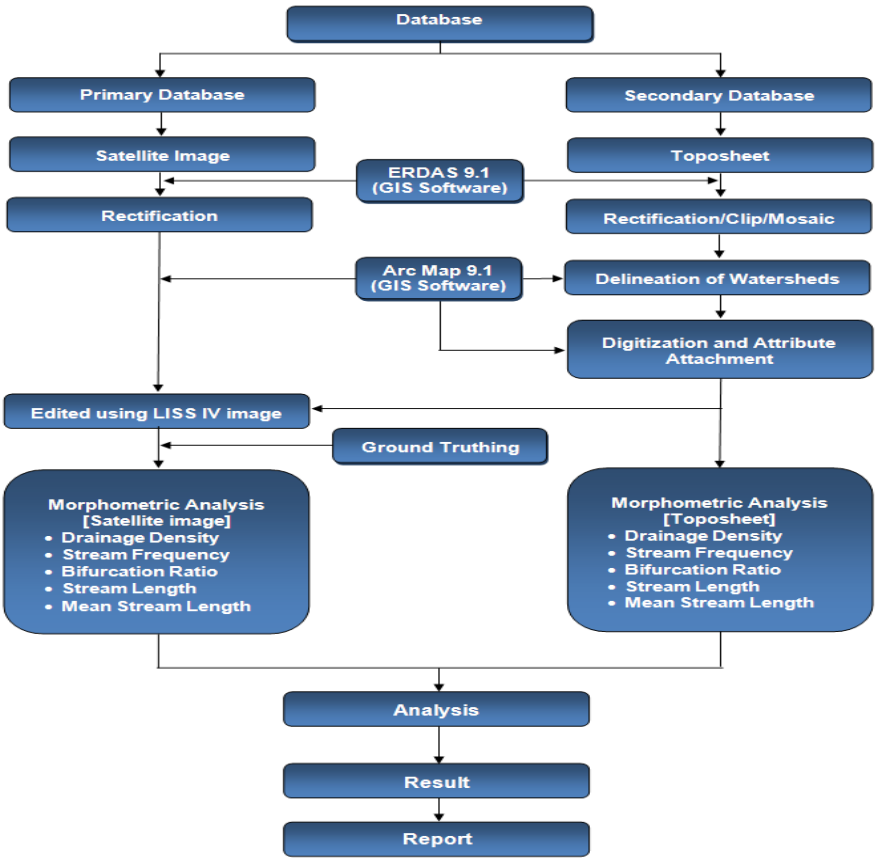
Although these Toposheet provided good plan metric controls and height information, but the available Toposheet were surveyed in different years quite some time back. Therefore, latest information about river courses was obtained using satellite images of latest available.

2. Secondary database

The Survey of India prepares the topographical maps on the basis of large scale. Topographical map scale is 1:50,000 were used in this study. We used the following topsheets for Assessment and Change Detection of Morphometric Analysis Bori and Mor River watersheds toposheets No is - 55 C4, 55 C3, 46 O15, 46 O16, 46 O4, 46 P1,

46 O8 and 46 P5. These maps used for collect the spatial information and their characteristics which are covered in study area.

DATABASE MANAGEMENT AND ANALYSIS



Preprocessing

For the present study collected the SOI Toposheet of scale 1:50,000 and satellite image IRS-P6-LISS IV for March 2008 – March 2009 of Jalgaon District and rectified using ERDAS 9.1 software. The georeferenced Toposheet were mosaic and then using the clipping feature of the GIS tool, the map of Jalgaon district was extracted. Using this map, delineation of watersheds of Bori, Ajani, Bhokad and Mor rivers were done.

Digitization and Attribute Attachment

Using GIS software (ArcGIS 9.1) streams were digitize. The order was given to each stream by following Strahler's stream order method. The attributes were assigned to create the digital database.

Edit

After attribute attachment, the initial drainage layer was edited by using IRS-P6 LISS-IV image (i.e. satellite image) and Google earth. We carried out an exhaustive ground Truthing using GPS.

Fig. 2: Stream Orderwise Watershed Maps using GIS Softwares

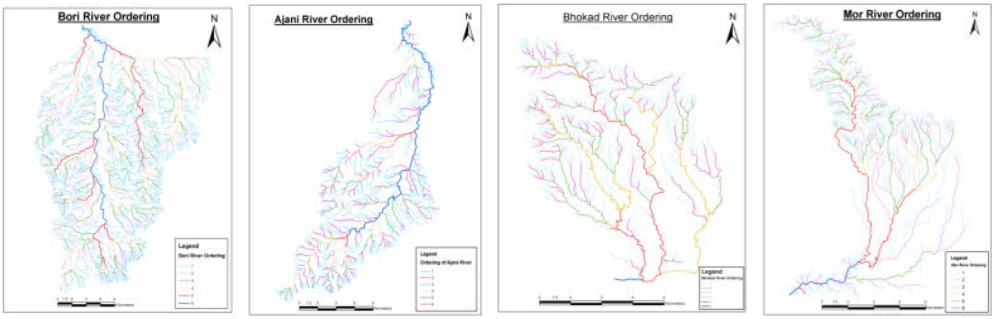


Table 1: Difference in morphometric analysis of Watershed

Rivers	**Bori**		**Ajani**		**Bhokad**		**Mor**	
Morphometric Parameters	**Toposheet**	**Satellite Images**	**Toposheet**	**Satellite Images**	**Toposheet**	**Satellite Images**	**Toposheet**	**Satellite Images**
No. of streams	3181	1908	948	817	975	611	1051	952
Stream Length	2753.9	2158.85	903.67	861.69	845.78	623.83	806.26	764.54
Drainage Density	1.91	1.52	1.8	1.71	2.1	1.54	2.21	2.09
Mean Stream length	79.92	78.33	62.44	65.95	43.59	38.69	40.77	34.01
Stream Frequency	2.24	1.34	1.89	1.62	2.41	1.51	2.87	2.61
Bifurcation Ratio	22.1	21.68	18.69	18.27	18.73	17.64	19.46	19.1

Morphometric Analysis

After ground truthing, various morphometric parameters were calculated of delineated watershed area which prepared using SOI toposheets and the LISS – IV image. Morphometric parameters were calculated such as linear aspects of the drainage network: stream order (Nu), bifurcation ratio (Rb), stream length, mean stream length (Lu) and areal aspects of the drainage basin: drainage density (Dd), drainage frequency (Df), Bifurcation ratio (Rb) of the river basins.

RESULT

On the basis of all the calculation (Table 1) conclusions were carried out. After completion of calculation and analysis, we detect the change between the morphometric parameters of the selected upper and lower basins which extracted data from toposheets and LISS – IV image.

OBSERVATIONS AND FINDINGS:

The above methodology is innovative in moving beyond technical interventions aiming to move the system in a certain direction, to assessing the magnitude of change required to **t**he Assessment and Change Detection of Morphometric Analysis of Ajani, Bhokad, Bori and Mor River and their watersheds**.** Reverse current degradation processes – and the social and biophysical potential of the current system to absorb these changes.

Using this study we can easily find out the difference between these two regions. Like number of streams as per toposheets of upper and lower basins is 2026 and 4129 respectively, but after changing as per LISS IV image it is now for upper basins is 1563 and lower basins is 2725. Drainage density of upper basins is changing from 2.16 to 1.82 km/km2 and in the lower basin is changing from 1.86 to 1.62 km/km2. Also in the Bifurcation ratio, Stream length, stream frequency found the variation.

CONCLUDING REMARKS

The drainage pattern of study area is mainly dendritic to sub dendritic and a little parallel. Remote sensing and Geographic Information System are very efficient, time-saving and accurate calculation tools for the morphometric analysis.

Generally geographers and planning officers used the traditional method for Morphometric analysis using Toposheets which survey in the period of 1970 to 80, so it is not perfect applicable for present of future planning. But using this study we can calculate perfect morphometric analysis, which can be perfect applicable for present and future water related planning. It will be also helps to site selection and type of water harvesting structures.

REFERENCE

- D.H. Pawar, A.K. Raskar (2009): Linear aspects of basin morphometry of panchaganga river (kolhapur): Western Maharashtra, International Referred Research VOL-II, 95-97
- Girish Kumar, M., Agarwal, A.K. and Bali Rameshwar, “Delineation of Potential Sites for Water Harvesting Structures using Remote Sensing and GIS”, Journal of the Indian Society of Remote Sensing, Vol.36, No.4, 2008: 323-334.
- Rajiv Chopra, Raman Deep Dhiman, P. K. Sharma, “Morphometric analysis of sub-watersheds in Gurdaspur district, Punjab using remote sensing and GIS techniques”, Journal of the Indian Society of Remote Sensing, Vol.33, Issue. 4, Dec. 2005: 531-539.
- Rudraiah, M., Govindaiah, S. and Srinivas Vittala, S., “Morphometry using Remote Sensing and GIS Techniques in the Sub-Basins of Kagna River Basin, Gulburga District, Karnataka, India”, Journal of the Indian Society of Remote Sensing, Vol.36, No.4, 2008: 351-360.

ENVIRONMENT SCIENCE

Assessment of physico-chemical parameters of groundwater quality in Padmalaya Model Watershed, Jalgaon using GIS techniques

P.S.Varade, C.J.Sharma, S.P.Karda*, G. M.Rane and C.D.Mahajan
Department of Environmental Sciences, Moolji Jaitha College, Jalgaon

ABSTRACT

Total 40 ground water samples were collected from the wells located in the Model watershed area and analyzed for physicochemical parameters as pH, EC, TDS, Turbidity, acidity, alkalinity, Total hardness, Calcium, Magnesium, Chlorides, Fluoride, Sulphate, Phosphate and Nitrate etc. The values were analyzed in detail using standard procedures and compared with WHO drinking water quality standards. On comparing the results, it was found that some of the water samples at various locations are non-potable due to high concentration of one of the other parameters and need treatment before it is used for drinking purposes. Physicochemical analysis data of ground water samples were taken into GIS environment and spatial distribution maps of water quality parameters were prepared using Arc GIS software. Thus, a GIS based study proves to be an essential tool to evaluate and quantify the impacts of groundwater pollution.

Keywords: Geographical Information System (GIS), Padmalaya, Watershed, physicochemical

*Address to whom the correspondence should be made

INTRODUCTION

Water is essential component for all living organism in the world. Water available in different sources like rain water, river water and spring water, meet requirement of each living organism (C. Vasantharaja et. al., 2011). During the last decade, it is observed that groundwater pollution has drastically increased due to human activities. Consequently, number of waterborne diseases has also increased among publics. Contaminated drinking water is believed to be the case of various diseases which is on raise during summer (D. Loganathan et. al., 2011). In the present study, groundwater samples have been collected and analyzed for various physico-chemical parameters and the analyzed results were taken into GIS environment.

MATERIALS AND METHODS

Padmalaya Model Watershed encompasses of two villages i.e. Pathri and Samner located in Jalgaon district of Maharashtra state about 26 km from the city of Jalgaon. The watershed extends between Latitudinal 20° 47' to 20° 50' N and longitudinal 75° 27' to 75° 29' E. Ground water samples were collected from forty (40) wells at various locations within the study area in summer season during the month of May and analyzed for various physico-chemical characteristics using standard procedures. Based on the attribute database of the water quality, the mapping of physico-chemical analysis was carried out and the extent of estimated parameters of pollution was mapped using ARCGIS and spatial distribution maps were generated.

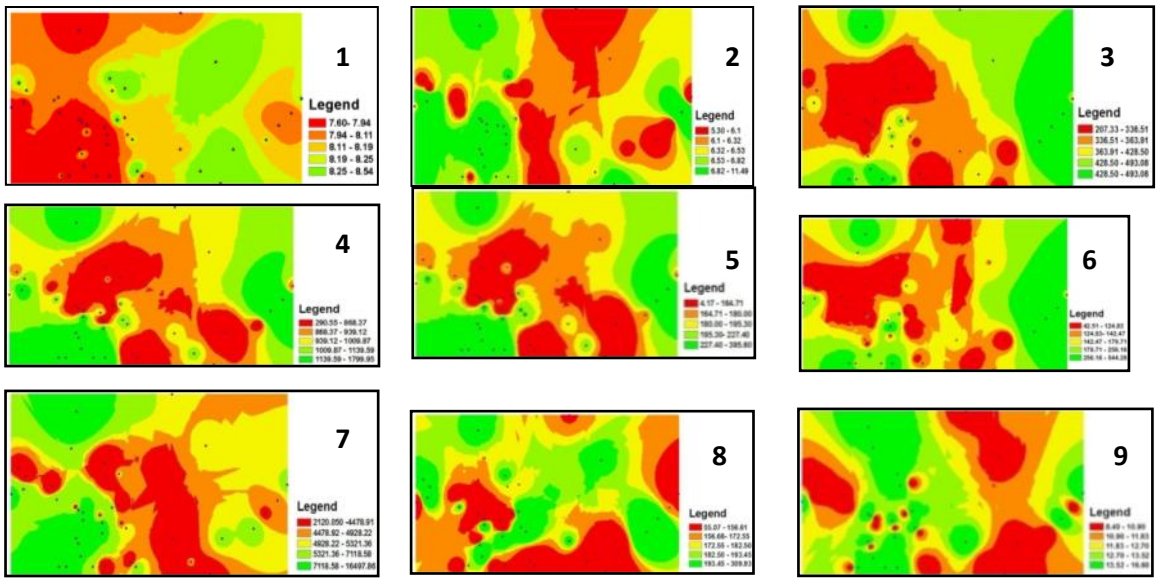
RESULTS AND DISCUSSIONS

The present investigations made on the groundwater quality of Padmalaya Model watershed area revealed that certain parameters such as pH (fig1), turbidity (fig2), TDS (fig3), Total Hardness (fig4), Mg content (fig5), chlorides (fig 6), sulphates (fig 7), nitrates (fig 8) and fluorides (fig9) were beyond the permissible limit as prescribed by WHO standards for drinking water. The undesirable effects caused to humans when parameters exceed the allowable limits (WHO 1983) are presented in table 1.

Table 1 - Groundwater samples for the study area exceeding the permissible limits prescribed by WHO standards for drinking purpose and the resulting undesirable effect on humans.

Parameters	WHO International Standards 1983,1996		No. of samples Exceeding Permissible Limits	Total No. of Samples	Undesirable Effect on Human
	Most Desirable Limits	Maximum Allowable Limits			
pH	6.5-8.5	-------	G9, G11	2	Taste
TDS (mg/l)	500	1000	G3, G6, G7, G24, G26, G27, G37, G38 and G39	9	Gastrointestinal Irritation
TH (mg/l)	100	500	All locations except G9	39	Scale Formation
Ca^{2+} (mg/l)	75	200	-------	-------	Scale Formation
Mg^{2+} (mg/l)	30	50	All locations except G8, G9, G10 and G33	36	Scale Formation
Cl^{-} (mg/l)	-------	250	G3, G6, G7, G24, G26, G27, G34, G38	8	Salty Taste
SO^{2-}_{4} (mg/l)	-------	400	All locations	40	Laxative Effect
NO_3 (mg/l)	-------	45	All locations	40	Blue baby diseases
F^{-} (mg/l)	-------	1.5	All locations	40	Dental & Skeletal Fluorosis

Spatial distribution maps of various pollution parameters that exceeded the permissible limits are as shown in Fig 1 to 9.



CONCLUSIONS

The extent of pollution occurred may be due to agricultural activities, industrial discharge, urbanization, land use/land cover practices, improper maintenance of the sewage system and other anthropogenic activities. Hence, it can be concluded that the ground water quality of Padmalaya model watershed area is unsuitable for drinking purposes and may cause health hazards to the rural people. Thus, a GIS study proves to be an essential tool to evaluate and quantify the impacts of groundwater pollution.

REFERENCES

- **APHA (American Public Health Association) (1996)** Standard methods for Examination of water and wastewater, 19th eds. Public Health Association,Washington, DC.
- **Bharat, R. Sharma., Rao, K.V., Vittal, K.P.R., Ramakrishna, Y.S., Amarasinghe, U. 2010.** Estimating the potential of rainfed agriculture in India: Prospects for water productivity improvements. Agricultural Water management, 97: 23–30
- **C. Vasanthraja, K. Pugazhendy, M. Meenambal, S. Venkatesan, K. Jayachandara & C. Jayanthi, 2011.** Studies on the impact of Industrial effluents in the Physico-chemical parameters of ground water of Tindivanam Town, Villuparam District, Indian Streams Research Journal, Vol 1, pp.1-4
- **D. Loganathan, S. Kamatchiammal, R. Ramanibai, D. Jayakar Santhosh, V. Saroja & S. Indumathi, 2011.** Status of Groundwater at Chennai City, India, Indian Journal of Science and Technology, Vol 4 No. 5, pp.566- 572
- **Wani SP, Joshi PK, Ramakrishna YS, Sreedevi TK, Singh P and Pathak P. 2008.** A new paradigm in Watershed Management: A must for development of Rain-fed Areas for Inclusive Growth. Conservation Farming: Enhancing Productivity and Profitability of Rain-fed Areas, (Anand Swarup, Suraj Bhan and JS Bali eds). Soil Conservation Society of India, New Delhi. Pp. 163-178

Section B
GEOGRAPHY

Environment and Literacy in Jalgaon District

Narendra Patil, Pravin Gosavi, Dr. A. S. Bhole
Dept. of Geography, Moolji Jaitha College, Jalgaon

INTRODUCTION -

Education is one of the important media for the developing personality of the human being. The socio-economic status of the society is governed by the educational level of the society. Hence education is considered as a basic means of development of the society. In the old age society education was in the form of informal during the pastoral period. Afterward it was formal in nature. Education influences and determines the qualitatively and quantitatively not only human resources, but also population aspect like literacy, mortality, fertility, age at marriage, migration, economic status among the society. The recent 2001 census data shows the tremendous change in educational levels among the Indian population. The regional variations in environment play an important role in spatio-tempered changes in educational levels in various part of the country.

Environmental condition influence literacy level in the study region. The regional variations in environmental factors like, Geology, relief, slope, soil types, vegetation types, transport and communication, economic structure, social structure, educational facilities agricultural production, industrial and urban development varies in the study region. All these environmental factors badly influence unbalance educational development levels.

OBJECTIVES -

1. To study and mark Tribal literacy level and non-tribal literacy level.
2. To study and know the regional variations in the level of literacy in the study region.
3. To study the role of geographical environmental factors on variations in literacy level in study region.
4. To study the problems of regional unbalance literacy in the region.

RESEARCH METHODOLOGY

To complete this research work investigators were used descriptive research method. This research work is basic as well as applied in nature. To complete this project investigator was collect the information form secondary sources. In this research role of environment on literacy level studied by investigator. For this aspect limited secondary data is available. This research work is based on primary data and secondary data collected from various sources. The secondary data is taken from district gazzetters, district census, handbook, government records, maps, charts available in the market. The primary data is collected from the sample village. The questionnaire survey, interviews of experts, field observation, door to door survey are the main source of data collection. The detail door to door survey related with our goal was studied. The three identical natural environment regions are demarcated with the help of overlapping method of the natural environmental maps- Mountainous Tribal, Agricultural Plain and Southern hilly region.

RESULTS AND DISCUSSION-

Table No.1- Ranking of literacy of Jalgaon District in percentage.

1981				1991				2001				2011	
Rank	Total	Rural	Urban	Rank	Total	Rural	Urban	Rank	Total	Rural	Urban	Rank	Total
23	58.57	54.27	71.61	15	64.30	59.73	76.18	17	76.06	72.7	84.10	24	79.73

In this table we can see variations of rural, urban literacy rate for the three decades i.e. 1981, 1991 and 2001. This table also shows the literacy ranking position in the Maharashtra state Jalgaon district is one of the leading literacy districts in the North Maharashtra. In all decades Jalgaon district with higher rural and urban literacy and higher literacy rank in Maharashtra. The ranking of literacy in Jalgaon district is constantly going high in 1981, 1991 2001 and 2011.

Table No. 2-Spatio-temporal literacy in Jalgaon District

1981 % of Literate			1991 % of Literate			2001 % of Literate			2011 % of Literate		
Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
58.67	54.27	71.61	64.30	59.73	76.18	76.06	72.17	84.10	79.73	76.04	87.51

In 1991, there is sizable growth of literates in Jalgaon district. Lower awareness about education, limited educational facilities, low standard of living lower jobs, domestic work, farm work to children causes' lowest proportion of literate population in rural area. In the urban area there is higher growth of literacy in these three districts. According to 2001 and 2011 data, it shows that there are sudden growths of literate population than 1991. Rural literate population in this region is lower in this region. Numbers of natural, cultural, sociological factors influence lower educational facilities, lower awareness about education badly influence low level of education.

Table No. 3 Distribution of illiterate in Jalgaon District

Total			Rural			Urban		
1991	2001	2011	1991	2001	2011	1991	2001	2011
14.93	12.70	1.780	11.96	9.90	2.094	3.16	2.80	1.107

The table showing illustrates in the study region seems that for the two decades of 1991 and 2001 census. There are continuous decline of illiterate peoples in all the three districts. The sizable decline of illiterate people is found in Jalgaon district. As compare to urban illiterate population the sizable decline of number of illiterates to rural part of the study region.

Table No. 4- Environmental Area Literacy and Literacy Levels

Sr. No	Category of Environ-ment	Popul ation	% of Literate			Level of Literacy			
			Total	Male	Female	Prim-ary	Secon -dary	H.S.	Higher Educati on
1.	Mountainous Tribal	415	4.33	8.29	0.92	100	--	--	--
2.	Mountainous Tribal	467	14.13	22.08	5.72	99	1.0	--	--
3.	Mountainous Tribal	168	0.59	0.59	--	100	--	--	--
4.	Agricultural Plain	5886	59.3	64.10	53.71	13.39	58.34	9.15	9.12
5.	Agricultural Plain	1294	59.19	60.39	57.96	12.32	69.37	10.18	8.13
6.	Agricultural Plain	670	52.23	67.47	37.53	39.80	55.4	2.80	2.00
7.	Agricultural Plain	6420	53.87	66.21	41.20	13.15	62.85	13.50	10.50
8.	Agricultural Plain	2088	40.17	25.81	14.36	25.25	60.25	10.40	4.10
9.	Southern Hilly Area	1193	55.56	35.45	20.11	90.04	8.90	1.06	--
10.	Southern Hilly Area	346	32.94	24.56	8.38	97.75	1.20	1.05	--
11	Southern Hilly Area	485	14.63	13.19	1.44	100.00	--	--	--

The above table shows that tribal villages have lower literacy and agricultural plain villages have higher literacy. Southern hilly area found moderate literacy level.

CONCLUSION

- Jalgaon District is classified into three major environmental zones. Northern hilly tribal area, central Tapti river plain, the southern Ajanta hilly region. All these environmental zones are identified with specific character. Northern hilly region is inhabited by tribal people like Pawara, Bhil, Tadavi. The central Tapti river plain agriculturally prosperous non-tribal area and southern Ajanta hills is inhabited by tribals Vanjari people.
- There are spatio temporal variations in literacy in the Jalgaon District.
- The northern satpuda mountainous region is inhabited by tribal population with lowest literacy. Lack of educational facilities, social status, economic aspect out migration, influence lower literacy in tribal region.
- The central Tapti river plain occupied by non-tribal people with highest literacy in the study region. The tehsils located in this zone with high literacy, agricultural prosperity, educational facilities, standard of living, economic state, social status influence high literacy in this zone.

- The southern Ajanta hilly region is socially backward region inhabited by Tribals like Vanjari influence lower educational levels. Lack of educational facilities, socio-economic status, influence lower educated level.
- Male literacy is constantly higher all tehsils of the study region than females. Female literacy is lowest in all parts of the study region.
- Non-tribal urbanized tehsils like Bhusawal, Jalgaon, Yawal with highest male and female literacy.There are spatio-temporal variations in environment influence spatio-temporal variations in literacy in the study region.
- The non-tribal tehsils with lowest proportion of illiterate population. This may be due to social status, economic bases. There are uneven distribution of educational institutions.
- Though region with higher number of educational facilities influence literacy in the study region. Higher the educational facilities with higher the educational level. Tribal region with limited educational institutions badly influence lowest literacy in this zone. Non-tribal zone with high education, economic prosperity influence highest literacy in the study region.
- There are variations in social status influence regional variations in literacy. Trial social structure influence lower literacy while non-tribal area with higher literacy levels.

REFERENCES

- Agarwal J C Education in India, Concept Publication, New Delhi, 1989
- Fourth Survey of Research in Education, 83-88, Vol. II, NCERT, New Delhi, 1997
- Gharpure Vitthal, Loksankhya Bhugol, Pimpalpure Publication, Nagpur, 1999
- Nair S.M., National Environment Awareness Campaign : A report, Centre for environment education, Ahmedabad, 1986
- Pillai Jaya, Kothari, Effective teaching Kamraj University Publication, Chennai, 1985
- Sawant S. B. and Athawale, Population Geography, Pune
- Singh R. B., Environment and Resource Management in dry land of north india, Heritage publication, New Delhi, 1990
- Thakur Laxmi, Role of women in conservation and protection of environment, Environmental people, Sept. 2004
- UNESCO-UNEP, Internatinal environmental education programme, Environmental education series, Paris, 1985

Economics

एरंडोल तालुक्यातील पीक रचनेतील बदलांचे तौलनिक अध्ययन (२०००-०१ ते २००९-१०)

वर्षा शशिकांत विसपुते, प्रतिभा शिवाजी कोळी, महेश मोहनीराज बडवे*
अर्थशास्त्र विभाग, मू. जे. महाविद्यालय, जळगाव

भारतीय अर्थव्यवस्था ही कृषीप्रधान अर्थव्यवस्था म्हणून ओळखली जाते. आजही बहुसंख्य लोकांच्या उपजिविकेचे प्रमुख साधन शेती असल्यामुळे शेती हा भारताचा आत्मा आहे असे म्हटले जाते. १९९१ मध्ये देशाने नवीन आर्थिक धोरण स्वीकारल्यामुळे खाजगीकरण, उदारीकरण व जागतिकीकरण या त्रिसूत्रीचा अवलंब करण्यास सुरूवात केली. १ जानेवारी १९९५ रोजी जागतिक व्यापार संघटनेची (WTO) स्थापना झाली. भारताने नवीन आर्थिक धोरणाचा स्वीकार करून आता दोन दशके उलटून गेली आहे. एकूणच नवीन आर्थिक धोरण व जागतिक व्यापार संघटना यांचा परिणाम भारतीय अर्थव्यवस्थेतील विशेषत: कृषी क्षेत्रावर दिसून येवू लागला. त्या दृष्टीने कृषी क्षेत्रातील प्रामुख्याने पीक रचनेवर त्याचा काय परिणाम झाला हे पाहणे आवश्यक ठरते. त्यासाठीच जळगाव जिल्ह्यातील एरंडोल तालुक्यातील पीक रचना कशी बदलत गेली यावर संशोधन करण्याचे ठरविले. प्रस्तुत संशोधनाचा कालावधी २०००-२००१ ते २००९-२०१० असा आहे.

पीकरचना - व्याख्या

"विशिष्ट वेळी विविध पिकांच्या लागवडीखालील एकूण क्षेत्राचे किती प्रमाण आहे. त्यास पीकरचना किंवा पीकपध्दती असे म्हणतात."[१]

संशोधनाचे उद्दिष्ट्ये

१) आर्थिक सुधारणांमुळे पीक रचनेत झालेल्या बदलांचा अभ्यास करणे.
२) एरंडोल तालुक्यातील पीक रचनेतील बदलांचा तौलनिक अभ्यास करणे.
३) एरंडोल तालुक्यातील पीक रचनेतील बदलांचा धारणक्षेत्रानुसार तौलनिक अभ्यास करणे.

गृहीत कृत्ये

आर्थिक सुधारणा नंतरच्या कालखंडात (२०००-२००१ ते २००९-२०१०) पीकरचनेत बदल घडून आला.

संशोधन पध्दती

संशोधनाचा अर्थ

सर्वसामान्य भाषेमध्ये ज्ञानाचा शोध म्हणजे संशोधन होय. एखाद्या विषयासंबंधीची समर्पक माहिती गोळा करण्यासाठी जे पध्दतशीर आणि शास्त्रशुध्द अन्वेषण केले जाते त्याला संशोधन म्हणतात. शास्त्रीय शोधाची कला म्हणजे संशोधन होय.[२]

स्थूल व सूक्ष्म विश्लेषण पध्दती

प्रस्तुत संशोधनामध्ये आर्थिक सुधारणांच्या कालावधीत एरंडोल तालुक्यातील शेती क्षेत्रावर झालेल्या परिणामांचा अभ्यास करण्यात येणार आहे. त्यात प्रामुख्याने पीक रचनेतील बदलांचा तौलनिक अभ्यास करण्यात येणार आहे. हा अभ्यास पुढील दोन पध्दतीने करण्यात येणार आहे -

१) स्थूल पातळीवरील विश्लेषण - एरंडोल तालुक्यातील पीक रचनेतील बदलांचा अभ्यास करण्यासाठी दुय्यम स्वरूपाच्या आकडेवारीचा आधार घेण्यात आला आहे. दुय्यम आकडेवारी ही जिल्हा सामाजिक व आर्थिक समालोचन जिल्हा जळगाव, विविध नियतकालिके व वेबसाईट इत्यादीतून घेतलली आहे.

२) सूक्ष्मविश्लेषण पध्दती - ही पध्दती नमुना निवढलेल्या शेतकऱ्यांच्या प्राथमिक माहितीवर आधारलेली आहे. प्राथमिक आकडेवारी गोळा करण्यासाठी मुलाखत अनुसूचीचा वापर करून निवडलेल्या नमुन्याची मुलाखत घेऊन प्राथमिक माहिती संकलित केलेली आहे. त्यासाठी नमुना निवड पध्दतीचा वापर केला आहे.

नमुना निवड

अध्ययनांचे क्षेत्र असलेला एरंडोल हा जळगाव जिल्ह्यातील एक प्रमुख तालुका आहे. प्राथमिक आकडेवारी गोळा करण्यासाठी जी नमुना निवड केली त्यासाठी त्रिस्तरीय स्वैर नमुना निवड पध्दतीचा (Three Stage Stratified Random Sample) वापर केला आहे. त्यात तालुका हा पहिला एकक, गाव हा दुसरा एकक तर निवडलेला शेतकरी हा अंतिम एकक आहे.

सर्वप्रथम एरंडोल तालुक्यातील एकूण १० गावांची निवड केली आहे या निवडलेल्या प्रत्येक गावामधून १० शेतकरी या प्रमाणे (१०X१०=१००) एकूण १०० शेतकऱ्यांची निवड करण्यात आली आहे. तालुका व गावांची निवड करतांना त्या तालुक्याचे वा गावाचे साक्षरतेचे प्रमाण वाहतूक दळणवळणाच्या सुविधा संपर्काची साधने हे निकष लावले आहेत कारण आर्थिक सुधारणांचे परिणाम शेतकऱ्यांपर्यंत पोहचण्यासाठी या सर्व बाबी महत्वाच्या ठरतात. ज्या तालुक्यात व गावात साक्षरता वा वाहतूक व दळणवळण संपर्क साधने अधिक कार्यक्षम आहेत तेथील लोकांना आर्थिक बदलाचे व बाजारपेठेतील बदलाचे ज्ञान तुलनेने लवकर मिळते व त्या ज्ञानाचे प्रत्यक्ष अनुकरण करण्याचे प्रमाणही तुलनेने अधिक असते. या अनुकरण केलेल्या गावातील लोकांचे अनुभव इतर मागासलेल्या भागातही हळूहळू झिरपत जातात. म्हणजेच तालुका व गावांची निवड सप्रयोजन नमुना निवड पध्दतीच्या आधारे केली आहे. या आधारे निवडलेले तालुके व त्यातील गावांची नावे खालीलप्रमाणे आहेत.

अ.क्रं	जिल्हा	निवडलेला तालुका	निवडलेली गावे
१.	जळगाव	एरंडोल	नागदूली, रवंजा, खडका, खर्ची, रिंगणगाव, सावदा, पिंपळकोठा, खेडी, कढोली व दापोरी

निवडलेली गावे व तालुका अभ्यासक्षेत्राचे योग्य ते प्रतिनिधित्व करतात.

शेतकऱ्यांची निवड करतांना शेतकरी हाच एकमेव निकष लावला आहे. कारण संशोधकाला सिमांत,लहान,मध्यम व मोठे शेतकरी यांची आकडेवारी व माहिती उपलब्ध झाली नाही. नमुना निवडलेल्या शेतकऱ्यांतून नंतर सिमांत,लहान,मध्यम, व मोठे शेतकरी असे वर्गीकरण करण्यात आले आहे. ० ते १ हेक्टर

धारणक्षेत्र असणारे शेतकरी सिमांत शेतकरी ,१ ते २ हेक्टर धारणक्षेत्र असणारे लहान शेतकरी, २ ते ४ हेक्टर धारणक्षेत्र असणारे मध्यम शेतकरी व ४ हेक्टरापेक्षा अधिक धारणेक्षेत्र असणाऱ्या शेतकऱ्यांना मोठे शेतकरी असे संबोधले आहे. निवडलेल्या एकूण १०० शेतकऱ्यांमध्ये सिमांत, लहान,मध्यम, मोठ्या शेतकऱ्यांचे प्रमाण खालीलप्रमाणे आहे.

तक्ता - धारणक्षेत्र निहाय पाहणी केलेले सिमांत, लहान, मध्यम व मोठे शेतकरी

सिमांत शेतकरी	लहान शेतकरी	मध्यम शेतकरी	मोठे शेतकरी	एकूण शेतकरी
१९	३१	४०	१०	१००

संकलीत केलेल्या सामुग्रीचे विश्लेषण

संकलीत केलेल्या तथ्यांचे विश्लेषण करुन पीक पध्दतीतील बदलांचे अध्ययन करण्यासाठी ज्ञान निर्देशांक (Knowledge Index) व अनुकरण निर्देनांक (Adoption Index) काढण्यात आले.

ज्ञान निर्देशांक (Knowledge Index)

ज्ञान म्हणजे एखाद्या व्यक्तीने प्राप्त केलेली माहिती होय. प्रस्तुत अध्यायनात आर्थिक सुधारणांमुळे अर्थव्यवस्थेत जे बदल झाले त्याबाबतची माहिती व जागरूकता म्हणजे ज्ञान होय. शेतकऱ्यांना आर्थिक सुधारणांमुळे जे बदल झाले त्याबाबतचे ज्ञान मोजण्यासाठी ज्ञानचाचणी (Knowledge Test) तयार करण्यात आली आहे. यात आर्थिक सुधारणांमुळे जे बदल झालेले आहेत त्याबाबतचे १९ घटक समाविष्ट आहे व त्याबाबतची उत्तरे आधीच दिलेली आहेत. त्यातील पूर्णत: माहिती आहे यासाठी ३गुण, अंशत: माहिती आहे यासाठी २ गुण व माहिती / ज्ञान नाही यासाठी १गुण (Score) दिला आहे. मिळालेल्या एकूण गुणांची बेरीज करून त्याचे रूपांतरण ज्ञान निर्देशांकात खालील सूत्राचा वापर करून केले आहे.

$$\text{ज्ञान निर्देशांक} = \frac{\text{माहितीचे मिळालेले एकूण गुण}}{\text{माहितीचे मिळण्यायोग्य महत्तम गुण}} \times १००$$

ज्ञान निर्देशांक म्हणजेच आर्थिक सुधारणांमुळेच झालेल्या बदलांचे ज्ञान (माहिती) असणाऱ्याचे शेकडा प्रमाण होय.

शेतकऱ्यांच्या ज्ञानाचे (माहितीचे) मोजमाप करण्यासाठी आर्थिक सुधारणांमुळे अर्थव्यवस्थेत झालेल्या बदलांची यादी पुढीलप्रमाणे - किंमतीतील बदल, बाजारपेठेच्या उपलब्धतेत वाढ, करारशेतीचे प्रमाण वाढले, बिगरशेतीसाठी जमिनीच्या मागणीत वाढ (प्लॉट, उद्योग, शाळा), संघटीत क्षेत्राकडून (औद्योगिक घराणे) शेतजमिनीच्या मागणीत वाढ, साठवणूक व शीतगृहांच्या उद्योगात वाढ, शेतमालावरील प्रकिया उद्योगात वाढ, जैविक तंत्रज्ञानात प्रगती, शेतीच्या यांत्रिकीकरणातील वाढ, वाहतुकीच्या सोयी-सुविधेत वाढ, दळणवळणाच्या

सोयीत वाढ, शेती व्यवसायाला मिळणाऱ्या अनुदानात बदल, पीक व इतर विमा सुविधेत वाढ, शेती व्यापारी तत्वावर केली जाऊ लागली., व्याजदरातील झालेला किफायतशीर बदल, शेतीव्यवसायात रोजगाराच्या संधीत वाढ झाली, ग्रामीण भागात मजुरांची संख्या कमी झाली, पाणी पुरवण्याच्या सुविधेत बदल आणि धारणक्षेत्रात बदल झाला

अनुकरण निर्देशांक (Adoption Index)

अनुकरण ही अशी मानसिक प्रक्रिया आहे की ज्यात व्यक्ती एखाद्या नाविन्यपूर्ण बदलाबाबतची माहिती प्रथम ऐकल्यापासून तिचा अंतिमत: वापर करण्यापर्यंतचा प्रवास होय. प्रस्तुत अध्ययनात अनुकरण म्हणजे शेतकऱ्यांनी आर्थिक सुधारणांमुळे झालेल्या बदलांच्या ज्ञानामुळे शेती व्यवसायात केलेले बदल, प्रामुख्याने पीक रचनेत केलेले बदल होय. पाहणी केलेल्या शेतकऱ्यांची अनुकरणाची पातळी काढण्यासाठी अर्थव्यवस्थेत झालेल्या बदलांच्या १९ घटकांची यादी ज्ञानपातळीप्रमाणेच तयार केली आहे. निवडलेल्या शेतकऱ्यांना त्याबाबतच्या प्रत्येक प्रश्नाचे उत्तर देण्याबाबत विनंती करण्यात आली. उत्तरदात्यांनी दिलेली उत्तरे तीन भागात विभागली ते म्हणजे १) पूर्णत: बदल २) अंशत: बदल व ३) बदल नाही व त्यास अनुक्रमे ३, २ व १ असे गुण (Score) दिले आहे मिळालेल्या एकूण गुणांची बेरीज करून त्याचे रूपांतरण अनुकरण निर्देशांकात खालील सूत्राच्या साह्याने केले आहे.

$$\text{अनुकरण निर्देशांक} = \frac{\text{अनुकरणाबाबत मिळालेले एकूण गुण}}{\text{अनुकरणाबाबत मिळण्यायोग्य महत्तम गुण}} \times १००$$

संशोधनाची व्याप्ती व कालखंड

प्रस्तुत अध्ययनाची व्याप्ती स्थूल व सुक्ष्म अध्यायनासाठी एरंडोल तालुक्यापुरती मर्यादित आहे. या अध्यायनाचा कालावधी २०००-०१ ते २००९-१० असा निश्चित करण्यात आला होता.

संशोधनाची उपयुक्तता

आर्थिक सुधारणांच्या कालावधीत कृषीक्षेत्रातील सुधारणा धिम्या गतीने होत आहेत. या पार्श्वभूमीवर या सुधारणांचे कृषी क्षेत्रावरील परिणामांचा अभ्यास करणे उपयुक्त ठरेल. या अभ्यासाच्या आधारावर भविष्यात कृषीक्षेत्रातील सुधारणा कोणत्या दिशेने व्हाव्यात याचा अंदाज बांधता येईल. हा अभ्यास शासनकर्ते, नियोजनकार, वित्तसंस्था, शेतकरी व संशोधकांना उपयुक्त ठरेल.

संशोधनाची मर्यादा

प्रस्तुत संशोधन हे नमुना निवड पध्दतीवर आधारलेले आहे. त्यामुळे नमुना निवड पध्दतीच्या मर्यादा या संशोधनाला लागू पडतात तसेच हे संशोधन एरंडोल तालुक्यातील निवडलेल्या शेतकऱ्यांच्या प्रतिसादावर आधारलेले आहे. या मर्यादा असल्यातरी प्रस्तुत संशोधन हे याच प्रकारची भौतिक, सामाजिक, आर्थिक परिस्थिती असलेल्या भारतातील इतर भागांना पर्यायाने संपूर्ण कृषी क्षेत्राला लागू पडल्यास उपयुक्त ठरेल.

प्रमुख निष्कर्ष

दुय्यम आकडेवारीवर आधारित प्रमुख निष्कर्ष

- एरंडोल तालुक्यातील एकूण अन्नधान्याच्या लागवडीखालील क्षेत्राच्या प्रमाणात अध्ययनाचा कालावधीत (२०००-०१ ते २००९-१०) घट (५०.३७% वरून ३८.५०%) झालेली दिसून येते.

- मात्र एकूण अन्नधान्यांतर्गत एकूण कडधान्याच्या लागवडीखालील क्षेत्राच्या प्रमाणात उपरोक्त कालावधीत सिमांत वाढ (१३.८१% वरून १४.११%) झाल्याचे दिसून येते तर एकूण तृणधान्याच्या लागवडीखालील क्षेत्रात थोडी घट झाल्याचे दिसून येते.

- एकूण तृणधान्यात घट दिसत असली तरी त्याअंतर्गत येणा-या मका पिकाच्या लागवडीखालील क्षेत्राच्या प्रमाणात बरीच वाढ (०.६३% वरून ३.९०%) झालेली दिसून येते. तर ज्वारीच्या लागवडीखालील क्षेत्राच्या प्रमाणात बरीच घट (२७.४५% वरून १४.५१%) झाल्याचे दिसून येते.

- गव्हाच्या लागवडीखालील क्षेत्राच्या प्रमाणामध्ये अभ्यासाच्या कालावधीत जवळजवळ दुपटीइतकी वाढ झाल्याचे निदर्शनास येते

- तूर (१.७४% वरून ३.५६%) व हरबरा (१.४५% वरून ३.३६%) पिकांच्या लागवडीखालील क्षेत्राच्या प्रमाणात दुपटीपेक्षा जास्त वाढ झाल्याचे आढळून येते.

- मात्र एकूण गळीत धान्यांतर्गत येणा-या भुईमूग पिकाच्या लागवडीच्या क्षेत्राच्या प्रमाणात तिपटीपेक्षाही जास्त (१.३१% वरून ४.६५%) वाढ झाल्याचे आढळून येते.

- इतर गळीत धान्याच्या लागवडीखालील क्षेत्राच्या प्रमाणातही फार मोठ्या प्रमाणात (०.०२% वरून २.२०%) वाढ झाल्याचे आढळून येते.

- नगदी पिकांतर्गत येणा-या ऊसाच्या लागवडीखालील क्षेत्राच्या प्रमाणात वाढ झाल्याचे (१.४२% वरून २.०१%) निदर्शनास येते.

- मात्र नगदी पिकांपैकी कापूस या दुस-या पिकाच्या लागवडीखालील क्षेत्राच्या प्रमाणात निम्म्यापेक्षाही जास्त (३७.०७% वरून १६.३२%) घट झाल्याचे आढळून येते.

- केळीच्या लागवडीखालील क्षेत्राच्या प्रमाणात दुपटीपेक्षा जास्त (०.९८% वरून २.३३%) वाढ झाल्याचे निदर्शनास येते.

- एकूण भाजीपाला व फळांच्या लागवडीखालील क्षेत्राच्या प्रमाणात उपरोक्त कालावधीत दुपटीपेक्षा जास्त (२.६१% वरून ५.६७%) वाढ झाल्याचे आढळून येते.

- सर्व पिकांचा एकत्रित विचार केला असता बाजरी, एकूण तृणधान्य, मूग, तीळ व कापूस या पिकांच्या लागवडीखालील क्षेत्राच्या प्रमाणात घट झाली तर गहू, हरबरा, तूर, एकूण कडधान्ये, भुईमूग, केळी व एकूण भाजीपाला व फळे यांच्या लागवडीखालील क्षेत्राच्या प्रमाणात वाढ झाल्याचे दिसून येते म्हणजेच घट झालेल्या पिकांची जागा वाढ झालेल्या पिकांनी घेतली आहे.

प्राथमिक आकडेवारी आधारित अभ्यासाचे प्रमुख निष्कर्ष

- सिमांत (२३०), लहान (२०५.५४) आणि मध्यम (१८३.७५) शेतकऱ्यांची पीकाची घनता एरंडोल तालूक्यापेक्षा (१७९.२९)जास्त आहे. तर मोठ्या (१५१.८५) शेतकऱ्यांच्या बाबतीत ती कमी आहे.

- पाहणी केलेला एरंडोल तालूक्याचा जिरायती क्षेत्राचा विचार केला तर अनुक्रमे कापूस,मका,ज्वारी,बाजरी ही प्रमुख पिके आहेत तर बागायती क्षेत्रात अनुक्रमे कापूस कांदा, मका, गहू, व तांदूळ ही प्रमुख पिके असल्याचे दिसून येते. एरंडोल तालूक्यातील सर्वात प्रमुख पिक असलेल्या कापसाची लागवड जिरायती व बागायती अशा दोन्ही भागात मोठ्या प्रमाणा होत असली तरी तुलनेने बागायती क्षेत्रातील कापसाच्या लागवडीखालील क्षेत्र जिरायती क्षेत्रापेक्षा जास्त असल्याचे निदर्शनास येते

- सिमांत शेतकऱ्यांचा जिरायती क्षेत्राचा विचार केला तर कापूस हे प्रमुख पीक दिसून येते. त्यानंतर प्रमुख पिकांमध्ये अनुक्रमे मका, मूग व ज्वारीचा क्रम दिसून येतो. बागायती क्षेत्रातही कापूस हेच प्रमूख पीक असल्याचे दिसते. त्यानंतर गहू व कांदा याचा क्रमांक लागतो. कापूस हे पीक दोन्ही क्षेत्रात प्रमुख असले तरी जिरायती क्षेत्रापेक्षा बागायती क्षेत्रात त्याचे लागवडीखालील प्रमाण तुलेनेने जास्त असल्याचे निदर्शनास येते.

- लहान शेतकऱ्याचा जिरायती क्षेत्राचा विचार केला तर मूग हे प्रमूख असल्याचे दिसते. त्यानंतर प्रामुख्याने पिकांमध्ये कापूस,मका,ज्वारी, बाजरी व उडीद हे असा क्रम लागतो. बागायती क्षेत्रात कापूस हे सर्वात प्रमुख आहे. त्यानंतर कांदा, गहू,व भुईमूग या पिकांचा क्रम येतो. कापूस हे पीक सर्वात प्रमुख असल्याने जिरायती क्षेत्रापेक्षा बागायती क्षेत्रात त्याच्या लागवडीखालील क्षेत्राचे प्रमाण अधिक असल्याचे आढळून आले.

- मध्यम शेतकऱ्यांच्या जिरायती क्षेत्राचा विचार केला तर मूग हे सर्वात प्रमुख पीक दिसून येते. त्यानंतर प्रमुख पिकांमध्ये मका,ज्वारी, व कापूस असा क्रम लागतो. बागायती क्षेत्राचा विचार केला तर कापूस हे सर्वात प्रमुख पीक असुन त्यानंतर कांदा,गहू,केळी व भुईमूग असा क्रम लागतो. कापूस हे पीक दोन्ही क्षेत्रात होत असले तरी जिरायती क्षेत्रापेक्षा बागायती क्षेत्रातील त्याचे लागवडीखालील प्रमाण अधिक असल्याचे दिसून येते.

- मोठ्या शेतकऱ्यांच्या जिरायती क्षेत्राचा विचार केला तर मका हे सर्वात प्रमुख पीक असल्याचे दिसते. त्या नंतर प्रमुख पिकांमध्ये मूग,बाजरी,कापूस व ज्वारी यांचा क्रम लागतो. बागायती क्षेत्रात कापूस हे सर्वात प्रमुख आहे. त्यानंतर केळी,कांदा,गहू व तांदूळ या पिकांचा क्रम लागतो. कापूस हे पीक दोन्ही क्षेत्रात प्रमुख असले तरी तुलनेने जिरायती क्षेत्रापेक्षा बागायती क्षेत्रामध्ये लागवडीखालील क्षेत्राचे प्रमाण अधिक असल्याचे निदर्शनास येते.

- आर्थिक सुधारणांच्या कालावधीत ज्या विविध घटकांमध्ये बदल झाला त्यापैकी किंमतीत झालेले बदल हा प्रमुख घटक असून एरंडोल तालुक्याची पाहणी केलेल्या ९६.६७% शेतकऱ्यांना या घटकाचे ज्ञान असून त्यामुळे ८५.६७% शेतकऱ्यांनी पीक रचनेत बदल दिसून येतो.

- एरंडोल तालूक्याची पाहणी केलेल्या सिमांत शेतकऱ्याना किंमतीतील बदल या घटकांचे असलेले ज्ञान (९४.७४ %)व त्यामुळे पीक रचनेत केलेला बदल (८२.४६%) यांचे प्रमाण तुलनेने सर्वाधिक आहे.

- एरंडोल तालूक्याची पाहणी केलेल्या लहान शेतकऱ्यांच्या किंमतीत बदल या घटकांचे असलेले ज्ञान (९५.७०%) व त्यामुळे पीक रचनेत केलेला बदल (८३.८७%) यांचे प्रमाण तुलनेने सर्वाधिक आहे.

- एरंडोल तालूक्याची पाहणी केलेल्या मध्यम शेतकऱ्यांनी किंमतीतील बदल या घटकाचे असलेले ज्ञान (९७.५०%) व त्यामुळे पीक रचनेत केलेला बदल (८६.६७%)यांचे प्रमाण तुलनेने सर्वात जास्त होते.

- एरंडोल तालूक्याची पाहणी केलेल्या मोठ्या शेतकऱ्यांना किंमतीतील बदल या घटकाचे असलेले ज्ञान (१००%) व त्यामुळे पीक रचनेत केलेला बदल (९३.३३%) याचे प्रमाण तुलनेने सर्वात जास्त दिसुन आले.

  अनुकरण १००% न होण्यामागे पुढील प्रमुख अडथळे निदर्शनास आले.

- खंडीत वीजपुरवठा, शीतगृहांचे अंतर व भाडे जास्त, साठवणूक व शीतगृह उपलब्ध नसणे, सिंचनासाठी पाण्याची कमी उपलब्धता संपर्क माध्यमांचा अपुरा वापर, आदानांच्या जास्त किंमती कर्ज आणि स्त्रोताच्या माहितीचा अभाव शव पीक व इतर विम्याच्या माहितीचा अभाव वेळेवर खते न मिळणे, वाहतुकीची साधने उपलब्ध नसणे सामाजिक सहभागाचा अभाव, सहकाराचा अभाव वैज्ञानिक दृष्टीकोनाचा अभाव, बियाणे उपलब्ध नसणे, विस्तार सेवांची अपूर्णता इ.

वरील सर्व निष्कर्षांवरून आर्थिक सुधारणानंतरच्या कालखंडात पीक रचनेत बदल घडून आला हे गृहीतक सिध्द झाले आहे.

उपाययोजना

आर्थिक सुधारणांच्या कालावधीत ज्या आर्थिक घटकात बदल झाले. त्यामुळे साधारणत: ५५.२६% शेतकऱ्यांनी पीक रचनेत बदल केल्याचे आढळले. मात्र उरलेल्या शेतकऱ्यांना आर्थिक सुधारणांची माहिती मिळवून घेणे व त्याचे अनुकरण करणे यात अनेक अडथळे आले. या अडथळ्यांचे निराकरण करणे गरजेचे आहे. त्या अनुषंगाने खालील उपाययोजना महत्त्वाच्या ठरतात -

- शेतीच्या उत्पादकतेत वाढ होण्यासाठी ग्रामीण भागात अखंडीत व शक्य तितक्या अधिक काळासाठी वीजपुरवठा होणे गरजेचे आहे.

- शेतीत निर्माण होणाऱ्या रोजगाराचे स्वरूप हंगामी असते. त्यामुळे ग्रामीण मजूर शहराकडे स्थलांतरित होतात व शेतीमध्ये मजूरांच्या तुटवड्याची समस्या निर्माण होते. त्याकरिता हंगामाव्यतिरिक्तच्या कालावधीत ग्रामीण भागात इतर क्षेत्रात रोजगार निर्माण होईल यादृष्टिने शासकीय पातळीवर प्रयत्न होणे अत्यावश्यक आहे.

- आर्थिक सुधारणांमुळे पीकरचनेत बदल करण्यासाठी शेतीत मोठ्या प्रमाणात भांडवलाची गरज निर्माण झाली आहे. परंतु आजही वित्तसंस्थामार्फत पुरेशा भांडवल पुरवठा होत नाही. म्हणून किफायतशीर व योग्य वेळी पुरेसा भांडवल पुरवठा करण्यासाठी ग्रामीण भागात संस्थात्मक पातळीवर वित्तसंस्थाचे जाळे सुदृढ करणे गरजेचे आहे.

- कृषी विस्तार सेवा व संपर्क माध्यमांच्या अपुरा वापर होत असल्याने अनेक योजना शेतकऱ्यांपर्यंत पोहचत नाही. त्यासाठी कृषी विस्तार कार्यक्रम अधिक प्रभावीपणे राबविणे गरजेचे आहे. तसेच संपर्क माध्यमातून शेतकऱ्यांना शेतीविषयीच्या उपयुक्त सूचना मोफत वेळेवर देण्याची योजना करावी.

- काही शेतकरी फळे व भाजीपाल्याची पिके घेऊ इच्छितात. या पिकांची साठवणूक करण्यासाठी शीतगृहे अत्यंत कमी प्रमाणात उपलब्ध आहेत. म्हणून ग्रामीण भागात ठिकठिकाणी शीतगृहांची सोय उपलब्ध करणे व त्याचे भाडे शेतकऱ्यांना परवडेल इतकेच ठेवणे गरजेचे आहे.

- अनेक शेतकरी रूढी परंपरांच्या प्रभावामुळे तसेच नवीन उपक्रम करण्यातील धाडसीपणाच्या अभावामुळे आर्थिक सुधारणांच्या कालावधीत जे बदल झाले त्यांचे अनुकरण करून शेतीव्यवसायात सुधारणा करीत नाहीत. त्यासाठी ग्रामीण भागात उच्च शिक्षणात वाढ करून वैज्ञानिक दृष्टिकोन निर्माण केला पाहिजे.

- धारणक्षेत्र लहान असल्यामुळे अनेक शेतकरी शेतीव्यवसायात नवीन उपक्रब राबवित नाहीत. अशावेळी सहकारी तत्वावरील शेतीस प्रोत्साहन देणे गरजेचे आहे.

- शेतीक्षेत्राला लागणारे खते, बी-्बियाणे यासारख्या आदानांची नेमक्या गरजेच्या वेळी टंचाई निर्माण होते व शेतकऱ्यांना त्याची जास्त किंमत द्यावी लागते. म्हणून आदानांचा वेळेवर व किफायतशीर भावात पुरेसा पुरवठा करण्याची शासनाने काळजी घ्यावी.

- ग्रामीण भागातील बहुसंख्य शेतकरी अजूनही पीकविमा व इतर मालमत्तेच्या विम्याचा लाभ घेत नाहीत. त्याबाबतचे अज्ञान दूर करून विविध विमा योजनांची माहिती शेतकऱ्यांपर्यंत पोहचविणे गरजेचे आहे.

संदर्भ सूची

१. प्रा. मुलाणी महंमद रफीक उमराव, कृषी अर्थशास्त्र, Success Publication, Pune, आवृत्ती सप्टेंबर २००९, पृ. ३१२

२. रा. र. बोराडे, संशोधन पध्दतीशास्त्र, आवृत्ती पहिली, १७ सप्टेंबर २००५, पुणे विद्यार्थी गृह प्रकाशन, पुणे, पृ. २

३. प्रा. सौ. अलका झिमरे, कृषी अर्थशास्त्र, सुयश प्रकाशन, पुणे, प्रथमावृत्ती, दि. ११ डिसेंबर २००२, पृ. ५२

४. ज. फा. पाटील, के. जी. पठाण, पी. जे. ताम्हणकर, अर्थशास्त्रीय संशोधनाची तोंडओळक, पहिली आवृवी, १९७९, कॉन्टिनेन्टल प्रकाशन, पुणे, पृ. २२

५. बडवे महेश मोहनीराज, आर्थिक सुधारणांनंतरच्या कालखंडातील (१९९१-२००१) महाराष्ट्र आणि खान्देशातील पीक रचनेतील बदलाचा तौलनिक अभ्यास (फेब्रुवारी २०११), अप्रकाशित प्रबंध, उत्तर महाराष्ट्र विद्यापीठ, जळगाव, पृ. ४५२, ४७४-४७८

६. Pawar A. N. - Some Aspects of Agricultural Development in Maharashtra, Serial Publications, New Delhi

History

yàmwàÑÂàà jà §ýàÓ ß ¥§ý Âàà½à§ýÎàeâu ¡Çuày

सुचिता एस. वसावे, अविनाश एम. बाविस्कर, अतुल एस. गव्हाळे, जुगलिकशोर दुबे*

kÂàqÀâu yÙàà°uà ¡ÐmàÂàmÊ À©hÂàtÁu âwÎàxmß tÑàÊà¯àm ¡Ît§ý, tv§ý, âwÀs, ¡qÊàm§ý ¢. ZàÀÎàà j ¥§ý0àã§ýÊ½à §ýÚÀà ÊàK§ýLu ¥§u yào½ààÊ yàmwàÑÂà Ñ ¥§ý ¡àù Êàk iÊà½à Ñàu. ÂâÕà½àm ÊàkÂààtàâ§ým Âàà½àã qà»|½uà j óu w ¥§ý ÎuwÐnm jvÂàÎuwÐnà ââàtà½à §ýÚÀà ¼uàm yàm¼u °|w½uà j óu ¼uàÂàà ùàw vªàm. yàmwàÑÂàà°uà §ýàÓàm ÂâÕà½à sàÊmàm, âwÎàxmß tÑàÊà¯àm oàâtsý, ¡ààn§ý ¡ââ½à Êàk§ýLu Õà0àà°uà §ýyà¹âwÊ âw jàÊ §ýÎuày ¼uà j uªà ¡âmÎàu wswÎààvã ¡yÌuà j ââàÀÎàÂààvy um. yàmwàÑÂàà°uà ¢âmÑàyà°uà yÀsàm tààÑmã À½ààÊ qÊà½à, Zààmtàvh, âÎàvàvh, v½àã, £¼hÂàÂààmÂà ZààÀm lÀvvã q°|½à, mÊ, sà§ýÊÀÀà uà yàÊhã Zàà j ãÂà ÂàªàÊ w £¼hÂàÂààm ÐnÓàwÚÀà ZààÀm lÀvluà âwâwo sààm§ý qÊàÎuàyÑ Âàà½àã Ñã ¼uà°uà Êàkwlà, Îààyý§ýà j à §ýt ¥§ýÀÊj yyªàmq½à ¢âmÑày âvâÑ½uày uà yàoÂàà j ã tàvà j ã tÀm âtÓm. qÊà½à, âÎàvàvh ¡ââ½à Âàà½à§ý Îàeâu qÊàÎuà j à ¡Çuày §ýÚÀà ¢âmÑàyý§ýàÊàÂàã yàmwàÑÂàà°uà ¢âmÑàyàyÀsàm kã tà»|½àã §ývã ¡àÑ ¼uàm §ýàÑã Zàth tmsÀ ¡àqÎuàvà °|Ó§ýq½à âÀyÂà umàm. £Àà. Îààyý§ýà j à §ýt yàmwàÑÂàà°àà £ÀuÀ j à §ýàÓ mà ¢.y.q 230 §ýL ¢.y.q. 50 ? qÊà½ààtÁu t¼Ðu, wàu, rûà»| ¡ââ½à sàªàwm qÊà½àtÁu ÊàkwÎààmãv Îààyý§ýà°uà y©uràrm ¥§ýwà§umà ¡à¼Óm ÂààÑã myj uà qÊà½ààtÁu '¡àos¼u' Ñ yràoÂà âÀv ¡yÌuÂà ¢âmÑày§ýàÊàÂàã ¼uà Îà£Àà°uà yÀsàm wªàwªàÓ ¡n §ýà¼Âà ¼uà j ã Êàk§ýLu 0Ðnmã w £¼qÙàã °|Êàw½uà j à Zàu¼Âà §ývvà ¡àÑ.

£qÊàQý âwwàÀ Ñ yàmwàÑÂàà°uà ¢âmÑàyàm Zà§ýxÂàà âÀyÂà umàm. qÊà½à, âÎàvàvhâu qÊàw ¡ââ½à Âàà½à§ýÎàeâu yàoÂàà j à ¥§ýà0àm âw j àÊ §ýÎuày yàmwàÑÂàà°uà ¢âmÑàyàyÀsàm £q0Ðnm §ýÎuà kà½ààËuà ZàÎÂààq§ýL rÊà j £ÙàÊ âtÓ Îà§ýmàm w myà Zàu¼ÂàÑã §ýÊ½uàm ¡àvvà ¡àÑ. E. J. Rapson, V. A. Smith, V. V. Mirashi, Rajgopalachari, Parbramhashastri, S. Rao, Ajaymitra Shastri, R. S. Morvanchikar ¢. yÎààoý§ýàÂàã wÊàv qÊàÎuà j à ¥§ýà0àm âw j àÊ §ýÚÀà §ýàÑã tm ÂààÂàwvvã ¡àÑm. mã ywà j ã tm ªààü ¡àÑm ¡yà uà j à ¡n ÂààÑã, mÊ ¼uàq§ýL yàmwàÑÂàà°uà ¢âmÑàyà°uà âwwàù ràrã°uà yÀsàm màâ§ý§ý w qÊàÎàààÂà™| tà»|½ààmÂà ytàoàÂà§ýàÊ§ý £ÙàÊ Îààu½uà j à Zàu¼Âà §ývvà ¡àÑ. ¼uàq§ýL §ýàÑã tmà j à qÊàtÎà ¡àq½à uà â°§ýà½àã imvvà ¡àÑ. Âàà½à§ýÎàeâu qÊàÎuà¡àoàÊ uà Êàkwlàà°uà Zàth ràrãwÊ kà Zà§ýàÎà q»|mà mà q¼ nà»|§uàm Ðq¯ §ýÊ½uàm ¡àvvà ¡àÑ –

yàmwàÑÂàà j ã Âàà½àã ywZànt kÈy âZàÂyq uàÂà Zà§ýààÎàm §ývã. ¼uà°uà Âàà½uà j w½àÂà Zàntmß 1830 °uà ÀÎà§ýàmãv âZàÂyq°uà vhàm ¡à¼Ómàm. ¢âv¥¹ Àà Zà§ýààÎàm §ývÎuà 1858 toàv qÐm§ýàqàyÂà ÀâÕà½à sàÊmàmãv Âàà½uà°uà ¡Çuàyàvà ZààÊs lvà.[1] uà Âàà½uàwÚÀà yàmwàÑÂàà j ã wÎààwÓ ââà0Î j m §ýÊmàÂàà tàvà j ã tÀm âtÓàvvã ¡àÑ. t¼Ðu, rûà»|, âwÏ½à ¡ââ½à sàªàwm qÊà½ààmÂà uà wÎààm 30 Îààyý§ýà°uà y j ãvà 0Ðw§ýàÊv kàm ¡yv mÊãÑã qÊà½ààtÁu ÊàkÀ j ã wªàwªàÓã y©uà um. The Vayu refers to only 17, 18, 19 or 25 names and the `Bramhanda' to 17 while Vishnu mention 22, 24 or 23 names apposed to evidence of Matsya Purana which says that, there were 19 Kings, but 3 of manuscripts actually name 30. While in others the number varies 21-28. In spite of varying numbers it generally accepted that there were 30 rulers who are clearly named. [2] qÊm (¡àmàqum ÄýQý 20 ÊàkÀ j ã Âàà½àã yàq»|vvã ¡àÑm) qÊà½ààmãv wÎààwÓ ¡kuâtØà Îààeââà qÊà½ààmãv tààÑmã ¡ââ½à ¥âmÑàày§ý qÂààÀtà½àà°uà ¡àoàÊ ¡Àwuàn §ýà¼Âà yàmwàÑÂàà Îààyý§ýà°uà §ýtààyàÊ §ýàvh»| ââà0Î j m §ýÊ½uà j à Zàu¼Âà §ývvà ¡àÑ mà q¼ãv Zàtà½à ¡àÑ 3 –

SATVAHANAS : CHRONOLOGY AND ORDER OF SUCCESSION

Chhimuka (Simuka) Satvahana - Krishna
c. 52 – c. 30 BC c.29-12 BC

Satakarni[1]
c.12 BC – c.AD 44

Vedisri[2]
Gautamiputra Satakarni
c.AD 61 – 90

Vasishthiputra Pulumavi	Vasishthiputra Satakarni	Vasishthiputra Sivasri Pulumavi	Vasishthiputra Skandha Satkarni [3]
c.AD. 91- 118	c.AD. 119- 47	c.AD. 148- 55	c.AD. 156- 70
		Gautamiputra Yajna Satkarni	Gautamiputra Vijaya Satkarni
		c.AD. 171- 99	c.AD. 200 - 205
	Vasisthiputra Chanda Satkarni	Vasisthiputra Vijaya Satkarni	Vasusthiputra Pulumavi
	c.AD. 206 - 15		c.AD. 226 - 32

qÊà½ààÍuâmáÊQý §ýàÑã Êàkàjã Ââàw Ñã §ýwÓ Âàà½uàwÚÂà Öààm Ñàmàm. £Àà. tiÐwàmã, Ð§ýÀyàm§ý½àJ, §ýàâÎà§ýLqØà yàm§ý½àJ ¢. qÊm wÎààwÓãm ¾uàjà §ýt ytkm ÂààÑã.4 Âàà½à§ýÎààeÖààÂàãã Âàà½àZà§ýàÊà°uà (Typological) ¡àoàÊàwÚÂà uà Êàkwlààmãv Îààyѧýàjà §ýt âÂàöÎjm §ýÊ½uàjà Zàu¾Âà §ývvà ¡àÑ. ¾uà ¡àoàÊ yàmwàÑÂà iÊà½uàmãv qw§ýàvãÂà ¡àâ½à £ÙàÊ§ýàvãÂà Îààyѧýàj ªà¹ tà»½uàjà Zàu¾Âà §ývvà ¡àÑ. ¾uàZàtà½à yàmwàÑÂà, âyt§ý, §ýÏ½à, yàm§ý½àJ Zànt, yàm§ý½àJ âÕmãu (Zànt w âÕmãu uàwÚÂà ¢âmÑàyѧýàÊàtÁu tmsÀ ¡àÑm), ¡âqv§ ýÑ Êàk yàmwàÑÂàà°uà ¡àÊsã°uà §ýàÓàmãv mÊ ªààmtãqØà yàm§ý½àJ, wâÎàâ™qØà qÓtàwã, wâÎàâ™qØà Ð§ýÂÀ yàm§ý½àJ, wâÎàâ™qØà âÎàwóã qÓtàwã, ªààmtãqØà uÖà yàm§ý½àJ, tà¼ÊãqØà Îà§ýyÂà, ªààmtãqØà âwku yàm§ý½àJ, wâÎàâ™qØà j»Ðwàmã ¡àâ½à qÓtàwã âÕmãu ¢. Îààyѧý Ñ £ÙàÊ§ýàvãÂà Ñàm.

qÊà½ààmãv uàÀãm 30 Êàkà°uà yjãvà tàÂu §ýÚÂà âwâwo ¢âmÑàyѧýàÊàÂàã ¾uàjà §ýàvh» ¢.y.q. 230 m ¢.y. 230 ¡y ¥§ýÀÊãm 460 wx ¥w¼à ZàÀãi ¡yàwà ¡y tm tà»vv ¡àÑ. uàtÁu V. A. Smith, S. K. Gopalachari, A. S. Altekar ¡àâ½à V. V. Mirashi uàjà ytàwÎà ¡àÑ mÊ ¢âmÑàyѧýàÊà°uà ÀyËuà ªà¹àZàtà½à yàmwàÑÂàà°uà £Àjàjà §ýàÓ Ñà

¢.y.q. qâÑÌuà Îàm§ýà°uà tÁuàm ¡yàwà. `The second group dated the event to the last Quarter of first century B.C. and believe in shorter chronology'. [5] uà tmàvà ¡àÊ. kã. sà»âÊ§ýÊ, ¥j. yã. Êàujàoêã, »ã. yã. yÊ§ýâÊ uàÂàã q˜ã âÀvã ¡àÑ. qÊà½àà jà ¡àoàÊ i¤ýÂà ¥j. yã. Êàujàoêàââã uà tmày q˜ã ÂmàÂàà qÊà½àà jà ¡àoàÊ im ÈÑ¹v ¡àÑ §ýL, §ýà½wàuÂà ¡ââ½à yÎàtÂà wÊ '¡àÂo âyt§ý ÑÌvà §ýÊv ¡ââ½à Îàªà yÙàj ¡wÎàx Âà˜ §ýÚÂà Ñã q¿wã yqàÀÂà §ýÊv.' Ñ âwoàÂà hÊ ¡yv mÊ §ýàÑã wxàqum âyth Ñà yÎàtÂàjà yt§ýàvâÂà Ñàmà (¢.y.q 40 – 30) w ¢.y.q. qâÑÌuà Îàm§ýàm mà Ñà¤ýÂà ªvà Ñ Âàà§ýàÊmà u½ààÊ ÂààÑã. 6 qÊrûÎààeâÂàã §ýàSââvªààv un yàq»vÌuà Âàà½uà¡àoàÊ âyth Âà §ý½wàjà qÊàsw §ýÚÂà ¢.y.q. 30 và yàmwàÑÂà yÙàjã Ðnàqâàà Ìàvã ¡yÌuàj tm tà»v ¡àÑ. 7 qÊrûÎààeãj Ñ tm ªààü oÊÌuày ¡y vÕààm um §ýL, ¢.y.q. 187 và Îàw¹jà tàu Îààyȳ rÑôn uàjà wo §ýÚÂà qÌuâtØàÎàªà Ñà yÙàwÊ ¡àvà. Îàªààjã yÙàà 112 wxàqum â¹§ývã. ¼uàÂàmÊ 45 wx §ý½wàÂàã Îààyà §ýv. 112 ¡ââ½à 45 ¥§ý½à 157 wx Ñàmàm 187 toÂà 157 wx wkà §ýÌuày ¢.y.q. 30 Ñà §ýàÓ umà mnààq uà yÀsàm tmsÀ ¡àÑm. kÊ ¢.y.q. 230 Ñà yàmwàÑÂàà°uà £Àuàjà §ýàÓ tàÂàvà mÊ tªà £ÙàÊm uà §ývh»àm £ÙàÊ§ýàvâÂà tàu, my°à ¼uàÂàmÊ yÙàwÊ ¡àvv Îàªà ¡ââ½à §ý½w uà°uà ÎààyÂà§ýàÓàm yàmwàÑÂààjã ÊàkÂà§ýu ÐÐnmã §ýÎàà Ñàmã? m tà»âv§ý Ñàm §ýL Ðwmßà? ¡yà ZàÎÂà £qÐ¿àm ÊàÑmà. ¡àk rÊj ¢àmÑày§ýàÊ ¢.y.q. qâÑÌuà Îàm§ýàj tm ÌuQý §ýÊmàm Ñà yàmwàÑÂàà°uà £¼§ýxàjà §ýàÓ ¡yàwà uà tmày ªààü tàÂàmàm. Êââtvà nàqÊ uà°uà tmâÂàyàÊ, In the first century B.C. the Satvahana Dynasty was established in Western Deccan. [8]

ÀâÕà½àm tàmyj§ý Âààw ÐÐw§ýàÊ½uàjã q÷m yàmwàÑÂààÂàã ÐÐw§ýàÊvvã Ñàmã qÊm ¡àÊsã°uà §ýàÓàmãv Îààyȳàjã Âààw tàmyj§ý ¡à¼ÓÂà um ÂààÑãm. ªààmtãqØà yàm§ý½àJ qàyÂà wÂÎàã™qØà j»Ðwàmã qum°uà ytàÊ ¡à° m Âà¤ý Îààyȳàââã tàmyj§ý Âààw oàÊ½à §ýÌuàj Âàà½à§ýÎààeâu qÊàÌuàwÙÂàÑã Ðq˜ Ñàm. 'ªààmtã q¼my ym§ý½ày' ¡y Zàà§ým sàxmãv £Ìvh Âàà½uàwÙÂà ¡§ýLm §ývv ¡à¼Óàmà. ¡àÊsã°uà §ýàÓàmãv yàmwàÑÂàââã tàmyj§ý Âààw oàÊ½à §ývvã Âàyvã mÊãÑã ¼uà°uà §ýÓàm âeuàjà tàÂàyÂtàÂà âÂàØÎjmj §ývà kàm Ñàmà. yàm§ý½àJ Zànt°uà ¥§ýà Âàà½uàwÊ tÑàÊnã wÎààmãv ¼uàjã Êà½àã Âààªààâà§ýà uàj âjØà ¡yvv kà»Âàà½à £qÊàQý tmày q˜ã Âm. `Nagnika was first Indian Queen to have old coins liberal attitude towards women and their high social status appear to be the unique phenomenon of the Satvahana period"[9]

yàmwàÑÂààÂàã ¡àqÌuà Âàà½uàwÊ Zàà§ým sàxmj vh ¡â§ým §ývv ¡àÑm. yàmwàÑÂàà°uà qwJ tàu §ýàÓàmãv ytà¹ ¡Îàà§ý Âà âÎàvàvhàwÊàv vhàyà°ã Zàà§ým sàÎàvàj Zààoâu âÀvv âÀyÂà um. ¼uàtÓ yàÑkâ§ýj Zàà§ým Ñã ¼uà §ýàÓàmãv và§ýsàxà ¡yàwã. yàmwàÑÂààj ¡àmàqum 37 âÎàvàvh £qv£o Ìàvv ¡àÑm. ¼uàq§ýL 28 âÎàvàvh tÑàÊã˜àm mÊ 9 ¡àoàm ¡àÑm. uà ywàwÊàv vh Ñ tÑàÊã˜ã Zàà§ým tÁu w ràûã âvqãm ¡àÑm.10 kÂÂàÊ unãv Âàà½à i๠àm yàmwàÑÂàwÎàà°uà yÀsàm ¡âmÎàu tѼwàjã tààÑmã âtÓm. rûàÂàÀ ÀÎàqà»°uà tm yàmwàÑÂà ÊàkwÎààj Àw§ýv q½à âkÌüàmãv kÂÂàÊkwÓ Âàà½à i๠àm ¡àÑ. ¼uàj yàmwàÑÂà Êàk§ývàmãv âyth ¡ââ½à ¢mÊ ÊàkqÚxàj qmÓ §ýàÊvv ¡àÑm. ¼uà°uà Îààxsàªàã ¼uàjã Âààw tÑàÊã˜àmãv Zàà§ým sàxm §ýàÊvvã ¡àÑm mÎÑà yàmwàÑÂà Êàk§v Ñ ââàßyÎàuq½à tÊà°ã ¡àÑ.11 ÂààâÎà§ý vhàm £Ìvâhm '§ýÑàq½à Zàumà ªààwoÂà wànàwÐà ó½ààay' uà wâ§uàmãv §ýÑàq½à Ñ §ýàxàq½ààj Zàà§ým Úq ¡àÑ w m jàÀâj Âàà½à Ñàu ¡ââ½à tѼwàjã ràr §ýL ¼uàj Zàjvà yàmwàÑÂàà°uà Êà³uàm ¡yàw ¡ââ½à §ýàÀàjãm uàtÓ ¡àÊsã°uà §ýàÓàmãv yàmwàÑÂààÂàà jàÀâjã Ðwmßà Âàà½àã qà»¼uàjã ªàÊk q»vã Âàyàwã. ÂàÑqàÂààÎàã Ìàvàlùà yixàÂàmÊ yàmwàÑÂààÂàà ¡àoã ¼uàjãj Âàà½àã qÂàtôâm (ounter Struck) §ýÚÂà wàqÊvã ¡ââ½à ÂàmÊ Ðwmßàq½à jàÀâjã Zàâmtàuqý Âàà½àã qà»vã. 1906 tÁu kàªàv¹sã (âkÌÑà ÂààâÎà§ý) un 13,250 Âàà½uàjà yj yàq»và. uà yjàm ¥§ý¹Ùà ªààmtãqØà yàm§ý½àJjã 9,270 Âàà½àã Ñàmã. £wÊàm 3,980 Âàà½àã ÂàÑqàÂà uà Âàqâmjã Ñàmã.12 ªààmtãqØà w ÂàÑqàÂààm Ìàvlùà Êàk§ýLu yixàjà tѼwàjà qÊàwà ÈѽàÂà uà yjàj (Hoard) tѼw ¡àÑ. uà âwkuàjà £Ìvh qÓtàwã°uà ÂààâÎà§ý âÎàvàvhàm ¡àvvà ¡àÑ. ¼uàm ªààmtãqØààvà 'Ìà§ýuwÂàqÌvwâÂàxÀÂày' ¡ââ½à '§ývuÎàZààm™àqÂà§ýÊy' ¡yà £Ìvh ¡àÑ. wÊàv jjwÚÂà ¡àq½ààay §ýàÑã ràrã vÕààm umàm. ¼uàq§ýL qâÑvã - yàmwàÑÂààÂàã Zàà§ým sàxjà wàqÊ §ývvà ¡àÑ. ÀyÊã - §ýàxàq½à Ñ jàÀâj Âàà½à ¼uàÂàã qà»v ¡yàw â§ýwà ¼uà°uà Êà³uàm mã Zàjvãm ¡yàwã ÈѽàÂà ¡àÊsã°uà §ýàÓàmãv yàmwàÑÂààjã jàÀâjã Âàà½àã âÀyÂà um ÂààÑãm. ¡ââ½à âmyÊã – ªààmtãqØààjà §ýàÓ yàmwàÑÂàà°uà qÂàÚ¼nàÂààjà ¡àÑ ¡ââ½à ÂàÑqàÂààwÊ âtÓâwvÌuà ¼uà°uà âÎàvàvhâu £Ìvhày Ñ Âàà½à§ýÎààeâu qÊâw s§§ýtmà ZàÀàÂà §ýÊmàm.

yàmwàÑÂààÂàã ¡àqÌuà £¼§ýxàrÊàrÊj m¼§ýàvâÂà tàu yàtà³uàmãv §ýàÑã ÄýàÊ tà°à ssàªà âtÓâwvvà ÂàÎÑmà. ¡àÊsã°uà §ýàÓàmãv yàmwàÑÂà Ñ Âààw ¡yvvã Âàà½àã kÂÂàÊvà yàq»vvã ¡àÑm. According to the early coins and

inscriptional evidence, Naneghat and Nevasa site, the territories under the earliest groups of aims of the like Satvahanas, Satkarni and Satishri were around Nevasa, Tripuri, Vidhisha, Vidarbha and Central Talanghana areas [13] ªààmtãqØà yàm§ÿ½àJ°uà §ÿàÓàm m¹ãu ¡ào w §ÿÂàa¹§ÿ Ñà ZàÀÎà âk§ÿ½uàm ¡àvà. yàmwàÑÂàà°uà Âàà½uàwÊãv ªàkvÕtã uà Zààm§ÿà°uà yÀsàm Ðq˜| §ÿÊmàÂàà Îààsààà ªààhv°uà tm yàm§ÿ½àJ âÕmãu°uà §ÿàÓàqàyÀà uà âjÂÑàj ¡§ÿÀà ¼uà°uà Âàà½uàwÚÀà ZàAâÎàm Iàvv ¡àÑ. tàÓwà, yàm§ÿ½àJ°uà màÆuàm ¡àÎuàÂàmÊ Ñ Zàmã§ÿ mnÀà i½uàm ¡àvv Ñàm.14 yàmwàÑÂàà°uà Âàà½uàj yju Ñ tÑàÊà˜|, tÁuZàÀÎà, ¡àoZàÀÎà, §ÿÂàa¹§ÿ ¡ààÀ âwÐmm sàªààmÀà yàq»|vv ¡àÑm. ¼uà ¡àoàÊ uà §ÿÓàmãv âwâwo Îààyy§ÿà°uà §ÿàÓàmãv yàtà³u âwÐmàÊàjã §ÿIqÀàà um. uÖàóã yàm§ÿ½àJj ÀàÀà âÎà»|à°uà kÑàkàj âjØà ¡yvv Âàà½à Ñ §ÿàÊàt»v°uà â§ÿààËuàwÊ yàq»ÌuàÀà ¼uà°uà §ÿàÓàm yàmwàÑÂààÀàã ¡àªÀàu ¡ààÎàuàÎàã Íuàqàʹ ¡àià»|ã imÌuàj y§ÿm âtÓmàm. ¡nàm Ñà sàªà uÖàóâ°uà màÆuàm ¡yàwà. qÊà½ààm uÖàóâÀà Àãi§ÿàÓ 27 wx Îààyàà §ÿIuàj Ààhv ¡àÑ. uàvà Âàà½à§ÿÎààeãu ¡àoàÊ vàsvvà ¡àÑ. A Terracotta mould which contain 3 sockets for portrait coins of Gautamiputra Yajneshri Satkarni has been found at Paithan. It reveals 3 different portraits Yajneshri. They show young middle aged and old portrait of King. [15] ¡nàm uàwÚÀà uÖàóâÀà Àãi§ÿàÓ Îààyàà §ÿÌuàj âÀàÀÎàààÀy um.

yàmwàÑÂàà°uà ZààÀâÎà§ÿ âwÐmàÊàjã ¡ââ½à Îààyy§ÿà°uà §ÿàÓââwxuãjã tââÑmã À½uày âº§ÿàº§ÿà½ààÑÀà yàq»|vv ¼uàj Âàà½uàj yj Ñ ¡Îàà Zà§ÿàÊ ¼uà°uà ¢âmÑàyvhÂààm yÑàÆusm ºÊmàm. mËÑàÓà (âk. ¡§ÿàvà) unâv yàq»vÌuà Âàà½àyjàm uà ÈàkwÎààmãv kwÓqày rÑm§ÿ Îààyy§ÿàjã Âàà½àã ZààÀm Iàvvã ¡àÑm. 1939 tÁu mËÑàÓà uà âº§ÿà½ââ 1600 Âàà½uàjà yj (oard) ZààÀm Iàvà ¡yÀà ¼uàtÁu yàm§ÿ½àJ, âyÊã qÓtàwã, wââÎââ™|qØà yàm§ÿ½àJ, âÎàwâyÊã qÓtàwã, Ð§ÿÀ yàm§ÿ½àJ, âyÊã uÖà yàm§ÿ½àJ, âwku yàm§ÿ½àJ, §ÿ½à yàm§ÿ½àJ, âyÊàyy§ÿ yàm§ÿ½àJ ¡ââ½à âyÊãqÓtàwã (mmãu ?) uà Îààyy§ÿàjã Âààw ¡yvvã Âàà½àã Ñàmã. Ñã Âàà½àã qà¹|ãÀàjã ¡àÑm. [16] (Potin is an alloy of copper, tin, zinc and lead) wÊãv Âàà½àã Ñã âtó oàmjã ¡yÀà Ñã Âàà½àã ªààvà§ÿàÊ ¡àÑm. uàwÊ ¥§ÿà ràky Îà»|à £jàwvvà ªàk (Upraised Trunk) ¡à¼Ómà. [17]

This Houard also indicates that the Vidarbha earia was under the Satavahanas at least from the time of Gautamiputra Satkarni till its down fall.[18]

yàmwàÑÂààÀàã ¡àqÌuà §ÿàÓàm wâÎà˜|uq½à ¡Îàã jvÀàÍuwÐnà ââàtà½à §ÿvvã Ñàmã. uàj £¼§ÿ˜| £ÀàÑÊ½à ÈÑ½àk âwâwo âº§ÿà½ààÑÀà yàq»½ààÊã ¼uàjã Âàà½àã Ñàu. Ñã Âàà½àã ¡àk ¼uà°uà ¢âmÑàyàmãv ¡yvvã qà§ÿÓã sÚÀà §ÿà¼½uày ¡nàm ¢âmÑàyàwÊ Âàwà Zà§ÿàÎà ¹à§ÿ½uày yÑàÆu §ÿÊmàm. uàwÚÀà ¼uàjã £¼qÙàà, ZààÀâÎà§ÿ âwÐmàÊ, Îààyy§ÿàjã y©uà, sàxà, ot ¢. ¡Àà§ÿ ÕàØààmãv tââÑmã À½uàm ¡àqv uàªàÀàÀà Àm ¡àÑm.

(1)

(2)

(3)

(4)

(5)

1) Õà¡àq ÂàÑqàÂà j qÂàtâôm Âàà½à jÑËuàwÊ yàmwàÑÂàà j £³kÂà â j ÂÑà j ¡§ýÂà §ýv v ºÓ§ýq½à âÀym ¡àÑ. tàªàãv ràky wk â j ÂÑ ¡§ýLm ¡àÑ.

2) wâÎà™q¡à qÓtàwã j j àÀã j Zàâmtàu Qý Âàà½à.

3) ªàkvÕtã ²àq âÎàÎàà°uà Âàà½uà j â j ¡à.

4) mÊ unãv §ý. Êàtâvªàlqà vàtmÊ Îààyy§ýLu yªàÑàvuàm ºwvvã ªàkvÕtã ²àq tàmã j ã tôà.

5) yàmwàÑÂààÂàà j qà¹âÂà oàm j Âàà½à Îà»à £ j àwvvà ªàk ¡àà½à ¼uàwÊãv Zàà§ým sàxà w ràÛâvãqãmãv 'yàm§ý½ày' Ñà vh Ðq˜q½à âÀym ¡àÑ. uà Âàà½uà°uà tàªàãv ràky £³kÂà â j ÂÑ ¡àÑ.

References

1. www.medversity.com, page 1 of 1
2. Jha, Amiteshwar `Bearing numismatic evidence on the Puranic sequence of the Satavahana Kings (ed. by Shastri A. M., 1999.) The Age of the Satavahanas, Vol-II, pp-298.
3. Shastri A. M., `Pururanas on the Satavahanas and Archeological, Historical Perspective (ed. Shastri A. M. 1999) . The Age of the Satavahanas, New Delhi. Asian Books International Vol.-I p.p. 34.
4. **âtÊâÎàã, wà. âw. (1979) yàmwàÑÂà ¡àà½à qÎ j tà Õà¡àq uà j à ¢âmÑày ¡àà½à §ýâÊàw vh, tr¢ t.Êà.yà.y.t, q. 48,49.**
5. Sharma I. K. `New Evidences on the early Satavahanas Coinage Culture and Commerce, (ed. Shasatri A. M., 1999), (Vol.-II, pp. 345)
6. **¡Âà- ¡àºwv ¥y., ràq»J§ýÊ ¥t. 2006, Zàà j ââà sàÊmà j à Êàk§ýLu ¢âmÑày (Êàu j àoÊã Ñt j ô) q½à, »àut» q0ãv§ýÎàâà, q. 433.**
7. Raja Reddy B., Reddy P., Suryanarayan (1987), Kotilingala Coinage of Satavahanas and Other Local rurals a profile Haidrabad.
8. Thapar Romila, `Early India' Penguin Academic, pp. 225
9. **ªààhv Îààsâàà** "Satavahana Coinage : Origins and Influences", The age of Satavanas, (ed. Shastri A. M.) Vol.-2, pp 279.
10. **tàÊw j â§ýÊ Êà. óã., (2009) ß yàmwàÑÂà §ýâvãâà tÑàÊã˜, q½à Zàâmtà Zà§ýâÎàâÀà. q. 37**
11. **ÀÎàqà» rÛàâàÀ (yqà) Îààotôà (h» 3) ¡àÊªàràÀ §vày qÆvã§ýÎàây, q. §ý.25**
12. **¼wÓã§ýÊ t. §ý. (2006). Zàà j ââà sàÊmãu Âàà½ã§ýÎàe, q½à, §ýâÂ¹ââÂ¹v q.§ý. 81.**
13. **£qÊàQý Îàtà ¡àu. §ý. q. 342**
14. Gokhale Shobhana, (1981). "New Discovery in Satavahana coinage, JNSI). Vol. XLIII, pp.55.
15. **£qÊàQý ªààhv Îààsâàà (1999) q. 280**
16. Shrivastava S. L. (2006), An Introduction to the Satavahana Coinage, Mau (U.P.), Krishna Books Publications, pp. 52)
17. Ray Himanshu Prabha (1991). `Trade in Deccan Under the Satavahanas: Numismatic evidence' `Coinage trade and economy'. (ed. Jha Amalkumar, Anjneri IIRNS pp. 60)
18. **£qÊàQý óãwàÐmw q. 52**

Psychology

IMPACT OF CARTOON CHANNELS VEIWING ON AGGRESSION AND MENTAL HEALTH AMONG CHILDREN

Mayuri Sharma, C.P.Labhane*, P.A.Baviskar

ABSTRACT

The present study was conducted to see the aggression level of viewing cartoon channels on secondary school going students of Jalgaon City. Mental health was measured by Anandkumar and Giridhar Thakur (1986) Mental health inventory.While Dr.Mathur & Dr.Bhatnagar Aggression scale was used to measure the aggression level of the students. For this study a sample of 40 male & female students of age range 14-16 years studying in secondary school classes were selected from different school of Jalgaon city.

Keywords- Children viewing the different cartoon channels, Mental Health,Aggression.

* Address to whom the correspondence shall be made.

INTRODUCTION -

When in the past time TV had come into our country, every person was excited about it. Nowadays TV is a common thing, which is available in our house. Some people watch TV to escape to their difficulties in real life. Fantasy and reality are very difficult to tell apart for children. TV requires as much concentration as reading. If kids watch lot of TV, they will get used to it and want be able to concentrate at school. Kids who have TV in their room cannot focus on their homework because of it. Day time sleepiness for kids is caused by late night TV watching. TV can affect kid's health behavior and family life in negative ways.

There were many shows like MAD (music, art and dance) and Backyard Science, which were purely based on new ideas. Unique concepts like MAD had great art and the drawing which they used to show were totally unique and awesome and in Backyard Science children used to invert new things by waste in the Backyard which would make science interesting as most of the children doesn't like it.

There are some good and some bad influence of TV shows. When the children see the cartoon or cartoon films, their concentration is so deep that it has great impact on their mind. Consequently they imitate the character of the cartoon film, which has impressed them most and they imitate that character as much as they talk like them and behave like them. They develop the style, hair style, life style of character in themselves. They identify themselves with the character.

SOME IMPORTANT CONCEPTS OF THE STUDY:-

AGGRESSION:-The internal infliction of some form of harm on **others**.

Behavior directed toward the goal of harming another living being who is motivated to avoid such treatment.

MENTAL HEALTH:-

Mental health describes a level of psychological well-being, or an absence of a mental disorder.

The World Health Organization defines mental health as "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community".

AIM OF THE STUDY:-

The major aim of the present study is to find out the relationship between two variables namely aggression and mental health and also find out the influence of sex difference on aggression and mental health of the male and females children.

SCOPE OF THE STUDY:-

A total sample of 40 children 20 girls and 20 boys from different places of Jalgaon city were collected. The age range of the subject was 14 to 16 years.

OBJECTIVES:-

The main objectives of the study are as follows:

1) To study the aggression in children, who watch the TV more than two hours.
2) To study the mental health in children, who watch the TV less than two hours.
3) To study the aggression in male children.
4) To study the mental health in female children.
5) To study the other factors affecting mental health of the male and female children.

HYPOTHESIS:-

1) There is significant difference of aggression in male and female students, who watch TV less than two hours.
2) There is significant difference of mental health in male and female children, who watch TV less than two hours.
3) There is significant difference of mental health in female children, who watch TV less than two hours and more than two hours.
4) There is significant difference of aggression of male children, who watch TV less than two hour and more than two hour.
5) There is significant difference of aggression of male and female children, who watch TV more than two hour.
6) There is significant difference of mental health of male and female children, who watch TV more than two hour.

LIMITATIONS OF THE STUDY:-

The data is collected from Jalgaon city. It is collected from some schools and some other public places like garden of the city. So it is the limit of the data collection.

VARIABLES-

Table

No.	Variables	Nature of variables
1	Sex difference	Independent Variable
2	Time	Independent Variable
3	Aggression	Dependent Variable
4	Mental health	Dependent Variable

SAMPLING

A sample is a relatively small number of participants drawn from an entire population. For this study a random sample of 40 students were collected. In which 20 male and 20 female children had participated. The data was collected from different places of Jalgaon city.

EXPERIMENTAL DESIGN-

The present investigation is designed as 2×2 factorial design, to study the aggression and mental health of the children. As well as to study an influence of sex difference on aggression and mental health.

TOOLS-

Following instruments have been used for the purpose of the present study.

1. Aggression scale - Of Dr. G. P. Mathur and Dr. Raj kumari Bhatnagar (1985)

Aggression scale is used to study the level of aggression in any age group (above 14 years) Now it consists of 55 items. Each item describes different forms of individual's aggression in different situation. It is a likert type's 5 point scale. In the scale items are in two forms i.e. positive & negative. 30 items are in positive form & 25 in negative form. In positive form of items, scores will be given as 5,4,3,2,1, respectively & in negative form of items, scores will be given as 1,2,3,4,5 respectively.

Reliability – Was .88 in males & .81 in females.

Validity- Was .80 in males & .78 in females.

2. Mental health inventory - Of Anandkumar and Giridhar Thakur (1986)

Scoring -

It is a 5 point scale. In this scale, statements are in two forms i.e. positive and negative. 25 statements are in positive forms and 25 in negative form. In positive form of statements, scores will be given as 5, 4, 3, 2, 1 respectively and in negative form of statement scores will be given as 1, 2, 3, 4, 5.

Reliability-

The sample of 200 males and 200 females was used to develop the test. The reliability is .74 to .88.

Explanation of Statistical Results :

In this part investigator has explained the results related to statistical analysis and hypothesis.

1) Hypothesis -1 there is the significant difference of aggression in male and female students, who watch TV less than two hours.

	Girls	**Boys**
Total	10	10
Mean	212.5	214.9
S.D.	9.86	10.66
't' Value	1.67	
	Non-significant.	

2) Hypothesis -2 there is the significant difference of mental health in male and female children, who watch TV less than two hours.

	Girls	**Boys**
Total	10	10
Mean	125.8	128.5
S.D.	8.70	13.20
't' Value	1.83	
	Non-significant.	

3) Hypothesis -3 there is the significant difference of mental health in female children, who watch TV less than two hours and more than two hours.

	Less than two hours (Girls)	**More than two hours (Girls)**
Total	10	10
Mean	125.8	129.7
S.D.	8.70	11.92
't' Value	2.72	
	Significant	

4) Hypothesis -4 there is the significant difference of aggression of male children, who watch TV less than two hour and more than two hour.

	Less than two hours (Boys)	**More than two hours (Boys)**
Total	10	10
Mean	214.9	219.9
S.D.	10.66	10.36

't' Value	3.47
	Significant

5) Hypothesis -5 there is the significant difference of aggression of male and female children, who watch TV more than two hour.

	Girls	**Boys**
Total	10	10
Mean	218.8	219.9
S.D.	10.43	10.36
't' Value	0.76	
	Non-Significant	

6) Hypothesis -6 there is the significant difference of mental health of male and female children, who watch TV more than two hour

	Girls	**Boys**
Total	10	10
Mean	129.7	123.7
S.D.	11.92	16.58
't' Value	3.57	
	Significant	

CONCLUSIONS/RESULTS –

Hypothesis no-01 the above table-no-01 is presenting the aggression among both male and female students. Investigator has selected 10 girls and 10 boys for study. The obtained't' value is 1.67. So, we can say that there is not a significant difference of aggression in male and female students and the hypothesis presented by investigator is non-significant.

Hypothesis no-02 the above tableno-02 is presenting the mental health of both male and female students. Investigator has selected 10 girls and 10 boys for study. The obtained't' value is 1.83. So, we can say that there is not a significant difference of mental health in male and female students and the hypothesis presented by investigator is non-significant.

Hypothesis no-03 the above table no-03 is presenting the mental health of female students. Investigator has selected 20 girls for study. The obtained't' value is 2.72. So, we can say that there is significant difference of mental health in female students and the hypothesis presented by investigator is significant at 0.05 levels.

Hypothesis no-04 the above table-no-04 is presenting the aggression among male students. Investigator has selected 20 boys for study. The obtained't' value is 3.47. So, we can say that there is significant difference of aggression in male students and the hypothesis presented by investigator is significant at 0.05 and 0.01 levels.

Hypothesis no-05 the above table no-05 is presenting the aggression among both male and female students. Investigator has selected 10 girls and 10 boys for study. The obtained't' value is 0.76. So, we can say that there is not a significant difference of aggression in male and female students and the hypothesis presented by investigator is non-significant.

Hypothesis no-06 the above table no-06 is presenting the mental health among both male and female students. Investigator has selected 10 girls and 10 boys for study. The obtained't' value is 3.57. So, we can say that there is significant difference of mental health in male and female students and the hypothesis presented by investigator is significant at 0.05 and 0.01 levels.

MAJOR FINDINGS OF THE STUDY –

In this study, results have been discussed. Investigator has studied an influence of sex difference on aggression and mental health of the students. Result shows that sex difference did not indicate significant influence on aggression but it indicates the significant influence on mental health and on the basis of mean differences, female students exhibited good mental health as compared to male students.

REFERENCES-

1) Badgujar C. O. (2001): Psychopathology, mahalaxmi prakashan, Nasik.
2) Oxford publication (2003), Oxford textbook of Psychiatry, Oxford publication, New Delhi.
3) Robert T. Baron (1998), Social Psychology, PHI publication.
4) Sing A. P. (1999), Basic Psychiatry, Armed Force Medical College, Publication, Pune.

मतिमंदांच्या पालकांच्या वैवाहिक समायोजनाचा अभ्यास

माधुरी पाटील, शुभांगी पाटील, गणेश सोनवणे, नीरज देव*

मानसशास्त्र विभाग, मूळजी जेठा महाविद्यालय, जळगाव

गोषवारा

मतिमंदत्वाच्या समस्येने ३% जनसंख्या पीडित आहे. या समस्येचा सर्वाधिक प्रभाव हा कुटुंबावर व पर्यायाने पालकांवर पडत असतो. या समस्येमुळे पालकांच्या सामाजिक जीवनावर जसा परिणाम होतो तसाच परस्पर संबंधावरही पडत असावा असे लक्षात आल्यावरुन 'मतिमंद मुलांच्या पालकांतील वैवाहिक समायोजनाचा अभ्यास' हा विषय निवडण्यात आला. प्रस्तुत अभ्यासासाठी प्रमोदकुमार व कंचना रोहतगी (१९७६) यांची वैवाहिक समायोजन चाचणी वापरण्यात आली. मध्यमान, प्रमाण विचलन 'F' व 't' टेस्ट वापरुन सांख्यिकीय विश्लेषण करण्यात आले. या शोधाअंती ध्यानात आले की सामान्य मुलांच्या पालकांशी तुलना करता मतिमंद मुलांच्या पालकांतील वैवाहिक समायोजन निम्न स्तराचे आढळून आले.

मुलभूत संकल्पना : मतिमंद, वैवाहिक समायोजन

प्रस्तावना

आजचे जीवन हे फार कठीण आणि गुंतागुतीचे झालेले आहे. त्यात मानसिक ताण-तणाव वाढलेले दिसून येतात. समाजामध्ये, कुटुंबामध्ये वावरतांना व्यक्तिला विविध भूमिका पार पाडाव्या लागतात. स्थानानुसार भूमिका बदलतात. पर्यायाने त्या भूमिकेत असणाऱ्या व्यक्तिच्या वर्तनाबद्दलच्या अपेक्षा बदलतात. वैवाहिक जीवनही याला अपवाद नाही. विवाह हा सुरुवातीपासून मानवी जीवनात महत्त्वाची भूमिका बजावत आला आहे. ''विवाह हा एक मनोसामाजिक घटक आहे व त्याला संस्कृती आकार देते. विवाह संबंधात भौतिक, सामाजिक आणि मानसिक घटक अंतर्भूत असतात.'' (हर्निंग आणि हर्निंग, १९५६)

विवाह म्हणजे व्यक्तिच्या जीवनातील सर्वात मोठे परिवर्तन होय. विवाह हा व्यक्तिच्या आयुष्यातील समाधानाचा, आनंदाचा व मांगल्याचा क्षण समजला जातो. ज्यामुळे विवाह, कुटुंब व व्यक्तिजीवनास सुखसमाधान व स्थैर्य लाभते. व्यक्ती विवाह करते तेव्हा आपले एक छोटेसे घर असावे, मूले-बाळे असावी, आपल्याला सामाजिक दर्जा, स्थैर्य मिळावे अशा इच्छा मनाशी बाळगते. एकमेकांच्या दु:खापासून सुटका व्हावी असेही तिला वाटते. त्यामुळे विवाह करतांना बहुसंख्य व्यक्तिंचा दृष्टिकोन सकारात्मक असतो व तो वैवाहिक समायोजनाला पोषक असतो.

विवाहामुळे स्त्री-पुरुष, पती-पत्नी या नात्याने बांधले जातात. आपल्या सर्व गरजांसोबत लैंगिक गरजा, प्रजोत्पादन यासारख्या प्रमुख गरजा ते पूर्ण करतात. समाजाचे सातत्य टिकवून ठेवण्यासाठी वैवाहिक समायोजनात प्रजोत्पादन अत्यावश्यक असते. सामान्यपणे गर्भावस्थेपासून व विशेषत: अपत्य जन्मानंतर माता-पित्यांच्या दिनक्रमात फरक पडतो व वर्तनातही तो जाणवायला लागतो. वैवाहिक समायोजनावर कुटुंबातील मुलांचा महत्त्वपूर्ण प्रभाव दिसून येतो. मुलांचे वागणे, बोलणे, आजारपण इ. घटक त्याचप्रमाणे मूल जर विकलांग असेल तर

त्याचा सर्वात अधिक प्रभाव माता-पित्यांच्या वैवाहिक समायोजनावर झालेला दिसून येतो. सामान्य मूल असेल तर पती-पत्नीला वैवाहिक समायोजनात समस्या व अडथळे कमी स्वरुपाचे असतात. याउलट

जर मूल मतिमंद, व्यंग स्वरुपाचे असेल तर माता-पित्यांना मुलांचे समायोजन साधतांना गंभीर व व्यापक स्वरुपाच्या अडचणी अनुभवाला येतात व वैवाहिक समायोजनात अधिक समस्या निर्माण होवून वैवाहिक समायोजन निम्न दर्जाचे घडून येते.

उद्देश

१) मतिमंद मुलांच्या पालकांचे वैवाहिक समायोजन अभ्यासणे.
२) सामान्य व मतिमंद मुलांच्या पालकांच्या वैवाहिक समायोजनातील भेद अभ्यासणे.

गृहितके

१) मतिमंद मुलांच्या पालकांशी तुलना करता सामान्य मुलांच्या पालकांचे वैवाहिक समायोजन उच्च दर्जाचे आढळून यावे.[III]
२) सामान्य मुलांच्या आई-वडील पालकात वैवाहिक समायोजनात सार्थ भेद आढळून यावा.[III]
३) मतिमंद मुलांच्या आई-वडील पालकात वैवाहिक समायोजनात सार्थ भेद आढळून यावा.[III]

संशोधन आराखडा

लिंग	घटनात्मक प्रारुप (2 x 2 factorial design)		
	मतिमंद मुलांचे पालक	सामान्य मुलांचे पालक	एकूण
आई	२०	२०	४०
वडील	२०	२०	४०
एकूण	४०	४०	८०

नमूना

प्रस्तुत संशोधनासाठी जळगाव शहरातील एकूण ८० पालकांचा नमुना घेण्यात आला. यामध्ये मतिमंद मुलांचे २० आई व २० वडील असे एकूण ४० पालक तसेच सामान्य मुलांचे २० आई व २० वडील असे एकूण ४० पालकांची निवड केली. यात कोणत्याही प्रकारचे विकलांग मुलांच्या (अंध, मुक-बधीर) पालकांचा समावेश करण्यात आला नाही.

परिवर्तक

i) स्वतंत्र परिवर्तक
मतिमंद मुलांचे पालक - १) आई २) वडील
ii) मध्यवर्ती परिवर्तक -
सामान्य मुलांचे पालक - १) आई २) वडील
iii) परतंत्र परिवर्तक - वैवाहिक समायोजन

संशोधन साहित्य

प्रस्तुत संशोधनात मतिमंद व सामान्य मुलांच्या पालकांचा अभ्यास करण्यासाठी कुमार प्रमोद आणि रोहतगी कंचना (१९७६) यांची Marital Adjustment Questionnaire (MAQ) ही चाचणी वापरण्यात आली आहे. या चाचणीची विश्वसनीयता Spilt- help method - .70, Test - retest method - 0.84 आहे.

प्रक्रिया

सर्वप्रथम प्रदत्त गोळा करण्यासाठी संशोधकाने जळगाव शहरातील खोटे नगर येथील उत्कर्ष विद्यालयास भेट देऊन तेथून काही मतिमंद मुलांची नावे व घराचे पत्ते मिळविले. त्यानंतर संशोधकाने जळगाव शहरातील ६ ते १८ वयोगट असणाऱ्या सामान्य व मतिमंद मुलांच्या पालकांची चाचणी सोडविण्यासाठी अनुमती घेतली. पालकांना चाचणी सोडविण्याबाबत सूचना देण्यात आल्या. सूचना समजल्या की नाही याची खात्री केली. समजल्या नसतील तर सूचनांमध्ये येणाऱ्या अडचणी दूर करण्यात आल्या. आपली उत्तरे गोपनीय ठेवली जातील असे आश्वासन देऊन प्रामाणिकपणे उत्तर देण्यास सांगितले. काही पालक वाचण्यास असमर्थ असल्याकारणाने संशोधकाने स्वत: विधान हळू–हळू, स्पष्ट उच्चारात व आवाजात चढ–उतार न आणता सारख्या स्वरात वाचले. पालकांनी सांगितलेले उत्तर संशोधकाने 'होय' किंवा 'नाही' मध्ये स्वत: नमूद केले. चाचण्या वैयक्तिकरित्या सोडवून घेतल्या.

सांख्यिकीय विश्लेषण

प्रस्तुत संशोधनात संशोधकाने उद्दीष्टांची व गृहितकांची मांडणी करुन त्यानुसार प्रत्येक गटातील विचरण शोधण्याच्या उद्देशाने 'F' test काढली ज्या गटाच्या संदर्भात 'F' test ०.०५ स्तरावर सार्थक आली त्याच गटातील भिन्नता शोधण्याच्या उद्देशाने 't' test. केली गेली. 't' test. ची सार्थकता स्विकारण्यासाठी ०.०५ स्तराचा प्रयोग करण्यात आला. (बर्वे बी.एन.२००७)

फलिते -

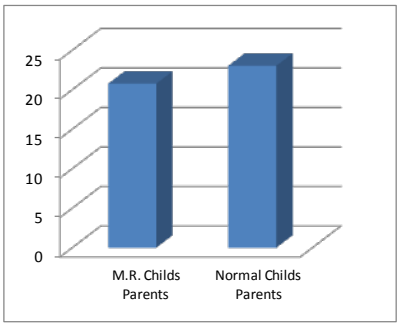
'F' table

क्र.	तुलना गट	N	Mean	F	df	Significant
१	मतिमंद मुलांचे पालक व सामान्य मुलांचे पालक	80	140.63	48.86	79	0.01
२	मतिमंद मुलांचे आई पालक व सामान्य मुलांचे आई पालक	40	53.94	15.29	39	0.01
३	मतिमंद मुलांचे वडील पालक व सामान्य मुलांचे वडील पालक	40	92.35	38.29	39	0.01
४	सामान्य मुलांचे आई व वडील पालक	40	7.55	18.84	39	NS
५	मतिमंद मुलांचे आई व वडील पालक	40	33.05	9.93	39	0.01

वरील तालिकेवरुन असे लक्षात येते की, मतिमंद व सामान्य मुलांचे पालक, मतिमंद व सामान्य मुलांचे आई पालक, मतिमंद व सामान्य मुलांचे वडील पालक तसेच मतिमंद मुलांचे आई व वडील पालक यांच्या गटाचा 'F' मूल्य सार्थक भेद दर्शविते. अर्थात त्यातील विचरण समान नाही.म्हणून त्यांचेच 't' मूल्य काढण्यात आले आहे. (Subashini 2006)

परंतु सामान्य मुलांचे आई व वडील पालक यांच्या गटाचे 'F' मूल्य हे समान असून त्यातील विचरण समान आहे. त्यात भेद आढळून आला नाही म्हणून त्याचे 't' मूल्य काढण्यात आलेले नाही.

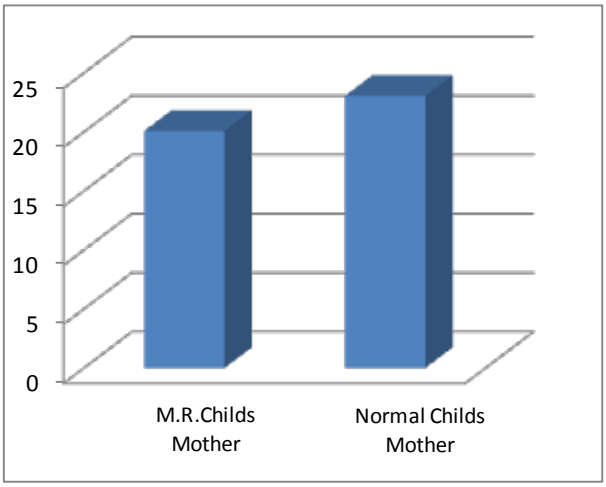
मतिमंद मुलांचे पालक व सामान्य मुलांचे पालक



N	Mean	SD	t	df	Significant level
40	20.77	1.69	7.51	78	0.01
40	23.04	1.58			

वरील तालिकेवरुन असे लक्षात येते की, मतिमंद मुलांच्या पालकांचा Mean- २०.७७ व सामान्य मुलांच्या पालकांचा Mean - २३.०४ आहे. त्यांचे t मूल्य ७.५१ असून ते ०.०५ ते ०.०१ या स्तरावर सार्थ भेद दर्शविते. यावरुन मतिमंद मुलांच्या पालकांच्या वैवाहिक समायोजनापेक्षा सामान्य मुलांच्या पालकांचे वैवाहिक समायोजन चांगल्या दर्जाचे दिसून येते.

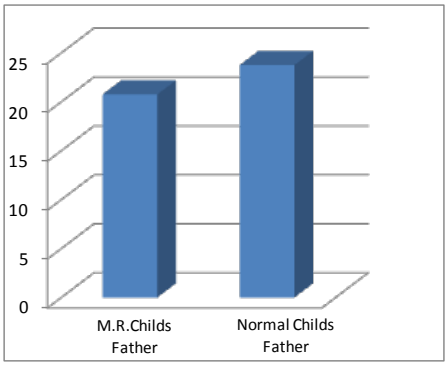
मतिमंद मुलांचे आई पालक व सामान्य मुलांचे आई पालक



N	Mean	SD	t	df	Significant level
20	20.08	1.69	4.16	38	0.01
20	23.05	1.85			

वरील तालिकेवरुन असे लक्षात येते की, मतिमंद मुलांच्या आई पालकांचा Mean -२०.०८ व सामान्य मुलांच्या आई पालकांचा Mean - २३.०५ आहे. त्यांचे t मूल्य ४.१६ असून ते ०.०५ ते ०.०१ या स्तरावर सार्थ भेद दर्शविते. यावरुन सामान्य मुलांच्या आई पालकांचे वैवाहिक समायोजन मतिमंद मुलांच्या आई पालकांपेक्षा चांगल्या दर्जाचे दिसून येते.

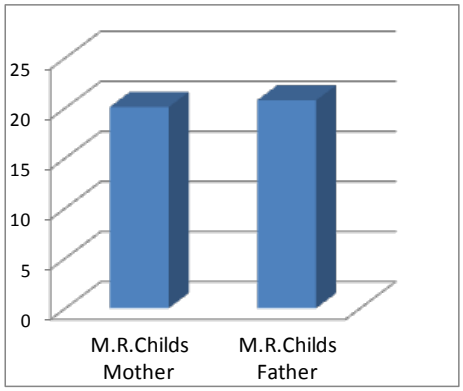
मतिमंद मुलांचे वडील पालक व सामान्य मुलांचे वडील पालक



N	Mean	SD	t	df	Significant level
20	20.75	1.69	6.66	38	0.01
20	23.75	1.25			

वरील तालिकेवरुन असे लक्षात येते की, मतिमंद मुलांच्या वडील पालकांचा Mean - २०.७५ व सामान्य मुलांच्या वडील पालकांचा Mean -२३.७५ आहे. त्यांचे t मूल्य ६.६६ असून ते ०.०५ ते ०.०१ या स्तरावर सार्थ भेद दर्शविते. यावरुन सामान्य मुलांच्या वडील पालकांचे वैवाहिक समायोजन मतिमंद मुलांच्या वडील पालकांपेक्षा चांगल्या दर्जाचे दिसून येते.

मतिमंद मुलांचे आई व वडील पालक



N	Mean	SD	t	df	Significant level
20	20.08	1.69	0.09	38	NS
20	20.75	1.69			

वरील तालिकेवरुन असे लक्षात येते की, मतिमंद मुलांच्या आई पालकाचा Mean-२०.०८ व वडील पालकांचा Mean -२०.७५ आहे. त्यांचे t मूल्य ०.०९ इतके असून ते ०.०५ ते ०.०१ या दोन्ही स्तरावर सार्थ भेद दर्शवित नाही. यावरुन मतिमंद मुलांच्या पालकांचे वैवाहिक समायोजन समान स्वरुपाचे आढळून आले आहे.

निष्कर्ष

१) अ) मतिमंद मुलांच्या पालकांशी तुलना करता सामान्य मुलांच्या पालकांचे वैवाहिक समायोजन उच्च दर्जाचे आढळून आले.

ब) मतिमंद मुलांच्या आई पालकांशी तुलना करता सामान्य मुलांच्या आई पालकांचे वैवाहिक समायोजन उच्च दर्जाचे आढळून आले.

क) मतिमंद मुलांच्या वडील पालकांशी तुलना करता सामान्य मुलांच्या वडील पालकांचे वैवाहिक समायोजन उच्च दर्जाचे आढळून आले.

२) सामान्य मुलांच्या आई-वडील पालकांचे वैवाहिक समायोजन समान आढळून आले.

३) मतिमंद मुलांच्या आई-वडील पालकांचे वैवाहिक समायोजन समान आढळून आले.

चर्चा

वैवाहिक जीवनातील पती-पत्नीच्या समायोजनावर अनेक घटकांचा प्रभाव दिसून येतो. त्यातील एक महत्त्वाचा घटक म्हणजे त्यांची मूले होत. आपले मूल आजारी जरी पडले तरी त्याचा ताण

पालकांवर येतांना दिसतो. मग मूल विकलांग असेल व विकलांगता जन्मभर राहणार असेल तर ? या प्रश्नाच्या अनुषंगाने प्रस्तुत विषय संशोधकाने निवडला.

प्रस्तुत शोधात असे आढळून आले की मतिमंद मुलांच्या पालकांचे वैवाहिक समायोजन एकत्रित दृष्ट्या व स्वतंत्र दृष्ट्या (मतिमंदांची आई व सामान्यांची आई; मतिमंदाचे वडील व सामान्यांचे वडील) निम्न स्तराचे आढळून येते. याचे कारण हे असावे की, सामान्य मूले ही मतिमंद मुलांच्या तुलनेत अधिक स्वावलंबी, जबाबदार असतात. याउलट मतिमंदांचा विकास मागासलेला असल्याने त्यांना दैनंदिन कामकाजात (उदा.आंघोळ करणे, कपडे घालणे इ.) आई वडिलांची सतत मदत लागते. इतकेच नव्हे तर ही मदत कधी कधी जन्मभर लागणारी असते. त्यामुळे मतिमंदांचे पालक हे भविष्याविषयी केवळ चिंतातूर नव्हे तर काहीसे हताश झालेले असतात.

त्याचबरोबर इतर नातेवाईक, सगेसंबंधी व शेजारीपाजारी कळत नकळत या मुलांचा तिरस्कार करतात वा नको तितकी सहानुभूती दर्शवितात ही बाब पालकांना कुठे न् कुठे बोचत असते.

याशिवाय जन्मभर सहन करावा लागणाऱ्या या त्रासाचे कारण हे आपण नसून आपला जोडीदार असावा अशा नैसर्गिक भावना त्यांना वाटत असतात. या व इतर अनेक कारणांमुळे त्यांच्यातील वैवाहिक समायोजन निम्न स्तराचे आढळून येत असावे. या बाबींवरुन काहीसे दूर असल्यामुळे सामान्य मुलांच्या पालकांतील वैवाहिक समायोजन मतिमंद मुलांच्या पालकांपेक्षा उच्च प्रतीचे आढळत असते.

प्रस्तुत शोध हा मर्यादीत परिवेशात, स्थानात केला असल्याने अधिक ठोस निष्कर्षासाठी मोठा प्रदत्त घेऊन व अन्य विकलांग मुलांच्या पालकांचा अभ्यास करणे अगत्याचे आहे असे शोध कर्त्यास नमूद करावेसे वाटते.

संदर्भ व आधार ग्रंथ

१) कुमार पी., रोहतगी के. (१९७६). *डेव्हलपमेंट ऑफ अ मॅरिटल ॲडजस्टमेंट क्वश्चनेअर,* इंडियन जर्नल ऑफ सायकॉलॉजी (Vol.51), 346, 348

२) कुमार पी., रोहतगी के. (१९८७), *मॅन्युअल फॉर मॅरिटल ॲडजस्टमेंट क्वश्चनेअर,* वल्लभ विद्यानगर, सरदार पटेल युनिव्हर्सिटी.

३) दिक्षित बी.एम., भार्गव महेश (१९८०), *मनोवैज्ञानिक एवं शैक्षिक सांख्यिकी की तालिकाएँ,* आगरा : हर प्रसाद भार्गव प्रकाशन.

४) देशपांडे चंद्रशेखर, काळे प्रेमला, कुमठेकर मेधा (२००२). *कुटुंब आणि वैवाहिक समायोजन,* पहिली आवृत्ती, चतुर्थ पुनर्मुद्रण, नाशिक, य.च.म.मु.विद्यापीठ, ३१-५०

५) देशपांडे चंद्रशेखर, किंकर रमेश, काळे प्रेमला (२००२), *वैवाहिक समस्या : मार्गदर्शन व उपचार,* तिसरी आवृत्ती, चतुर्थ पुनर्मुद्रण, नाशिक, य.च.म.मु.विद्यापीठ.

६) Deo N. S. (2010) *To study for relation between Birth Condition & Frustration by using Rosenzweig Picture Frustration Test,* unpublished Ph.D. Thesis.(Gujarat University)

७) Neely - Barnes, Susan L., Dia, David A. (2008). Early & Intensive Behavioral Intervention, *Journal of Psychology.*

८) बर्वे बी.एन. (२००७), शैक्षणिक मानसशास्त्रीय संख्याशास्त्र, पहिली आवृत्ती, नागपूर : विद्या प्रकाशन.

९) Bernard F. (1959). Society for research In Child Development INC, *Journal of Psychology.*

१०) बोरसे अशोक, चौधरी ना.रा., वाडकर अलका, काळे प्रेमला, जे.जे.सी.व्ही. (२००२). *वैवाहिक समस्या आणि चांगल्या वैवाहिक संबंधाचे फायदे,* दुसरी आवृत्ती, चतुर्थ पुनर्मुद्रण, नाशिक : य.च.म.मु.विद्यापीठ २–४, ६३–७३.

११) भार्गव महेश (२००२). *विशिष्ट बालक – शिक्षा एवं पुनर्वास*, आठवी आवृत्ती, आग्रा: राखी प्रकाशन १६–४३.

१२) मूरजानी जानकी (२०१०). *मानसिक मंदित बालक*, पहिली आवृत्ती, नवी दिल्ली : कनिष्ठ पब्लिशर्स प्रकाशन, १६–२४.

१३) सिंह चंद्रपाल (२००६). *मानसिक मन्दता*, पहिली आवृत्ती, नवी दिल्ली : कनिष्ठ पब्लिशर्स प्रकाशन, १६–२४

१४) Subashini S (2008) *Research methodology :* A study material for M Sc. Psychology, Chennai : TNPES university 52.

१५) Harning J.L., Harning Alma (1956). *Marrage Adjustment*, New York : American Book

Sociology

महिला कायदेविषयक जाणीव - एक सामाजिक अध्ययन

विशेष संदर्भ - महाविद्यालयीन विद्यार्थिनी

पूनम अनिल जोशी, कांचन हिलाल देसले, जयश्री महाजन*

प्रस्तावना

महिला वर्ग हा समाजाचा अर्धा भाग. या वर्गाने स्वत:ची प्रगती करून राष्ट्र उभारणी कार्यात महत्त्वाची भर टाकावी, म्हणून त्यासाठी तळागाळापासून सर्व स्तरावरील महिलांना सक्षम, सबल बनविण्यासाठी निरनिराळे उपाय, धोरणे, कार्यक्रम आखले जातात. त्यांचे प्रश्न सोडवण्यासाठी आंतरराष्ट्रीय स्तरावर परिषदा, मेळावे आयोजित केले जातात. स्वातंत्र्योत्तर कालखंडात भारतीय महिलांच्या शहरी भागातील महिलांच्या दर्जात थोडासा फरक पडला आहे. शिक्षणाचा प्रसार होवून अनेक क्षेत्रात त्याचा शिरकाव झाला आहे. आर्थिकदृष्ट्या परावलंबन थोडे कमी झाले आहे. परंतु अजूनही विकासाची फळे सर्व स्तरांवरील महिलांपर्यंत पोहचली नाहीत. बहुसंख्य महिलांच्या दर्जात, परिस्थितीत फारसा फरक नाही. ग्रामीण भागातील बहुसंख्य महिला निरक्षर असून गरीबीचे कष्टमय जीवन त्यांना कंठावे लागत आहे. शेतीशिवाय उदरनिर्वाहाचे दुसरे साधन त्यांना उपलब्ध नाही. तरीही त्या शेतीवरसुध्दा त्यांचा मालकी हक्क नाही. तेथील पुरूष वर्ग त्यांच्याकडे केवळ कष्ट करणारी महिला कामगार व उपभोग्य वस्तू या दृष्टीनेच पाहतो. मग सबल कशा होणार ? त्यामुळेच या बहुसंख्य महिलांचे गौणत्व दूर झालेले नाही. तेव्हा त्यासाठी शासनाचे परिणामकारक उपाय व समाज परिवर्तन यांची जोड एकदम होणे जरूर आहे.

महिलांच्या स्थितीत सुधारणा घडवून आणण्यासाठी स्वातंत्र्यपूर्व काळापासून अनेक सुधारकांनी मोलाचे योगदान दिलेले आहे. महात्मा ज्योतिराव फुले, विष्णूशास्त्री पंडीत, गोपाळ गणेश आगरकर, पंडीता रमाबाई, राजा राममोहन रॉय, डॉ. बाबासाहेब आंबेडकर, महात्मा गांधी या समाजसुधारकांचे त्यात महत्त्वाचे योगदान आहे. त्यांनी महिलांचे जीवन सुधारण्यासाठी अनेक प्रयत्न केले. आपली खरीखुरी आणि मुलभूत प्रगती होण्यासाठी महिलांविरूध्द जो अन्याय घडतो तो दूर करून त्यांना सार्वजनिक जीवनात परिपूर्ण संधी द्यावी, असे पंडीत जवाहरलाल नेहरू यांचे उदगार होते. शहरी कुटूंबात मुलींची स्थिती थोडी सुधारली असली तरी तेथे पण हुंडाबळी, हुंड्यासाठी छळ, महिलालिंगी गर्भ नष्ट करणे, महिला धनाची अफरातफर असे प्रकार चालू असतात.

भारतीय घटनेने प्रारंभापासून महिलांना पुरूषांप्रमाणेच समान हक्क प्रदान केलेले आहेत. दुर्देवाने निरक्षरतेमुळे आणि पुरूषांच्या वर्चस्वाखाली राहण्याच्या परंपरेमुळे आपल्या देशातील महिलांना या हक्काची जाणीव नाही, कल्पना नाही, याउलट पाश्चिमात्य देशात आपल्या समानतेच्या हक्काबाबत महिला अतिशय जागरूक असल्यामुळे त्या नेहमी सावध होऊन आपल्या हक्कांचे संरक्षण करत असतात.

स्वातंत्र्याच्या पन्नास वर्षात सामाजिक परिस्थिती सुधारलेली नाही, उलट बिघडत आहे. एकीकडे सर्व क्षेत्रात पाश्चिमात्य राष्ट्रांची भ्रष्ट नक्कल चालू असते, तर उलट कायदा व समाजव्यवस्था या दोन क्षेत्रात महिलांच्या संबंधातील प्रश्नांबाबत विसंगती कायमच आहे. समाजात महिला-पुरूषांच्या संबंधात निती-अनितीच्या वेगवेगळ्या फुटपट्ट्या आहेत. बलात्कारीत महिला कायद्याच्या दृष्टीने निर्दोष आहे. बाहेरख्याली पुरूष समाजात अनितीमान

मानला जात असते. परंतु, समाज ही भूमिका स्विकारत नाही. याचाच अर्थ कायद्याची परिणामकारकता समाज याबाबत काय दृष्टीकोन ठेवतो, त्यावर पुष्कळ अंशी अवलंबून असते. आपल्याकडे महिलांबाबतचे कायदे व सामाजिक मत यात हवे तेवढे सामंजस्य घडून आले नाही; असे वाटते. महिलांवर होणाऱ्या अन्याय अत्याचाराला वाचा फोडून त्यांची वैचारिक गुलामगिरी व मानसिक दबावातून मुक्तता व्हावी यादृष्टीने शिक्षण, साक्षरता, प्रचाराबरोबरच राज्यघटनेत काही तरतूदी केल्या आहेत. लिंगभेदावर आधारित पक्षपात केला जाऊ नये, म्हणून राज्य सरकारांना पण कायदेशीर कारवाई करण्याचे अधिकार दिले आहेत.

महिलांना पुरूषांच्या बरोबरीने स्थान देण्यासाठी अतिशय ठोस पावले हिंदू वारसा कायदा, २००५ याद्वारे उचलल्या गेली. या कायद्याच्या माध्यमातून अनेक आघाड्यांवरील महिला - पुरूषांमधील विषमता नाहीशी करण्याचा प्रयत्न केलेला दिसतो. शेतजमीन, एकत्र कुटुंबातील संपत्ती, आई-वडिलांचे राहते घर व काही प्रमाणात विधवांचे हक्क याबाबत क्रांतिकारक पाऊले उचलली गेली आहे. २००५ च्या कायद्यानुसार सर्व शेतजमीन ही आता अन्य संपत्तीच्या पातळीवर आणली गेली आहे. त्यामुळे हिंदू महिलांच्या जमीनीसंदर्भातील वारसा हक्क कायद्यानुसार सर्व पुरूषांच्या हक्कांशी समान प्रमाणात मानले जाणार आहे. ही कायद्यातील तरतूद सर्व राज्यांना लागू आहे. उदरनिर्वाहासाठी शेतीवर अवलंबून असणाऱ्या महिलांना या कायद्याद्वारे लाभ होणार आहे. एकत्र कुटुंबातील सर्व मुली विशेषत: विवाहीत मुलींनासुध्दा मुलांइतकाच वाटा मिळण्याची व्यवस्थाही या तरतूदीने केली आहे. मुलींनी आपल्या माहेरच्या कुटुंबाची जबाबदारी घ्यावी आणि मिळकतीमध्ये हक्काने वाटा मिळावा अशी मान्यता कायद्यानुसार दिली गेली आहे. राहते घर हे सुध्दा सर्व मुली मग त्या विवाहीत असतो किंवा नसोत त्यांना मुलांच्या बरोबरीने घरावर हक्क सांगता येणार आहे. आई-वडिलांच्या घरामध्ये यापूर्वी विवाहीत मुलींना राहण्याचा अधिकार नव्हता तसेच घर विकतांना किंवा त्याची वाटणी करतांना मुलींना जो अधिकार नव्हता तो आता त्यांना मिळाला आहे. इतकेच नव्हे तर पुनर्विवाहीत विधवांना मृत पतीच्या संपत्तीतील अधिकार नाकारला गेला होता, तो ही आता दिलेला आहे. या कायद्यातील तरतुदींमुळे विशेषत: विधवा आणि मुलींचा फायदा होणार आहे. त्याचे महत्त्व फार मोठे आहे, त्यांचा तो जन्मदत्त अधिकार आहे. कायद्याच्या माध्यमातून अधिकार मिळालेले असले तरी त्याची प्रत्यक्ष अंमलबजावणी अतिशय कठीण कार्य आहे. एकीकडे महिलांना कायद्याद्वारे अधिकार दिले तरी ते अधिकार समाज स्विकारणे अवघड स्थिती आहे. त्यासाठी सर्वप्रथम महिलांमध्ये कायद्याविषयक साक्षरता वाढवणे अत्यंत महत्त्वाचे आहे.

विवाहीत महिलांचे हक्क व महिलांच्या मालमत्तेवरील हक्क यासंदर्भात आज जग मागे आहे. लिंगभेद व वैवाहिक दर्जा या दोन्ही गोष्टींमुळे महिलांना आजही अन्याय भोगावे लागत आहे. भारतात व्यक्तीच्या खाजगी जीवनात धर्माला सर्वोच्च स्थान आहे.तसेच भारतात अनेक जाती व धर्माचे व पंथाचे लोक राहतात. अशा परिस्थितीत कायदा हतबल होतो. भारतात एकीकडे महिला - पुरूष समानता एक ऐरणीचा प्रश्न आहे, तर दुसरीकडे महिलांच्या अत्याचारात भर पडत आहे. महिलांच्या समान अधिकारांना कायद्यांना मान्यात देण्यात येते. पण त्यांना अंमलात आणण्यात येत नाही. स्वातंत्र्य मिळून ६४ वर्षा होवून सुध्दा महिलांना सर्व बाबतीत समान हक्क प्राप्त झालेले नाहीत. २००१ हे वर्ष महिला सक्षमीकरण वर्ष म्हणून घोषित झाले. अनेक समित्या व आयोग महिलांच्या विकासासाठी व त्यांच्या दर्जात सुधारणा करण्यासाठी निर्माण केले गेले. शासनाने अनेक कायदे करून त्यांना अधिकार व सोयी प्रदान केल्या व त्याद्वारे महिला - पुरूष असमानता नष्ट करून त्यांच्यात योग्य समन्वय साधण्याचा प्रयत्न सर्व पातळीवर केला. बालविवाह, हुंडाबळी, नवजात मुलीची हत्या, बलात्कार, लैंगिक शोषण, विनयभंग,

वडीलांच्या संपत्तीत वाटा इ. बाबतीतील कायद्यांची जाणीव महिलांना करून देण्यात आली. महाराष्ट्रातसुध्दा महिला विकासासाठी सतत प्रयत्न होत आहे. महिला स्वयंसिध्द व्हाव्यात म्हणून शासनाने वेळोवेळी धोरणे व योजना जाहीर केलेल्या आहे. महिलांसाठी आरक्षण ठेवलेले आहे.

या कायद्यांच्या प्रभावामुळे महिलांच्या कौटुंबिक व सामाजिक जीवनात बरेच परिवर्तन झाले आहे. या कायद्यामुळे महिलांना पुरूषांच्या बरोबरीने समान अधिकार मिळालेले आहे. महिला पुरूष समानतेचे फायदे परिणामकारक होण्यासाठी योग्य पोषक सामाजिक वातावरण निर्माण झाले पाहिजे. घटनात्मक व कायदेशीर उपायांबरोबर समाजाच्या दृष्टीकोनातून बदल होणे आवश्यक आहे. त्यासाठी सामाजिक अभिसरण घडावे लागते. कायदे करणारे अधिकारी कायद्यांचा अर्थ लावून त्याची अंमलबजावणी करतो, त्याचबरोबर सामाजिक मान्यता असल्याशिवाय कायदे परिणामकारक होऊ शकत नाहीत.

स्वातंत्र्यानंतर महिलांवर होणारा अन्याय, शोषण दूर करण्यासाठी काही घटनात्मक व कायदेशीर उपाय योजले जात आहेत. आपल्या घटनेप्रमाणे समान सामाजिक, शैक्षणिक, वैवाहिक, धार्मिक अधिकार महिलांना दिलेले आहेत. त्यामुळे महिला समाजाची सर्व क्षेत्रावर प्रगती, उन्नती झाली का? याचे उत्तर होय किंवा नाही असे एका शब्दात देणे कठीण आहे. शहरी मध्यमवर्गीय महिलांचे जीवन बरेच उन्नत झाले असे वाटते. त्या महिलांनी शिक्षण संपादन करून साहित्य, खेळ, कला, संगीत इ. क्षेत्रात वैयक्तिक पातळीवर प्रगतीकारक कामगिरी केली. किरण बेदी, मीरा बोरवणकर अशांनी आपले क्षेत्रे भूषणास्पद केली. पण अशा महिलांची संख्या नगण्य आहे. परंतु वैयक्तिक पातळीवरील प्रगतीने अखिल भारतीय महिलांच्या जीवनाची पातळी उंचावत नाही. भारतीय महिला जीवनाची पातळी उंचावण्यास सामाजिक उणिवा अन्याय नाहीसे करण्यासाठी संघटीत प्रयत्नांची आवश्यकता आहे.

महिलांसाठी अनेक कायदे हिंदू विवाह - १९५५, हिंदू वारसा हक्क कायदा - १९६६, मातृत्व लाभ कायदा - १९६१, भारतीय घटस्फोट कायदा - १८६९, बालविवाह निर्बंध कायदा -१९२९ व इतर अनेक कायदे महिलांच्या जीवनात नवे पर्व ठरावेत म्हणून करण्यात आले. हे सर्व कायदे सुशिक्षित व उच्चवर्णियांसाठी उपयुक्त ठरत आहेत. पण आदिवासी, ग्रामीण, सामान्य अशिक्षित महिलांना या कायद्यांचे अज्ञान असते व कोर्टकचेऱ्या करण्यासाठी पैसा त्यांच्याजवळ नसतो. तसेच कायद्याची अंमलबजावणी उदासीनतेने केली जाते. काही लोक त्यातून पळवाटा शोधतात.

अभ्यासविषय : महिला कायदेविषयक जाणीव : एक सामाजिक अध्ययन

उद्दिष्टे :महाविद्यालयीन विद्यार्थिनींना महिला कायदेविषयक जाणीवा किती प्रमाणात आहेत यांचे अध्ययन करणे.

गृहीतके : महाविद्यालयीन बहुसंख्य विद्यार्थिनींना महिलाविषयक कायद्यांची माहिती आहे.

अभ्यासपध्दती

प्रस्तुत अध्ययन प्राथमिक व दुय्यम आकडेवारीवर आधारित आहे. दुय्यम आकडेवारी विविध अहवाल, नियतकालिके, प्रकाशित ग्रंथ यामधून घेतली आहे. तर प्राथमिक आकडेवारी निवडलेल्या नमुन्यातील विद्यार्थिनींची प्रत्यक्ष मुलाखत घेऊन संकलित केलेली आहे.

नमुना निवड - सदरच्या अध्ययनासाठी संभाव्यता नमुना निवडीमधील साधा यादृच्छिक व त्यामधील कोटा पध्दतीचा वापर करण्यात आला. ज्यामध्ये जळगाव शहरातील एकूण १२ महाविद्यालयातील ९० विद्यार्थिनींची निवड करून त्यांच्याकडून प्रश्नावली भरून घेण्यात आली.

याच विषयाला अनुसरून महाविद्यालयीन विद्यार्थिनींमधील कायदेविषयक जाणीव अभ्यासण्यासाठी सामाजिक अध्ययन केले गेले. देशाची भावी पिढी म्हणून ओळखली जाणाऱ्या विद्यार्थिनींचा अभ्यास केला गेला. या अभ्यासातून मिळालेले निष्कर्ष मर्यादित असले तरी व्यापक पातळीवर विद्यार्थिनींचा कायदेविषयक जाणिव प्रतिबिंबीत होईल ही अपेक्षा आहे. या विद्यार्थिनींमधील कायदेविषयक जाणीव अभ्यासण्यासाठी जळगाव शहरातील महाविद्यालयांमधील विद्यार्थिनींकडून प्रत्यक्ष जाऊन प्रश्नावली भरून घेतली गेली. यात १२ महाविद्यालयांमधून ९० विद्यार्थिनींकडून प्रश्नावली भरून घेण्यात आली. त्यात व्यावसायिक अभ्यासक्रमातील विद्यार्थिनींचे प्रमाण ४२% असून त्या खालोखाल कला क्षेत्रातील विद्यार्थिनींचे प्रमाण ३६% आहे. वाणिज्य विभागातील विद्यार्थिनी १६% असून ६% विद्यार्थिनी विज्ञान विभागातील आहे.

निष्कर्ष

१. हुंडा प्रतिबंधक कायदा, वैद्यकीय गर्भपात कायदा, कौटुंबिक हिंसाचार कायदा, मानवी संरक्षण कायदा, भारतीय राज्यघटनेचे महिलांना संरक्षण, हिंदू वारसा कायदा, बालविवाह निर्बंध कायदा, गर्भलिंग चाचणी प्रतिबंधक कायदा या कायद्याविषयी माहिती असणाऱ्या विद्यार्थिनींचे प्रमाण सर्वात जास्त आहे. हे प्रमाण जवळपास ८०% आहे. त्या खालोखाल हिंदू वारसा दुरूस्ती कायदा, मातृत्व लाभ कायदा, भारतीय घटस्फोट कायदा, सतीप्रथा प्रतिबंधक कायदा, महिलाविरूध्दचे अपराध, लैंगिक छळ प्रतिबंधक कायदा या कायद्यांची माहिती महाविद्यालयीन विद्यार्थिनींना दिसून आली. ही माहिती असणाऱ्या विद्यार्थिनीचे प्रमाण ७० टक्क्यांच्या जवळपास आहे, तर अनैतिक देह व्यापार प्रतिबंधक कायदा, देवदासी प्रथा प्रतिबंधक व निर्बंध कायदा, राष्ट्रीय महिला आयोग, शेती मळा कामगार कायदा या कायद्यांची जाणीव कमी प्रमाणात विद्यार्थिनींमध्ये दिसली. हे प्रमाण ५० टक्क्यांपर्यंत आहे.
एकंदरीत, बहुतांशी विद्यार्थिनींना या कायद्याची जाणिव असल्याचे लक्षात आले.

२. महिला कायदेविषयक जाणिवांचा अभ्यास करतांना विद्यार्थिनींचा कौटुंबिक आकाराचा अभ्यास केला असता त्या विभक्त कुटुंबात राहणाऱ्या विद्यार्थिनींचे प्रमाण ७४ % आहे. तर त्या खालोखाल संयुक्त कुटुंबात राहणाऱ्या विद्यार्थिनींचे प्रमाण २७% दिसून येते.
३. या अध्ययनात वेगवेगळ्या धर्मातील विद्यार्थिनींचा अभ्यास केल्यास असे दिसते की, हिंदू धर्मातील विद्यार्थिनींचे प्रमाण ९१% आहे, तर इतर धर्मातील विद्यार्थिनींचे प्रमाण १% आहे.
४. या अध्ययनात जातीसंदर्भात असे दिसून आले की, इतर मागासवर्गीय जातीतील विद्यार्थिनींचे प्रमाण ६५% आहे, तर त्याखालोखाल खुला वर्ग असलेल्या जातीतील विद्यार्थिनींचे प्रमाण २४% दिसून येते. त्याचप्रमाणे अनुसूचित जातीतील विद्यार्थिनींचे प्रमाण ९% असून भटक्या विमुक्त जातीतील विद्यार्थिनींचे प्रमाण ३ % आहे.
५. या अध्ययनातील सहभागी विद्यार्थिनींची मातृभाषा मराठी असलेल्यांचे प्रमाण ९६% आहे, तर त्या खालोखाल हिंदी भाषा असलेल्या विद्यार्थिनींचे प्रमाण ४% आहे असे दिसून आले.
६. स्वातंत्र्योत्तर कालखंडात महिलांच्या उन्नतीसाठी करण्यात आलेल्या योजनांविषयीची माहिती किती विद्यार्थिनींना आहे, याचे अध्ययन केले असता खालील माहिती प्राप्त झाली.

स्थानिक स्वराज्य संस्थेतील ५०% आरक्षण, मोफत व सक्तीच्या शिक्षणाचा अधिकार, सावित्रीबाई फुले योजना, शासकीय अभियांत्रिकी तंत्रनिकेतनमध्ये ३०% जागा राखीव, शालेय विद्यार्थिनींसाठी सायकल वाटप गणवेश पुरवठा व मोफत वसतीगृह ही योजना, १२ वी पर्यंत मोफत पास योजना, अहिल्याबाई होळकर पास योजना या सर्व योजनांविषयी माहिती बहुसंख्य विद्यार्थिनींना दिसून आली.

७. महिला कायदेषिवयक जाणिवांचा अभ्यास करतांना कायद्यांमुळे महिलांची प्रगती होत आहे. कायदेशीर हक्कांमुळे महिलांच्या स्थितीत सुधारणा घडून आली. कायद्यामुळे महिलांच्या सामाजिक गतीशीलतेत वाढ होत आहे, कायदेशीर अधिकारामुळे महिलांच्या दर्जात वाढ झालेली आहे, हिंदू वारसा हक्क कायद्यामुळे महिलांच्या दर्जात वाढ झाली आहे. या सर्व विधानांसंदर्भात विद्यार्थिनींनी सकारात्मक प्रतिसाद दिला. परंतु, कौटुंबिक हिंसाचार प्रतिबंधक कायदा महिलांवरील अत्याचाराचे प्रमाण कमी करण्यास सहाय्यभूत ठरला आहे. महिलांच्या संरक्षणाबाबतीत कायदा महत्त्वपूर्ण भूमिका बजावतो. या दोन्ही विधानासंदर्भात ५०% विद्यार्थिनींनी सकारात्मक प्रतिसाद दिला तर ५०% विद्यार्थिनींनी नकारात्मक प्रतिसाद दिला.

८. महिलांसाठी कायदे अस्तित्वात असून महिलांचे शोषण होत आहे. या संदर्भात विद्यार्थिनींचे मत तपासले असता बहुसंख्य विद्यार्थिनींनी कायदे असून सुध्दा महिलांचे शोषण होत आहे हे मान्य केले. महिलांच्या उन्नतीसाठी शासनाने हाती घेतलेल्या महिला सक्षमीकरण कार्यक्रम उपयुक्त असल्याचे ही बहुसंख्य विद्यार्थिनींनी मान्य केले. यासंदर्भात शासकीय प्रयत्नांमुळे काही प्रमाणात महिलांची भिती दूर झाली व त्यांचा आत्मविश्वास वाढला, असेही काही विद्यार्थिनींनी नमूद केले.

९. या अध्ययनात स्त्री-पुरूष समानतेसाठी महिलांचा राजकीय सहभाग महत्त्वपूर्ण आहे, असे बहुसंख्य विद्यार्थिनीने नमूद केले आहे. त्याचबरोबर महिलांसाठी कायदे अस्तित्वात असूनसुध्दा सद्यपरिस्थितीत महिलांवरील अत्याचार वाढलेले आहे व महिलांवर अन्याय झाला तर तिला न्याय मिळणे समाजात कठीण जाते, असे मत अनेक विद्यार्थिनींनी व्यक्त केले. तर काही विद्यार्थिनींच्या मते, कायद्यांची अंमलबजावणी प्रभावीरित्या होत नाही, म्हणून महिलांवर अन्याय वाढत आहे. यासंदर्भात अनेक विद्यार्थिनींनी नवीन कायदे होण्याची गरज असून त्याची अंमलबजावणी प्रभावीरित्या झाली पाहिजे, असे नमूद केले.

१०. एकंदरीत, महिला विषयक कायद्यांची व योजनांची माहिती महाविद्यालयीन विद्यार्थिनींमध्ये दिसून आली. त्याविषयीची जाणीव जागृती ही त्यांच्यामध्ये असलेली लक्षात आली. परंतु, कायदे अस्तित्वात असूनसुध्दा महिलांचे शोषण होत आहेत. त्यांच्यावरील अन्याय वाढत आहेत. याविषयीची खंत विद्यार्थिनींनी व्यक्त केली.

संदर्भ

१. ॲड. प्रमिला जोशी, महिलांसाठी अत्यावश्यक कायदे
२. विजय नहाटा, लोकराज्य (मासिक)
३. कमलाबाई देशपांडे, स्त्रियांच्या कायद्याची वाटचाल, श्रीविद्या प्रकाशन, पुणे
४. प्रतिभा रानडे, स्त्री प्रश्नांची चर्चा, १९ वे शतक, पद्मगंधा प्रकाशन, पुणे
५. शारदा साठे, क्षितीजावरील शलाका, ग्रंथाली प्रकाशन, मुंबई
६. आ. ह. साळुंके, महात्मा फुले व धर्म, मुद्रक प्रकाशन, मुंबई
७. निलिमा भावे, मराठी स्त्रीची अस्मिता, ग्रंथाली ज्ञानयज्ञ, मुंबई
८. विलास खोले, ताराबाई शिंदे (स्त्री-पुरूष तुलना), प्रतिभा प्रकाशन, पुणे

जळगाव शहरातील माथाडी कामगारांचे समाजशास्त्रीय अध्ययन

स्वप्निल जयसिंग वाघ, सागर बडगे*

प्रस्तावना

जीवनात प्रत्येक व्यक्तीला काही ना काही आकांक्षा असतात. त्या आकांक्षा पूर्ण करण्यासाठी तो प्रयत्नशील असतो. या प्रयत्नात सतत संघर्ष त्याचा जीवनात सुरूच असतो. सतत प्रयत्न करूनसुध्दा आपल्या आकांक्षा पूर्ण होत नसतील तर त्याला जबरदस्त धक्का बसतो. सर्व इच्छा आकांक्षावर पाणी पडले म्हणून तो जीवनात उदासीन बनून प्रवाहीत होण्याची शक्यता असते. माथाडी कामगारांच्यासुध्दा याचप्रमाणे आकांक्षा असतात. कामगार आकांक्षा पूर्ण करत-करत जीवनाच्या शेवटच्या टोकाला आलेला असतो. कामगारांच्या मजूरीवर त्याचे संपूर्ण कुटूंब अवलंबून असते. सर्वात जास्त तो मजूरीला महत्त्व देत असतो. आपल्या कुटुंबातील सर्व सुख-सोई पूर्ण व्हाव्यात याकरिता तो अतिरिक्त काम सुध्दा करतो. पण प्रत्यक्षात त्याला मिळणाऱ्या मजूरीतून त्याला स्वत:च्याच गरजा, आकांक्षा पूर्ण करता येत नाही. त्यामुळे साहजिकच कुटूंबावर आर्थिक समस्या ओढवतात.

कामाचा संबंध फक्त उत्पन्नाशी नसून स्वाभिमानाशी सुध्दा आहे. माणूस कामामध्ये आपली ओळख शोधतो. श्रमातून माणूस स्वत:ला व्यक्त करत असतो. त्यामुळे काम म्हणजे पगारी काम असे समजणे चुकीचे आहे. जागतिकीकरण, उदारीकरण, खाजगीकरणामुळे उद्योग क्षेत्रात प्रचंड वाढ झाली. माहिती तंत्रज्ञानामध्ये क्रांती आली. या बदललेल्या प्रक्रियेमुळे कामाशी संबंधित सामाजिक संबंधांमध्ये मोठे बदल घडून येत आहे. तसेच व्यक्ती कुटूंब व समुदायावर या बदलांचे महत्त्वपूर्ण परिणाम दिसून येत आहे. उदारीकरणामुळे भारतात आर्थिक फेररचना सुरू झाली. भारतात बहुराष्ट्र कंपनीचे जाळे पसरू लागले. उदारीकरणामुळे कामाचे स्वरूप व कामगाराची नेमणूक यामध्ये बराच फरक झालेला आहे. कामगाराची स्थिती अधिकाधिक खालावत आहे. संघटीत क्षेत्रातील कामगार असंघटीत क्षेत्रात ढकलले जात आहे. यासाठी भारताच्या संविधानात ठोस तरतुदी केलेल्या आहे. श्रमिकांचे आरोग्य व सुरक्षितपतणा यांचे महत्त्व लक्षात घेवून भारतात आजपर्यंत अनेक कामगार कायदे केले गेलेले आहे. मुळातच भारताच्या एकूण श्रम शक्तीत असंघटीत कामगारांचे प्रमाण संघटीत कामगारांपेक्षा कितीतरी पटीने जास्त आहे. अशा संघटीत व असंघटीत कामगारांना अनेक तांत्रिक कायद्यांचे संरक्षण अथवा लाभ मिळू शकत नाही.

आर्थिक सुविधा किंवा सुरक्षितता नसेल तर कामगाराची जगून न जगण्यासारखी अवस्ता असते. त्याचा हा मुलभूत हक्क असतो त्यासाठी तो सातत्याने प्रयत्नशील असतो. कामगाराच्या जीवनात सर्वात जास्त महत्त्व आर्थिक सुरक्षिततेला असते कारण तो पूर्णपणे आपल्या कामावरच अवलंबून असल्याने त्याला मजूरी मिळते त्यावरच त्याचा उदरनिर्वाह अवलंबून असतो. मजूरीत नियमितपणा असेल तर त्याची जीवनपध्दती विस्कळीत होत नसते तसेच मजूरी किती आणि कशी असावी त्यालासुध्दा महत्त्व असते. फक्त मजूरीत नियमितीपणा असणे याला महत्त्व नसते तर मजूरी हेच त्याचे उदरनिर्वाहाचे साधन असल्याने किमान गरजा भागू शकतील एवढे असणे तरी आवश्यक असते. त्याशिवाय त्याच्या जीवनाला अर्थ प्राप्त होत नसतो. त्याचप्रमाणे दैनंदिन गरजा भागविण्याइतपत जर वेतन / मजूरी असेल तर अकस्मात निर्माण होणारी संकटे जसे अपघात, आजार, मृत्यु व कुटूंबातील विविध सण, उत्सव, नातेवाईक यांचा तर रोजच्या खर्चापैकी वेगळा खर्च जास्त असतो. त्याचीसुध्दा पूर्तता होण्याइतपत त्याला वेतन

मिळाले नाहीत तर तो उध्वस्त होण्याची शक्यता नाकारता येत नाही. म्हणून त्यासाठी त्याची मजूरी या आकस्मिक गरजा भागविण्याइतकपत असावी अशी त्याची मनोमन अपेक्षा असते.

त्याचबरोबर काम करणाऱ्या व्यक्तीला फुरसतीची गरज असते. जीवनाचा पुरेपूर उपभोग घ्यावा असे त्याला वाटत असते. हमलीचे काम करणारा व्यक्तीसुध्दा एक माणूसच असतो. तो सुध्दा कष्ट करतांना थकत असतो. अंगमेहनतीचे काम असल्याने थकवा तर जास्तच प्रमाणात असतो. श्रमाचे परिमार्जन फुरसतीत होत असते परंतु ही कसरत म्हणजे निव्वळ झोप काढणे नव्हे मिळालेल्या रिकाम्या वेळेत काहीतरी करावे अशी त्यांची आकांक्षा असते. कामाच्या व्यतिरिक्त समाजात घडणाऱ्या घडामोडीशी त्यांचा संबंध यावा, त्यात त्याने सहभागी व्हावे व त्याचा उपभोग घ्यावा असे माथाडी कामगाराला वाटणे साहजिकच आहे.

माथाडी कामगारांना आर्थिक समस्या हे सतत भेडसावणारी समस्या असते. मूळातच काम हे अतिरिक्त करून सुध्दा मिळणारी मजूरी ही त्याच्या कौटुंबिक गरजा पूर्ण करू शकत नाही. त्यामुळे त्यांना आपल्या मजूरीबरोबर अतिरिक्त जोडधंदा करावा लागतो.

काही कामगारांना जोडधंदा करता येत नाही. जोडधंद्याकरिता त्यांच्याजवळ जागा, भांडवल नसते. म्हणून त्याला आपल्या व आपल्या कौटुंबिक गरजा भागवण्यासाठी फक्त आणि फक्त मजूरीवरच अवलंबून राहावे लागते.

ब-याच कामगारांना आर्थिक अडचण असल्यास तो कुणाकडून तरी आर्थिक उचल घेतो. नाहीतर बँकेतून कर्ज काढतो. काही कामगारांना बँकेतून सहजच कर्ज उपलब्ध होते तर काही कामगारांच्या पदरी मात्र निराशाच येते. कारण बँकातून कर्ज काढतांना त्यांच्या मजुरीविषयी विचारपूस केली जाते. कामगार कर्ज काढत असतांना तो कर्ज व्याज सहज फेडू शकतो का? याचा पूर्णपणे विचार केला जातो. ब-याच कामगारांकरिता बँकेची दारे बंदच असतात असे म्हणता येईल. मग माथाडी कामगारांना शेजा-याकडून उचल करावी लागते. त्यामुळे उसनवारीचे दडपण नेहमी त्याच्यासोबत असते.

ब-याच ठिकाणी कामगार संस्था असतात. त्यामार्फतसुध्दा कामगारांना कर्ज मिळते. पण ते कमी प्रमाणात असते. त्यामुळे तो आर्थिक बाबीविषयी नेहमीच असमाधानी असतो. माथाडी कामगारांना कायद्यानुसार बोनस मिळत असतो. पण तो पुरेसा नाही. त्यामुळे माथाडी कामगार बोनस जास्त मिळावा म्हणून नेहमी संघर्ष करतात. माथाडी कामगारांची मजुरी ही कमी असून त्यांना बोनस हा कमी मिळतो. अतिरिक्त काम केल्यानंतरसुध्दा मजूरी ही तितकीच असते. त्यामुळे आर्थिक समस्यांना तोंड फुटते. माथाडी कामगार हा दररोज ६-८ तास हमाली करत असतो. परंतु त्याचप्रमाणात त्याला मजूरी मिळत नाही.

समाजात वावरत असतांना माथाडी कामगारांना निम्नस्थानी पाहिले जाते. कारण सतत काम करीत असल्याने त्याच्या अंगावर धूळ, घाम सतत असतो. सतत कामामुळे त्याला समाजात सहभागी होता येत नाही. एकप्रमाणे समाजाचा आणि त्याचा संबंध येतच नाही. त्यामुळे समाजात त्याला दुय्यम, मध्यम स्थान दिले जाते. माथाडी कामगारांच्या समाजाकडून ब-याच अपेक्षा व आकांक्षा असतात.

सर्वात महत्त्वाचे म्हणजे कामगाराची आर्थिक बाजू भक्कम व्हावी यासाठी शासनाकडून कामगारांची अपेक्षा नेहमीच असते व तो त्यासाठी नेहमी सातत्याने संघर्ष करीत असतो.

व्यक्तिगत संघर्षातून जर त्याला आपल्या पदरी निराशा येत असेल तर तो कामगार मंडळ सदस्य होऊन आपल्या मागण्या शासनासमोर ठेवत असतो. माथाडी कामगारांचे कामगार मंडळ यांचे सर्व प्रयत्न हे बोनस, पेन्शन, मजूरी यावर असते. या मजूरी, बोनस, पेन्शनवरून त्यांची आर्थिक बाजू भक्कम स्वरूपाची होणार असते. कामगारांची मुख्य मागणी ही निवृत्ती वेतन लागू करावी ही असते. कारण त्याचा जीवनाला आर्थिक हातभार हा नियमितपणे लागेल अशीच अपेक्षा त्यांची असते.

कुठलीही मानवी व्यक्ती ज्या वेळेस स्वत:हून स्वत:च्या खुशीने श्रम करते. त्या वेळेस तिला आनंद मिळतो. एकाच त-हेच्या मानसिक व शारिरीक समाधानाचा लाभ मिळतो. मानवी जीवन सफल झाल्याचा एक प्रेरणादायक अनुभव मिळतो आणि विशेष म्हणजे असे श्रम केल्याने मानवी व्यक्ती ख-या अर्थाने एकमेकांशी सामाजिक, सांस्कृतिक जिव्हाळ्याने बांधले जातात. परंतु ज्या वेळेस हे श्रम निव्वळ चाकरी करता केलेले असतात त्यावेळेस ते उपरे वाटतात व बरोबर विरूध्द अनुभव येतो. माणसे त्या श्रमाकडे काबाडकष्टाचे काम म्हणून बघतात. असेच एक काम म्हणून माथाडी कामगारांच्या कामाचा उल्लेख करता येतो.

असंघटीत क्षेत्रातील माथाडी कामगाराच्या कल्याणासाठी महाराष्ट्रात १९६९ साली पहिला कायदा करण्यात आला. परंतु प्रत्यक्षात मात्र या कायद्याचा काहीही उपयोग या कामगारांना झालेला आपल्यास दिसत नाही. भारताच्या संविधानात व कामगार कायद्यात कामगारांच्या सुरक्षिततेसाठी तरतूद केली गेलेली असली तरी माथाडी कामगारांचे काम नैमित्तिक असल्यामुळे त्यांच्यात मालक व नोकर असे नाते प्रस्थापित होत नाही. अशा कामगारांच्या कामाचे स्वरूप लक्षात घेता या कामगारांना अनेक प्रकारचे अपघात, संसर्गजन्य रोग, अतिकष्ट कामामुळे निर्माण होणा-या व्याधी अशा गंभीर आरोग्याच्या समस्यांना सामोरे जावे लागतो. अशा प्रकारच्या इतर अनेक समस्याही त्यांच्यासमोर उभ्या असतात. प्रस्तुत अध्ययनात अशा माथाडी कामगारांच्या समस्या जाणून घेण्याचा प्रयत्न केलेला आहे.

अभ्यासाची उद्दिष्टे : जळगाव शहरातील माथाडी कामगारांचे सामाकि व आर्थिक अध्ययन करणे.

गृहीतके - १) माथाडी कामगारमध्ये पुरूष वर्गाचे प्रमाण अधिक आहे.

२) माथाडी कामगारांची सामाजिक व आर्थिक परिस्थिती हलाखीची आहे.

अभ्यास पध्दती

सदरच्या अध्ययनासाठी कामगारांना संबंधित काही संदर्भ ग्रंथ, मासिके, विविध विशेषांक यांचा आधार घेतलेला आहे. त्याचबरोबर जळगाव शहरातील ५० माथाडी कामगारांना प्रत्यक्ष भेटन त्यांच्याकडून प्रश्नावली भरून घेण्यात आली आहे..

नमुना निवड पध्दती

सदरच्या अध्ययनासाठी संभव्यता नमुना निवडीमधील साधा यादृच्छिक त्यामदील कोटा पध्दतीचा वापर करण्यात आला. ज्यामध्ये जळगाव शहरातील धान्य बाजार वखार महामंडळ, कुसुंबा येथील ५० माथाडी कामगारांची निवड करून त्यांच्याकडून प्रश्नावली भरून घेण्यात आली.

माथाडी कामगारांच्या कामाचे स्वरूप

माथाडी कामगार म्हणजे मालाची चढ-उतार करणे, जसे की, बाजारपेठांमध्ये विविध मालाची पोती, कापड व कापसाच्या गठल्या, लोखंडी माल इत्यादी उतरवून दुकानात अथवा गोदामात थप्पी लावणे, वजन करणे, गट लावणे, एका ठिकाणचा माल दुसरीकडे हलविणे (वारफेर), भराई, उतराई, पोती-शिवणे, मालाची स्वच्चता, निवड, प्रतवारी, बांधणी (पॅकींग) इ. अनेक प्रकारची कामे करणारा कामगार. माथाडी काम हे सामूहिक (टोळी पध्दत) व मुकादमाच्या नेतृत्वाखाली चालते. अशा प्रकारची कामे प्रामुख्याने उत्पादन आस्थापना, किरकोळ व घाऊक व्यापारी बाजारपेठांमध्ये मधूनमधून नैमित्तिकपणे चालणारी असतात.

निष्कर्ष

१. या अध्ययनासाठी ज्या निवेदकाकडून माहिती घेण्यात आली ते सर्व निवेदक पुरूष कामगार आहेत. या क्षेत्रात स्त्रियांचे प्रमाण अत्यंत कमी प्रमाणात दिसून आले.

२. माथाडी कामगार म्हणून तरूण वयोगटातील कामगारांचे प्रमाण ३५ ते ५५ सर्वाधिक आहे.

३. प्राथमिक शिक्षण घेतलेल्या कामगारांची संख्या जास्त असून माथाडी कामगारांमध्ये उच्चशिक्षित कामगार आढळत नाही.

४. हिंदू धर्म असलेल्या कामगारांची संख्या जास्त प्रमाणात आहे. मराठी लोकांचे प्रमाण त्यातल्या त्यात जास्त आहे.

५. बहुतांशी कामगार जवळपास १० वर्षांपासून काम करत असून सर्वच कामगारांना मासिक मजूरी मिळते.

६. विभक्त कुटूंब पध्दतीत राहणा-या निवेदकांची संख्या जास्त आहे. कुटूंबातील सदस्यांचे प्रमाण ४ ते ६ झाले आहे. यापेक्षा जास्त सदस्य संख्या कुटूंबाचे प्रमाण कमी आहे.

७. माथाडी कामगारांना मिळणा-या मजुरीतून त्यांच्या कौटुंबिक गरजा पूर्णपणे भागवल्या जात नसल्याने अध्ययनातून स्पष्ट झाले. त्यासाठी कौटुंबिक इतर सदस्यांनाही काम करावे लागते.

८. माथाडी कामगारांना मिळणा-या मजूरीविषयी ते असमाधानी आहे. त्यांच्या कौटुबिंक गरजा पूर्ण होत नसल्याचे दिसून आले. त्यासाठी ते अतिरिक्त काम करतात.

९. माथाडी कामगार म्हणून ते जवळपास ६ ते ७ तास काम करतात. त्याचबरोबर अतिरिक्त काम करीत असल्यामुळे त्यांचा परिणाम त्यांच्या व्यक्तिगत जीवनावर झाल्याचे आढळून आले.

१०. आर्थिक अडचण असल्यास ते बँकेतून कर्ज काढतात. परंतु त्यासाठी बँकेतून त्यांना कर्ज लवकर मिळत नाही. तसेच जोडधंदा करण्यासाठी लागलीच भांडवलही उपलब्ध होत नाही असे त्यांनी नमूद केले. माथाडी कामगारांची सहकारी संस्था असून आर्थिक अडचण असल्यास एकूण सर्वच कामगार त्या संस्थेकडून कर्ज घेत असल्याचे दिसून आले.

११. निवेदकांपैकी सर्वच निवेदकांना राज्यकामगार विमा लागू असून त्यांना कायद्यानुसार बोनस मिळत असल्याचे दिसून आले.

१२. माथाडी कामगार म्हणून काम करीत असतांना समाजात वावरतांना त्यांना कमीपणा वाटत असल्याचे दिसून आले. माथाडी कामगार म्हणून समाजात त्यांना मध्यम स्थान असल्याचे त्यांनी सांगितले.

१३. सर्वच निवेदकांना माथाडी कामगार कायद्याविषयीची माहिती आहे असे दिसून आले.

१४. हे निवेदक ज्या ठिकाणी काम करतात त्यापैकी बहुतांश ठिकाणी कामगार संघटना असून हे निवेदक कामगार संघटनेचे सभासद असल्याचे दिसून आले. परंतु कामगारांच्या समस्येची दखल कामगार संघटना कधीतरी घेत असल्याचे लक्षात आले आणि म्हणूनच माथाडी कामगार संघटनेबाबत समाधानी नसल्याचे दिसून आले.

१५. माथाडी कामगार म्हणून काम करीत असतांना त्यांना अडचणी येत असल्याचे जाणवले. त्यांना त्यांच्या कामाचा योग्य मोबदला न मिळत असल्याचे दिसून आले.

१६. अतिरिक्त कामामुळे येणारा तणाव घालविण्यासाठी माथाडी कामगार तंबाखुचे व बिडी-सिगारेटचे सेवन अधिक करतात. त्याचबरोबर दारूचे व्यसन असणारे कामगार ही दिसून आले. एकंदरीत माथाडी कामगारांमध्ये व्यसनाधनीतेचे प्रमाण जास्त दिसून आले.

१७. माथाडी कामगारांच्या स्थितीत सुधारणा घडवून आणण्यासाठी त्यांनी समाजाकडून व शासनाकडून काही अपेक्षा व्यक्त केल्या. यासंदर्भात बहुतांशी कामगारांनी शासनाकडून व समाजाकडून आरोग्य संबंधीत योजना व कल्याणकारी योजना राबविल्या जाव्यात असे मत व्यक्त केले.

१८. कामगारांची आर्थिक स्थिती सुधारावी म्हणून त्यांनी पेन्शन योजना, बोनस, मजूरीत वाढ, भांडवल उपलब्धता, कमी व्याजदरात कर्ज इत्यादी बाबी नमूद केल्या.

अनुमान

जळगाव शहरातील माथाडी कामगारांच्या अध्यायनातून काही बाबी समोर आल्या. कष्टाचे काम करून त्यांना पुरेसा मोबदला मिळत नसल्याचे स्पष्ट झाले. आपल्या कौटुंबिक गरजा भागविण्यासाठी त्यांच्या कुटुंबातील इतर सदस्यांनासुध्दा काम करावे लागत असल्याचे दिसून आले. या कामगारांमध्ये शिक्षणाचे प्रमाण कमी आहे. त्यांच्याविषयीचा समाज दृष्टीकोनही कनिष्ठ असल्याचे जाणवते. त्याचबरोबर बहुतांशी कामगारांमध्ये व्यसनाधीनतेचे प्रमाण अतिशय जास्त आहे. ते कामगार संघटनेचे सदस्य आहे. परंतु त्याबाबतीत मात्र ते असमाधानी आहेत. आपल्या स्थितीत सुधारणा घडवून आणण्यासाठी समाजाकडून व शासनाकडून काही अपेक्षा त्यांनी व्यक्त केलेल्या आहे.

संदर्भसूची

१. प्रा. डॉ. शरदचंद्र गोखले, कामगार कल्याण
२. अरूणकुमार, जी. मुखेडकर, महाराष्ट्र माथाडी व हमाल, इतर श्रमजीवी कामगार
३. बाबा आढाव, हमाल मापाडी वार्ता
४. एम. बी. भागवत (महाराष्ट्र राज्य वखार महामंडळ), पुस्तिका - वखार महामंडळाच्या निर्मितीची पार्श्वभूमी,
५. पी. के. कुळकर्णी, औद्योगिक संबंध व श्रम कायदे
६. एम. जी. पाटकर, एन. बी. भागवत, औद्योगिक व्यवस्थापन
७. प्रा. डॉ. सुरेश मेश्राम, सामाजिक संशोधन पध्दती

Spiritual Platform
To Make
Golden Career...

ViViDhaTa
Research & Training Center

Moolji Jaitha College

Institute of Management
& Research

Ojaswini Kala
Mahavidhyalaya

KilBil Balak Mandir

IMPT

JalaSRI Watershed Surveillance
& Research Institute

Eklavya Krida Sankul

Eklavya College of
Physical Education

G. P. V. P. School

ज्ञानप्रसारो व्रतम्
स्थापना १९४४
खान्देश कॉलेज एज्युकेशन सोसायटी

College of Education

Ojaswini Institute
of Home Science

Girls Hostel

S. S. Maniyar Law
College

GICE

A. T. Zamare Highschool

Orion CBSE English
Medium School

Orion English Medium
School

Adhyapak
Vidhyalaya (D. T.Ed)

Post Graduation College of
Science, Technology &
Research

College of
Engineering & Information
Technology

Spark Design & Print
Services

Poornavad University

KHANDESH COLLEGE EDUCATION SOCIETY

A Profound Academic Movement

SPARK : 0257 2251918