

Volume 4, Issue 4(5), April 2015
**International Journal of Multidisciplinary
Educational Research**

Published by

Sucharitha Publications
8-21-4, Saraswathi Nivas, Chinna Waltair
Visakhapatnam – 530 017
Andhra Pradesh – India
Email: victorphilosophy@gmail.com
Website: www.ijmer.in

Editorial Board

Editor-in-Chief

Dr.K. Victor Babu

Faculty, Department of Philosophy
Andhra University – Visakhapatnam - 530 003
Andhra Pradesh – India

EDITORIAL BOARD MEMBERS

Prof. S.Mahendra Dev

Vice Chancellor
Indira Gandhi Institute of Development
Research
Mumbai

Prof.Y.C. Simhadri

Vice Chancellor, Patna University
Former Director
Institute of Constitutional and Parliamentary
Studies, New Delhi &
Formerly Vice Chancellor of
Benaras Hindu University, Andhra University
Nagarjuna University, Patna University

Prof. (Dr.) Sohan Raj Tater

Former Vice Chancellor
Singhania University, Rajasthan

Prof.K.Sreerama Murty

Department of Economics
Andhra University - Visakhapatnam

Prof. K.R.Rajani

Department of Philosophy
Andhra University – Visakhapatnam

Prof. P.D.Satya Paul

Department of Anthropology
Andhra University – Visakhapatnam

Prof. Josef HÖCHTL

Department of Political Economy
University of Vienna, Vienna &
Ex. Member of the Austrian Parliament
Austria

Prof. Alexander Chumakov

Chair of Philosophy
Russian Philosophical Society
Moscow, Russia

Prof. Fidel Gutierrez Vivanco

Founder and President
Escuela Virtual de Asesoría Filosófica
Lima Peru

Prof. Igor Kondrashin

The Member of The Russian Philosophical
Society
The Russian Humanist Society and Expert of
The UNESCO, Moscow, Russia

Dr. Zoran Vujisiæ

Rector
St. Gregory Nazianzen Orthodox Institute
Universidad Rural de Guatemala, GT, U.S.A

Prof.U.Shameem

Department of Zoology
Andhra University Visakhapatnam

Dr. N.V.S.Suryanarayana

Dept. of Education, A.U. Campus
Vizianagaram

Dr. Momin Mohamed Naser

Department of Geography
Institute of Arab Research and Studies
Cairo University, Egypt

I Ketut Donder

Depasar State Institute of Hindu Dharma
Indonesia

Prof. Roger Wiemers

Professor of Education
Lipscomb University, Nashville, USA

Dr.B.S.N.Murthy

Department of Mechanical Engineering
GITAM University –Visakhapatnam

N.Suryanarayana (Dhanam)

Department of Philosophy
Andhra University
Visakhapatnam

Dr.S.V Lakshmana Rao

Coordinator
A.P State Resource Center
Visakhapatnam

Dr.S.Kannan

Department of History
Annamalai University
Annamalai Nagar, Chidambaram

Dr. Barada Prasad Bhol

Registrar, Purushottam Institute of
Engineering & Technology
Sundargarh, Odisha

Dr.E. Ashok Kumar

Department of Education
North- Eastern Hill University, Shillong

Dr.K.Chaitanya

Department of Chemistry
Nanjing University of Science and
Technology
People's Republic of China

Dr.Merina Islam

Department of Philosophy
Cachar College, Assam

Dr. Bipasha Sinha

S. S. Jalan Girls' College
University of Calcutta, Calcutta

Dr. K. John Babu

Department of Journalism & Mass Comm
Central University of Kashmir, Kashmir

Dr.Ton Quang Cuong

Dean of Faculty of Teacher Education
University of Education, VNU, Hanoi

Prof. Chanakya Kumar

Department of Computer Science
University of Pune,Pune

Prof. Djordje Branko Vukelic

Department for Production Engineering
University of Novi Sad, Serbia

Prof.Shobha V Huilgol

Department of Pharmacology
Off- Al- Ameen Medical College, Bijapur

Prof.Joseph R.Jayakar

Department of English
GITAM University
Hyderabad

Prof.Francesco Massoni

Department of Public Health Sciences
University of Sapienza, Rome

Prof.Mehsin Jabel Atteya

Al-Mustansiriyah University
College of Education
Department of Mathematics, Iraq

Prof. Ronato Sabalza Ballado

Department of Mathematics
University of Eastern Philippines, Philippines

Dr.Senthur Velmurugan .V

Librarian
Kalasalingam University
Krishnankovil Tamilnadu

© Editor-in-Chief, IJMER®
Typeset and Printed in India
www.ijmer.in

IJMER, Journal of Multidisciplinary Educational Research, concentrates on critical and creative research in multidisciplinary traditions. This journal seeks to promote original research and cultivate a fruitful dialogue between old and new thought.

C O N T E N T S

Volume 4

Issue 4(5)

April 2015

S. No		Page No
1.	Influence of Co-Solvent on Chemical Speciation of Ternary Complexes of Bi- and Tri- Dentate Ligands with Essential Metal Ions Hadgu Hailekiros Belay, Budati Bala Venkata Sailaja and Gollapalli Nageswara Rao	1
2.	Extraction, Isolation and Characterization of Chlorophyll A from Spinach Leaves Leta Deressa Tolesa	20
3.	Effect of Hamstring and Lower Back Muscles Flexibility on Leg Elastic Strength Performances of Mekelle University Students Samson Wondirad	29
4.	Synthesis of CUO Nanoparticles by Precipitation Method and Characterisation V.Ranjith Kumar, P .Vijaya Kumar and B. Sudheer Kumar	42
5.	Design Synthesis and Biological Activity of ((S)-4,5,6,7-Tetrahydro-N ₆ -Propyl,2,6-Enzothiazole diamine)Metal Complexes G.Harisha, R.Vijaykumar and R.Mallikarjuna Rao	61
6.	Synthesis and Liquid Crystalline Properties of Flavonoid Triester Salah Hamza Sherif, Siddaiah Vidavalur, Suri Babu and Y.L.N. Murthy	76
7.	Teacher Education in the Wake of Globalization Vipinder Nagra	89
8.	Tribals and their Socio-Economic and Political Institutions V.Jarnardhana Rao Naidu	96

9.	Speciation of Ternary Complexes of CA(II), MG(II) and ZN(II) with L-Asparagine and L-Glycylglycine in Ethylene Glycol-Water Mixtures	108
	Bogi Srinu and B B V Sailaja	
10.	Consumer Perception on Awareness and Purchasing Behavior of Products at Girijan Cooperative Corporation	127
	K.V. Nagaraj	
11.	Public Attitude on Juvenile Crime: A Study in Visakhapatnam City	141
	Kadim Lovakumari	
12.	Slicing of Age Composition Using Maximum Likelihood from Length Frequency Analysis (LFA) of African Catfish (<i>Clarias Gariepinus</i>) in Lake Tana, Ethiopia	157
	Zewdu Berhanie Ayele and R Ramakrishna	
13.	A New Approach to Understand ADHD	174
	Sameena Moushtaq Shah	
14.	Counter Terrorism Approaches of India and Russia	181
	Sanjukta Maharana	
15.	Manohar Malgonkar's – A Bend in the Ganges: A Classic in Modern Indo-Anglian Fiction	192
	S .V Rama Rao	
16.	Reexamining Falsification	197
	Soumya R.V.	
17.	Ecological Crisis: An Examination	206
	Akram Ali Bhutto	

Dr. K. VICTOR BABU

M.A.,M.A.,M.Phil.,Ph.D.,PDF, (D.Lit)
Faculty of Philosophy and Religious
Studies & Editor-in-Chief
International Journal of Multidisciplinary
Educational Research (IJMER) &
Sucharitha: A Journal of Philosophy and
Religion
Andhra University, Visakhapatnam
Pin - 530 003 , Andhra Pradesh – India



ISSN : 2277 – 7881
Impact Factor :2.972(2015)
Index Copernicus Value: 5.16



Editorial.....

You will be happy to know that we have entered the fourth year of publication of IJMER, since its inception in April 2012. Focusing on many interdisciplinary subjects, the published papers are spreading the knowledge with fervent hope of upholding the holistic approach. With all my heart, I reiterate to echo my sincere feelings and express my profound thanks to each and every valued contributor. This journal continues to nurture and enhance the capabilities of one and all associated with it.

We as a team with relentless efforts are committed to inspire the readers and achieve further progress. Aim is to sustain the tempo and improve. We acknowledge with pleasure that our readers are enjoying the publications of Sucharita Publishers. We solicit to receive ideas and comments for future improvements in its content and quality. Editor – in-Chief explicitly conveys his gratitude to all the Editorial Board members. Your support is our motivation. Best wishes to everyone.

Dr.K.Victor Babu
Editor-in-Chief

**SOCIAL SCIENCES, HUMANITIES, COMMERCE & MANAGEMENT, ENGINEERING
& TECHNOLOGY, MEDICINE, SCIENCES, ART & DEVELOPMENT STUDIES, LAW**

www.ijmer.in



INFLUENCE OF CO-SOLVENT ON CHEMICAL SPECIATION OF TERNARY COMPLEXES OF BI- AND TRI- DENTATE LIGANDS WITH ESSENTIAL METAL IONS

Hadgu Hailekiros Belay
Department of Inorganic and
Analytical Chemistry
Andhra University
Visakhapatnam, India

Budati Bala Venkata Sailaja
Department of Inorganic
and Analytical Chemistry
Andhra University
Visakhapatnam, India

Gollapalli Nageswara Rao
Department of Inorganic and Analytical Chemistry
Andhra University, Visakhapatnam, India

1 Introduction

A number of studies has been reported on ternary stability constants of α -amino acids in different media.^[1,2] Metal ions exist in non-exchangeable form, loosely bound to some biological ligands and in equilibrium with a variety of bioligands in different biofluids like blood serum, intestinal fluid, cerebrospinal fluid, gastric juice etc. Thus, simultaneous equilibria involving a variety of metal ions and ligands are possible in biofluids. Cobalt, nickel and copper have several biological functions.^[3,4] Therefore, investigation of ternary complexes containing a metal ion and two different ligands drew attention of several researchers. Mixed ligand complexes can be considered as models for apoenzyme-metal ion-substrate complexes. In peptides, proteins and amino acids, amide group is one of the important binding sites for coordination of the metal ions. Acidity and basicity of a molecule is governed by its structure and solvent effects.^[5] Dioxan (Dox) is chosen as a polar organic solvent to mimic the permittivity of the biological fluids. L-ornithine (Orn) and ethylenediamine (en) are chosen as model compounds to protein and substrates.

The hepatic mitochondrial enzyme, Orn aminotransferase catalyses the transfer of amino group of Orn to α -oxoglutarate to form glutamic



acid.^[6] The enzyme serves an important metabolic function in the regulation of Orn available for participation in the urea cycle.^[7,8] En is used as an important monodentate, bidentate or a bridging ligand.^[9] It is used in the manufacture of EDTA, carbamate fungicides, surfactants and dyes. It is also useful in manufacturing accelerator or curing agent in epoxy industry. It is involved in the synthesis of seven-membered ring components with β -ketoesters resulting secondary amines and β -enaminoesters.^[10] The en plays an important role in the synthesis of Schiff bases.^[11] The protonation constants of ethylenediamine were reported earlier by theoretical calculations.^[12,13] Protonation constants^[14] and binary stability constants of en^[15] with Co(II), Ni(II) and Cu(II) have been reported earlier. Hence, in this communication we report the stability constants of ternary complexes of Co(II), Ni(II), and Cu(II) with Orn and en, in media of comparable dielectric constant with physiological fluids.

2 Experimental

Aqueous solutions (0.1 mol L^{-1}) of Co(II), Ni(II), and Cu(II) chlorides (GR Grade, E-Merck, Germany) were prepared by dissolving them in triple distilled water, 0.05 mol L^{-1} aqueous solutions of L-ornithine (GR Grade Merck, India) and Ethylenediamine (AR, Qualigen, India) were also prepared. To increase the solubility of the ligands and metal salts, 0.05 mol L^{-1} Hydrochloric acid was maintained in the solutions. Dox (AR, E-Merck) was used as received. The strength of alkali was determined using the Gran plot method.^[16,17] Errors in the concentrations of ligand, metal ions and alkali were subjected to analysis of variance (ANOVA).^[18]

The titrations were carried out in the medium containing varying concentrations Dox-water mixtures maintaining an ionic strength of 0.16 mol L^{-1} with sodium chloride at 303.0 K, with an ELICO (Model LI-120) pH meter of 0.01 readability in conjunction with a glass and



calomel electrode. The pH meter was calibrated with 0.05 mol L^{-1} potassium hydrogen phthalate in acidic region and 0.01 mol L^{-1} borax solution in basic region. The glass electrode was equilibrated in a well stirred Dox- water mixtures containing inert electrolyte. The effect of variations in asymmetry potential, liquid junction potential, activity coefficient, sodium ion error and dissolved carbon dioxide on the response of glass electrode were accounted for in the form of correction factor ($\log F$) which was computed from the experimental and simulated acid-base titration data calculated by SCPHD program.^[19] A correction was applied to the pH meter dial readings to account for the solvent effect on pH.

Titration of strong acid with alkali was carried out at regular intervals to check whether complete equilibrium was achieved. The calomel electrode was refilled with Dox- water mixtures of equivalent composition as that of the titrand. In each of the titrations, the titrand consisted of 1 mmol of Hydrochloric acid in a total volume of 50 cm^3 . Titrations were carried out in the presence of different relative concentrations of the metal (M) to Orn (L) and to en (X) (M:L:X = 1:2.5:2.5, 1:2.5:5.0, 1:5.0:2.5) with 0.4 mol L^{-1} NaOH. The details of experimental procedure and titration assembly were given elsewhere.^[20] The best-fit chemical model for each system investigated was arrived at using a non-linear least squares analysis program MINQUAD75^[21], which exploits the advantage of constrained least squares method in the initial refinement and reliable convergence of undamped, unconstrained Marquardt algorithm.

3 Results and discussion

3.1. Modeling of chemical speciation

A preliminary investigation of alkalimetric titrations of mixtures containing different mole ratios of Orn and en in the presence of Hydrochloric acid and inert electrolyte inferred that no condensed



species were formed. The existence of the ternary complexes was determined by performing an exhaustive modeling study and the results of a typical system are given in Table 1. The models were evaluated assuming the simultaneous existence of different combination of species. Models containing various number and combinations of species were generated using an expert system package CEES and these models were refined using MINQUAD75 ^[21]. As the number of species increased, the model gave better statistics denoting the best fit. The best fit models were chosen based on the statistical parameters like χ^2 , R-factor, skewness and kurtosis given in Table 2. The ternary complex species detected are MLXH, MLX, and ML₂X, for Co(II), Ni(II), and Cu(II).

A very low standard deviation (SD) overall stability constants ($\log \beta$) indicates the precision of these parameters. The small values of U_{corr} (sum of squares of deviations in the concentrations of the metal, the ligands and the hydrogen ion at all experimental points corrected for degrees of freedom) indicate that the models represent the experimental data. Small values of mean, standard deviation and mean deviation for the systems corroborate that the residuals are around a zero mean with little dispersion. For an ideal normal distribution, the values of kurtosis and skewness should be three and zero, respectively. The kurtosis values in the present study indicate that most of the residuals form leptokurtic pattern in majority of the systems. The values of skewness recorded in Table 2 are between -1.04 and 1.49. These data evince that the residuals form a part of normal distribution hence, least-squares method can be applied to the present data. The sufficiency of the model is further evident from the low crystallographic R-values recorded.



Table 1 Exhaustive modeling study performed on Orn-Co(II)-en ternary complexes in 10% v/v Dox-water mixtures pH range = 4.0-10.0, NP=44; Temperature= 303.0±0.1 K, $\mu = 0.16 \text{ mol L}^{-1}$.

Model No.	log β (SD)			$U_{\text{corr}} \times 10^8$	Skewness	χ^2	Kurtosis	R-factor
	MLX	ML ₂ X	MLXH					
1	9.22(19)	-	-	8.83	0.55	18.0	0.21	.5078
2	-	12.55(6)	-	8.42	2.34	14.67	0.67	.1237
3	-	-	25.88(2)	7.65	1.55	14.33	10.07	.0578
4	10.16(19)	16.29(11)	-	7.10	0.45	13.47	4.67	.0404
5	10.80(23)	-	22.61(1)	6.78	1.33	13.33	4.98	.0304
6	-	15.72(7)	20.4(3)	6.55	1.02	12.45	2.65	.0226
7	12.26(1)	14.86(8)	19.43(5)	5.83	0.05	11.08	2.70	.0122



Table 2 Best fit chemical models of ternary complexes of Co(II), Ni(II) and Cu(II) with Orn and en in Dox-water mixtures. Temperature= 303.0 K, $\mu = 0.16 \text{ mol L}^{-1}$

%v/v Dox	log β_{mixh} (SD)			NP	$U_{\text{corr}} \times 10^9$	χ^2	Skewness	Kurtosis	R-factor
	1111	1110	1210						
Co(II) (pH=4.0-10.0)									
00.0	19.30(02)	11.85(03)	14.60(15)	43	0.44	12.55	-0.30	3.05	.0033
10.0	19.43(05)	12.26(01)	14.86(08)	44	5.83	11.08	0.05	2.70	.0122
20.0	19.58(18)	12.70(04)	15.30(12)	32	4.48	09.44	1.07	2.62	.0217
30.0	19.77(13)	13.60(02)	15.36(13)	36	8.77	21.22	0.59	4.07	.0160
40.0	19.99(14)	13.71(03)	15.95(09)	37	2.90	12.45	0.62	3.41	.0244
50.0	20.47(06)	14.00(08)	16.23(09)	35	7.77	22.32	0.44	4.44	.0344
60.0	20.46(12)	14.54(10)	17.25(10)	39	0.43	12.43	-0.37	3.35	.0032
Ni(II) (pH=3.0-9.0)									
00.0	22.10(10)	15.08(09)	20.42(07)	85	0.76	23.44	0.60	2.83	.0117
10.0	22.38(07)	16.68(11)	21.23(11)	40	0.22	10.55	1.49	4.31	.0033
20.0	22.63(02)	16.51(14)	21.88(17)	66	2.99	12.90	-0.40	3.62	.0019
30.0	22.81(01)	16.28(13)	21.97(08)	32	0.53	11.90	0.11	3.56	.0042
40.0	22.17(08)	16.89(14)	22.04(13)	36	1.98	16.77	1.33	1.30	.0021
50.0	22.66(09)	17.12(15)	22.22(19)	33	0.32	9.52	0.44	3.53	.0016
60.0	23.27(03)	17.40(08)	22.69(02)	29	0.46	19.22	0.47	3.06	.0024
Cu(II) (pH=1.9-8.0)									
00.0	28.14(06)	23.55(09)	30.69(17)	31	1.54	10.33	0.04	4.62	.0105
10.0	29.18(06)	24.39(09)	32.56(20)	28	1.87	04.66	-0.13	3.06	.0019
20.0	29.35(05)	24.43(07)	32.97(19)	78	4.54	15.90	0.32	2.45	.0231
30.0	29.84(08)	24.62(06)	33.33(13)	43	9.43	14.56	0.68	3.25	.0143
40.0	30.04(13)	25.25(19)	33.62(11)	30	4.66	21.25	-1.04	3.45	.0108
50.0	30.17(08)	25.44(06)	33.89(10)	44	1.96	23.99	0.42	3.16	.0143
60.0	30.38(10)	25.59(20)	34.22(05)	28	3.56	23.08	0.25	4.07	.0141



3.2. Effect of dielectric constant on stability of ternary complexes

Dox is a water miscible non-polar organic solvent ^[22]. The Dox-water mixtures are the combination of aprotic and protic solvents with wide range of dielectric constants and with good solubility for polar as well as non-polar solutes. The co-solvent-induced increased basicity of Dox-water mixtures increases the stabilization of the protons. At the same time the coordinating solvent (Dox) competes with the ligands for coordination for the metals. This decreases the stability of the complexes. Hence, the stability of the complex is expected to either increase or decrease linearly. The variation of overall stability constants with co-solvent content depends upon electrostatic and non-electrostatic factors. Born's classical treatment holds good in accounting for the electrostatic contribution to the free energy change. ^[23] According to this treatment, the energy of electrostatic interaction is related to dielectric constant. Hence, the $\log \beta$ values should vary linearly as a function of reciprocal of the dielectric constant ($1/D$) of the medium. The linear variation observed in the present study (Figure 1) indicates that electrostatic forces are dominating the equilibrium process under the present experimental conditions. This also indicates the dominance of structure breaking nature of Dox over its complexing ability. The stabilities of the complexes follow the Irving-Williams order, i.e. $\text{Co}^{II} < \text{Ni}^{II} < \text{Cu}^{II}$.

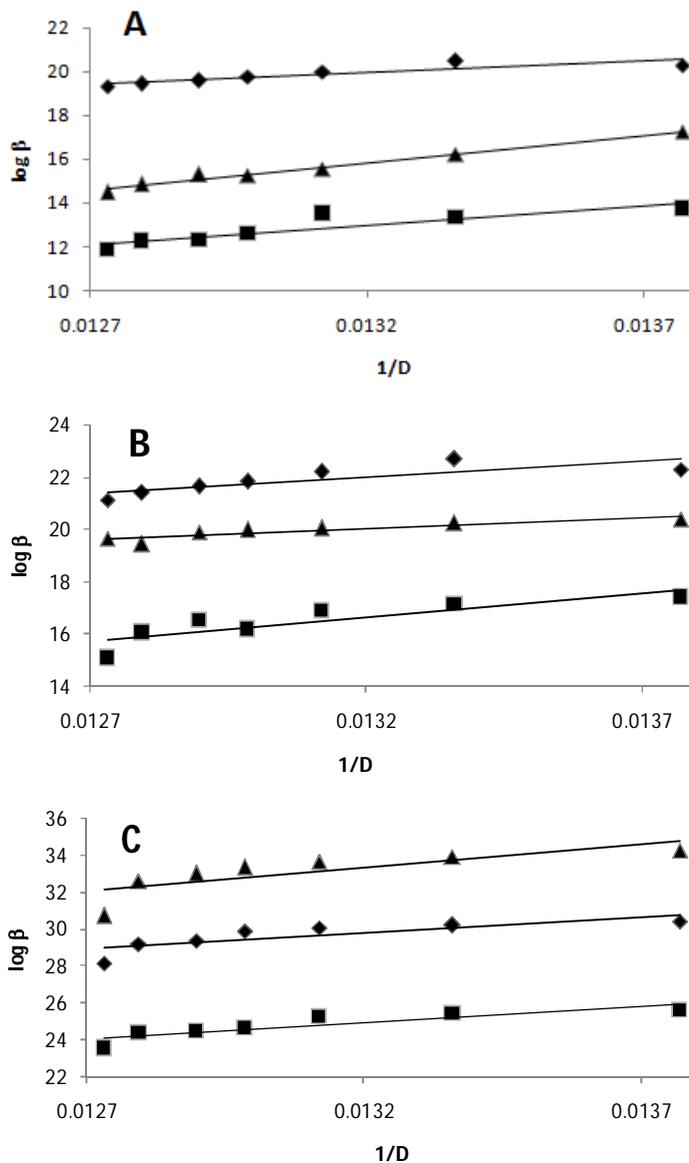


Fig. 1: Variation of stability constant values of metal-Orn-metal-en ternary complexes in Dox-water mixtures. (A) Co(II); (B) Ni(II); (C) Cu(II); (■) log β MLX, (◆) log β ML₂X and (▲) log β MLXH.



3.3 Interpretation of systematic errors

In order to rely upon the best chemical model for critical evaluation and application under varied experimental conditions with different accuracies of data acquisition, an investigation was made by introducing pessimistic errors in the influential parameters like concentrations of alkali, mineral acid, ligand and metal (Table 3). The sensitivity of the stability constants to these errors is in the order: alkali > acid > Orn > en > metal.

The order of concentrations/number of mmols of the ingredients used in the present study is alkali (0.4 M), acid (1.0 mmol), ligand (0.25 mmol) and metal (0.1 mmol). Since the content of alkali is far higher than those of other ingredients, any variation (error) in the concentration of alkali affects the magnitude of the stability constant greatly. The content of acid is highest next to alkali and hence the above order.

Some species were even rejected when errors were introduced in the concentrations. The rejection of some species and increased standard deviations in the stability constants on introduction of errors confirm the appropriateness of the experimental conditions (concentrations of ingredients) and choice of the best fit models. This study also indicates the relative sensitivities of the model parameters.

Table 3 Effect of errors in influential parameters on the stability constants of Orn-Co(II)-en ternary complexes in 10% v/v of Dox-water mixtures.

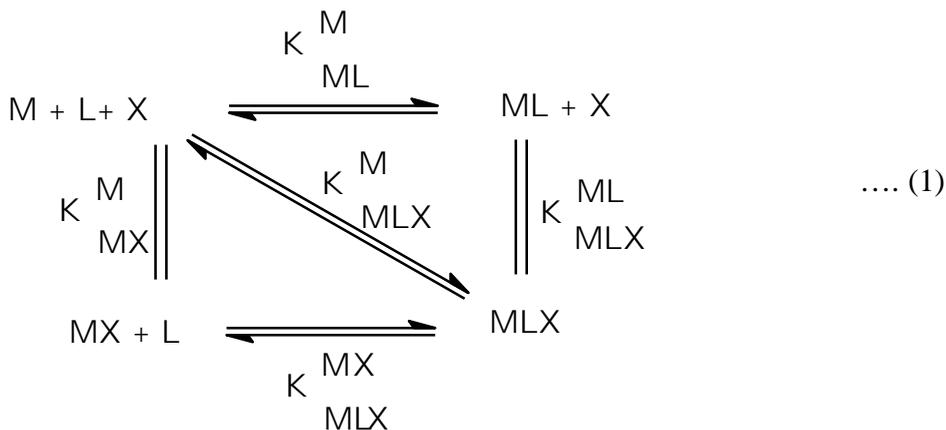
Ingredient	% error	log β_{mlxh} (SD)		
		1111	1110	1210
Dox				
	0	19.43(02)	12.26(03)	14.86(15)
Alkali	-5	Rejected	14.77(07)	Rejected



	-2	18.27(03)	11.08(26)	14.07(16)
	+2	20.63(05)	Rejected	Rejected
	+5	Rejected	Rejected	Rejected
Acid	-5	22.68(23)	15.10(99)	16.87(29)
	-2	20.50(06)	Rejected	15.64(18)
	+2	Rejected	11.14(17)	14.03(17)
	+5	17.18(03)	Rejected	Rejected
Orn	-5	20.09(04)	12.80(05)	15.27(16)
	-2	19.69(02)	12.48(04)	15.02(16)
	+2	19.19(01)	12.04(03)	Rejected
	+5	18.83(01)	Rejected	14.45(15)
En	-5	18.81(03)	11.65(07)	14.32(17)
	-2	19.18(01)	Rejected	14.63(15)
	+2	Rejected	12.53(06)	Rejected
	+5	20.11(07)	12.95(12)	15.45(18)
Metal	-5	19.61(02)	12.36(05)	14.95(15)
	-2	19.50(03)	12.30(04)	14.89(15)
	+2	19.37(04)	12.23(03)	14.82(15)
	+5	19.28(05)	12.17(02)	14.77(15)
	.			

3.4 Quantification of change in stability of ternary species

The change in the stability of the ternary complexes as compared to their binary analogues was quantified ^[24,25] based on the disproportionation constant ($\log X$) given by Equation 1 which corresponds to the equilibrium $ML_2 + MX_2 \rightleftharpoons 2MLX$. Under the equilibrium conditions one can expect the formation of 50% ternary complexes and 25% each of the binary complexes statistically and the value of $\log X$ shall be 0.6. A value greater than this account for the extra stability of MLX.



Another approach ^[26-28] to quantify the extra stability of ternary complexes was based on the difference in stability ($\Delta \log K$) for the reactions ML with X and $M(aq)$ with L and X , where L is the primary ligand (Orn) and X is the secondary ligand (en). It is compared with that calculated purely on statistical grounds as given in Equation 2. The equations for the calculation of $\Delta \log K$ and $\log X$ are given in Chart 1.

$$\begin{array}{cccc}
 ML & M & MX & M \\
 \Delta \log K = \log K & - \log K & = \log K & - \log K \\
 MLX & MX & MLX & ML \\
 \\ \\
 M & M & M & \\
 = \log K & - K & - K & \dots (2) \\
 MLX & ML & MX &
 \end{array}$$



The electrostatic theory of binary complex formation and statistical arguments suggest the availability of additional coordination positions of the hydrated metal ion for the first ligand than for the second. Hence, the usual order of stability $K_{ML}^M > K_{ML_2}^{ML}$ applies. This suggests that $\Delta \log K$ should be negative, although several exceptions have been found. [29] The statistical values of $\Delta \log K$ for tridentate L and bidentate X are 0.01 to 10.92 Dox- water mixtures (Table 4). Negative values of $\Delta \log K$ can be understood as the secondary ligand forms a more stable complex with hydrated metal ion than with L. Whenever the experimental values of $\Delta \log K$ exceed the statistical values, it can be inferred that the ternary complex is formed as a result of interaction of ML with X or MX with L.

The $\log X$ and $\Delta \log K$ values could not be calculated for some systems due to the absence of relevant binary species. The $\log X$ values range from 0.73 to 19.29, some of which are found to be higher than those expected on statistical bases (0.6). These higher values account for the extra stability of the ternary complexes. The extra stability of ternary complexes makes them more amenable for metal transport. The less stable binary complexes make the metals bioavailable.

Table 4 $\Delta \log K$ and $\log X$ values of ternary complexes of Co(II), Ni(II) and Cu(II)-Orn and en in Dox-water mixtures.				
% v/v Dox	$\Delta \log K$		$\log X$	
	Co(II)			
	1110	1210	1110	1111
0.0	0.12	0.01	4.13	8.22
10.0	0.59	0.33	4.82	0.75
20.0	0.07	0.59	5.53	0.80
30.0	0.28	0.08	6.63	0.73
40.0	0.05	0.08	6.18	0.86
50.0	0.08	0.25	6.79	1.80
60.0	0.08	0.75	6.95	0.77
	Ni(II)			



0.0	0.13	0.06	3.79	1.61
10.0	0.08	0.05	4.01	2.13
20.0	0.74	0.51	5.76	3.51
30.0	0.08	0.20	4.52	2.05
40.0	0.49	0.18	5.54	1.06
50.0	0.79	0.36	5.94	1.65
60.0	0.50	0.10	5.39	1.76
Cu(II)				
0.0	0.18	7.23	14.70	2.17
10.0	1.90	10.07	17.44	4.90
20.0	1.98	10.52	17.70	5.52
30.0	1.14	9.85	16.47	5.02
40.0	1.85	10.22	17.90	5.74
50.0	2.47	10.92	19.29	6.91
60.0	1.95	10.58	18.41	6.23

Chart 1 Equations for the calculation of $\Delta \log K$ and $\log X$

$\Delta \log K_{1110}$	$= \log \beta_{1110}$	$-\log \beta_{1100}$	$-\log \beta_{1010}$
$\Delta \log K_{1210}$	$= \log \beta_{1210}$	$-\log \beta_{1200}$	$-\log \beta_{1010}$
$\Delta \log K_{1111}$	$= \log \beta_{1111}$	$-\log \beta_{1101}$	$-\log \beta_{1010}$
$\log X_{1110}$	$= 2 \log \beta_{1110}$	$-\log \beta_{1200}$	$-\log \beta_{1020}$
$\log X_{1210}$	$= 2 \log \beta_{1210}$	$-\log \beta_{1400}$	$-\log \beta_{1020}$
$\log X_{1111}$	$= 2 \log \beta_{1111}$	$-\log \beta_{1202}$	$-\log \beta_{1020}$

3.5. Distribution diagrams

The distribution of metal ions in various complexes species (chemical speciation) with pH is represented as distribution diagrams. Some typical distribution diagrams are given in Figure 2. Based on the active forms of the ligands (LH_3^{2+} , LH_2^+ , LH , L^- and XH_2^{2+} , XH^+ and X) and the existence of the binary complex species (ML , ML_2 , MLH and ML_2H_2)



and MX , MX_2 and MX_3), the plausible forms of species are assumed to form through the following equilibria.

$ML_2H_2 + XH_2$	\rightleftharpoons	$MLXH + 3H^+$	(1)
$M(II) + LH + XH_2$	\rightleftharpoons	$MLXH + 2H^+$	(2)
$M(II) + LH + XH_2$	\rightleftharpoons	$MLX + 3H^+$	(3)
$ML + XH_2$	\rightleftharpoons	$MLX + 2H^+$	(4)
$MLXH$	\rightleftharpoons	$MLX + H^+$	(5)
$ML_2H_2 + XH_2$	\rightleftharpoons	$ML_2X + 4H^+$	(6)
$ML + LH + XH_2$	\rightleftharpoons	$ML_2X + 3H^+$	(7)
$MLX + LH$	\rightleftharpoons	$ML_2X + H^+$	(8)

The distribution of metal ions in various complex species (chemical speciation) with pH is represented as distribution diagrams. Some typical distribution diagrams are given in Fig. 2. The protonated ligands with metal ion (Equilibria 2, 3, and 4) to form $MLXH$ and MLX . MLX is also formed by the dissociation of $MLXH$ (Equilibrium 5) which is formed by the interaction of ML_2H_2 with XH_2 (Equilibrium 1). Similarly ML_2X is formed by the interaction of ML_2H_2 with XH_2 (Equilibrium 6), ML and LH with XH_2 (Equilibrium 7) and MLX with LH (Equilibrium 8), because the concentrations of both MLX and LH are decreasing with increasing concentration of ML_2X .

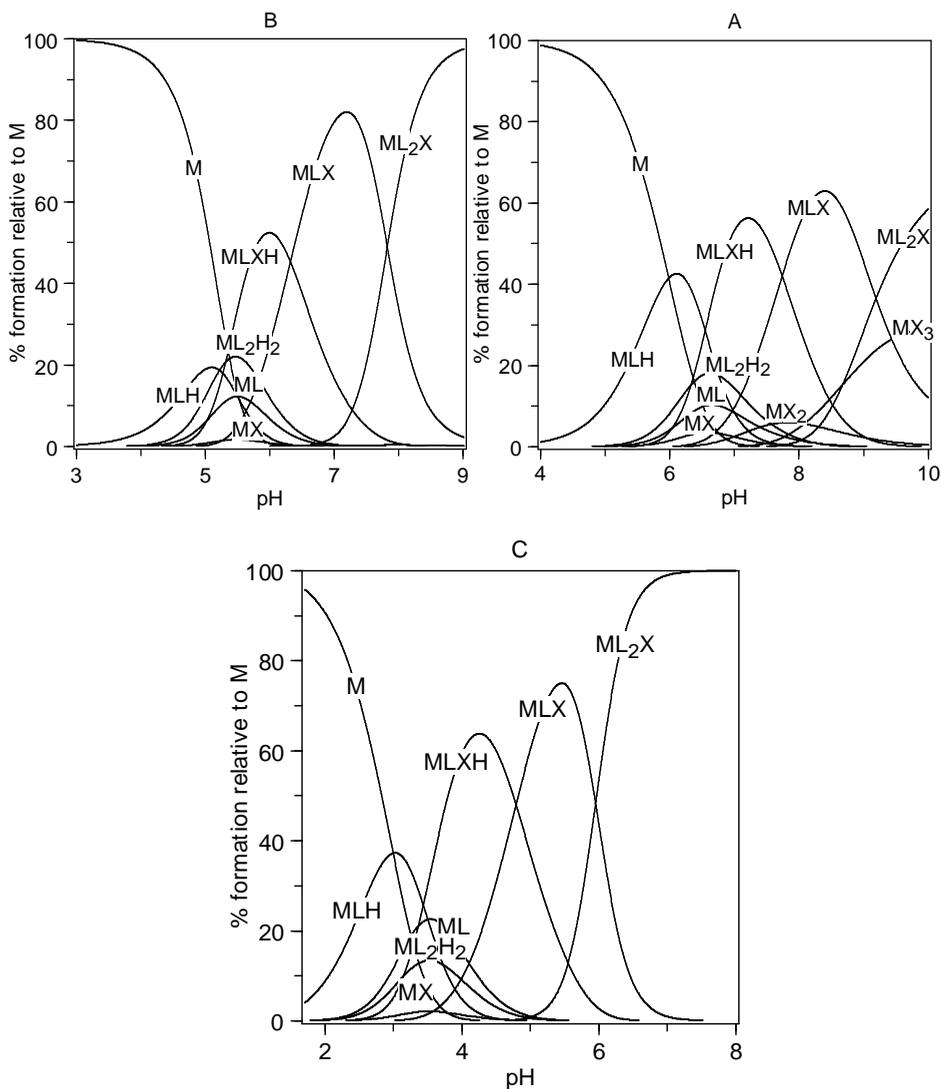
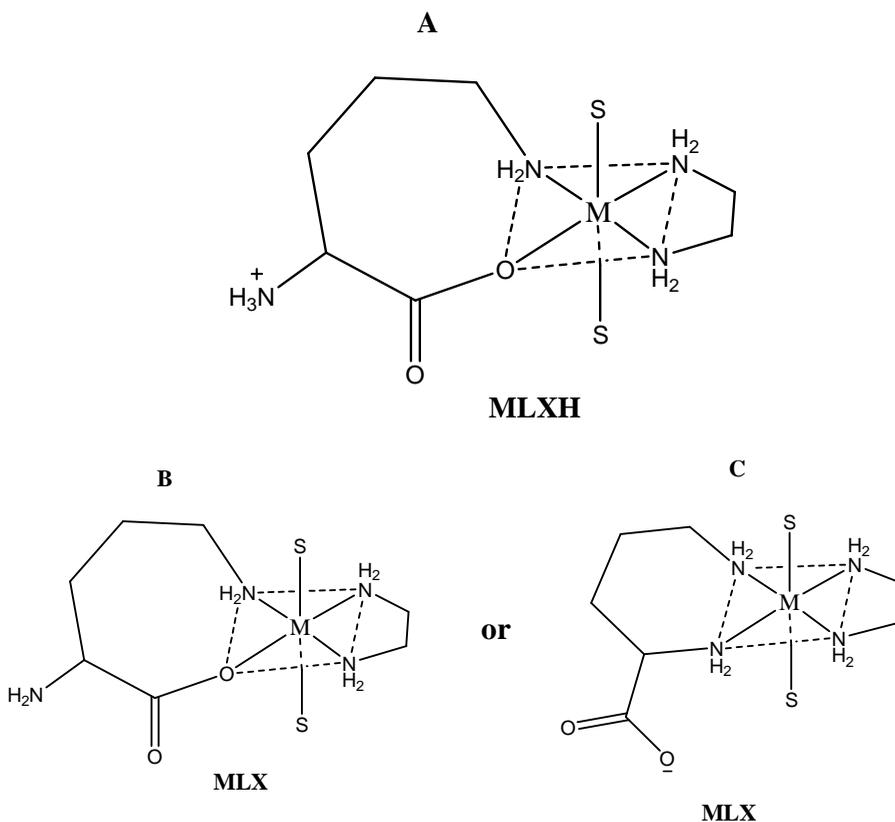


Fig. 2: Species distribution diagrams of ternary complexes of Orn and en in 10% v/v Dox-water mixture. (A) Co(II), (B) Ni(II), and (C) Cu(II).

3.6 Structures of complexes

The Literature suggests that, Co(II), Ni(II) and Cu(II) ions typically form octahedral complexes, with Cu(II) normally being Jahn-Teller distorted.^[30,31] Amino nitrogen can associate with hydrogen ions in the physiological pH ranges. Hence, there is often significant competition between hydrogen and metal ion for this donor site. This situation results in the simultaneous existence of a number of equilibria producing an array of protonated complexes, which are detected in the presented study. Orn acts as tridentate ligand and en acts as bidentate ligand. Thus based on the above equilibria the speculative structures of the complexes are presented in Fig. 3.



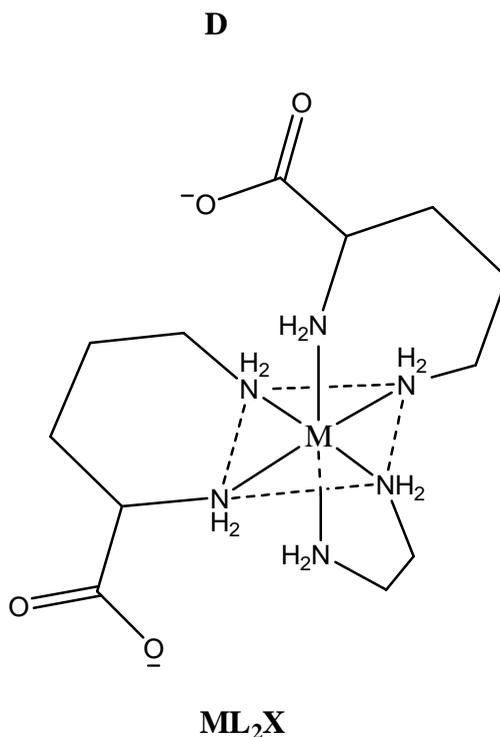


Fig. 3: Speculative structures of Orn-M(II)-en complexes, where S is either solvent or water molecule and M is Co(II), Ni(II) or Cu(II)

4 Conclusions

1. The ternary metal complex species detected are MLXH, MLX, and ML₂X for Co(II), Ni(II), and Cu(II) where L = Orn and X = en.
2. The values of $\Delta \log K$ and $\log X$ indicate that the ternary species have extra stability compared to their binary species, may be due to the interactions outside the coordination sphere, such as the formation of hydrogen bonds between the coordinated ligands, charge neutralization, chelate effect, stacking interactions and the electrostatic interactions between non-coordinated charge groups of the ligands.



3. The linear increase (Dox) in the stabilities of ternary complexes with decreasing dielectric constants is due to the dominance of electrostatic forces.
4. The study also gives an insight into the metal availability/metal transport in biofluids. The ternary complexes are more amenable for "metal transport" because of their extra stability.
5. The $\Delta \log K$ method is based on statistical grounds and the $\log X$ method takes disproportionation of the binary complexes into consideration. $\Delta \log K$ should be negative if the ternary complex has extra stability. Any value for $\log X$ greater than 0.6 accounts for extra stability.
6. The order of the ingredients that influence the magnitudes of stability constants due to incorporation of errors is alkali > acid > Orn > en > metal.

References

1. Rama Raju B, Devi K V S, Padmaja N, et al. J. Chil. Chem. Soc., 2011, 56: 842.
2. Hima Bindu G, Rao G N. Proc. Natl. Acad. Sci., India, 212, 82: 129.
3. Holm R H, Kennepohl P, Solomon E I. Chem. Rev., 1996, 96: 2239.
4. Mulrooney S B, Hausinger R P. FEMS Microbiol. Rev., 2003, 27: 239.
5. Hens J. "Structural effects on equilibria in organic chemistry", Willey, New York, 1975.
6. Peraino C, Pitot H C. Biochim. Biophys. Acta. 1963, 73: 222.
7. Morris J. E, Peraino C. J. Biol. Chem. 1976, 251: 2571.
8. Boernke W E, Stevens F S, Peraino C. Biochem. 1981, 20: 115.
9. Paoletti P. Pure Appl. Chem., 1984, 56: 491.
10. Hiromichi F, Kenichi M, Kita Y, et al. New three component reactions. Org. Lett., 2007, 9:1687.
11. Hiromichi F, Habibi M H, Harrington R. W, et al. J. Fluorine Chem., 2006, 127: 769.



12. Bjerrum J. Chem. Rev., 1950, 46: 381.
13. Everetti D H, Pinsent B R W, Proc. Roy. Soc., London, 1952, 215: 416.
14. Rani R S, Chandraleela A, Rao G N. Proc. Natl. Acad. Sci., India, 2012, 82: 313.
15. Rani R S, Rao G N. Oxidat. Commun., 2013, 25: 187.
16. Gran G. Analyst, 1952, 77: 661.
17. Gran G. Anal. Chim. Acta, , 1988, 206: 111.
18. Rao G N, Rao R S. Computer applications in chemistry, Himalaya Publishing House, Mumbai, 2005, 277.
19. Rao G N. Ph.D. Thesis, Andhra University, Visakhapatnam, India 1989.
20. Padmaja N, Babu M S, Rao G N, et al. Polyhedron 1990, 9: 2497.
21. Gans P, Sabatini A, Vacca A. Inorg. Chim. Acta, 1976, 18: 237.
22. Rao G N, Rao R S. J. Teach. Res. Chem., 1995, 2: 15.
23. Born M. Volume and hydration heat of ions. Z. Phys., 1920, 1: 45.
24. Griesser R, Sigel H. Inorg. Chem., 1970, 9: 1238.
25. Griesser R, Sigel H. Inorg. Chem., 1971, 10: 2229.
26. Sigel H, Caraco R, Prijs B. Inorg. Chem., 1974, 13: 462.
27. Sigel H, Huber P R, Greisser R, et al. Inorg. Chem., 1974, 12: 1198.
28. Martin R B, Prados R., J. Inorg. Nucl. Chem., 1974, 36: 1665.
29. Sigel H. Angew. Chem. Int. Ed. Engl., 1975, 14: 394.
30. Sheals J, Persson P, Hedman B. Inorg. Chem. 2001, 40: 4302.
31. Cherutoil J K, Cheruiyot L L, Kiprono C P. Bull. Chem. Soc. Ethiop. 2005, 19: 295.



EXTRACTION, ISOLATION AND CHARACTERIZATION OF CHLOROPHYLL A FROM SPINACH LEAVES

Leta Deressa Tolesa

Department of Chemistry
Faculty of Natural and Computational Sciences
Mettu University, Ethiopia

1. Introduction

The green appearance of plant cell results from the presence of the chloroplast with the pigment chlorophyll. This absorbs most strongly in the blue and red wave length, leaving the intermediate green wave length to be reflected to our eyes. The basis absorption of the light, chlorophyll molecule is seen from an analysis of electron structure. The presence of conjugated bond (alternative single and double bond along the porphyrin rings formed a conjugated system characterized by cloud of pi-electrons around the ring [1]. Chlorophylls are one of number of pigments usually contained in green organelles of higher plants [2], where they play central role in the primary stage of photosynthesis. The various chlorophyll pigments are chlorophylls a, b, c, d and e.

Chlorophyll a is conjugated macro cyclic molecule with a planar head of four pyrrole rings. But the overall size is much greater due to a phytal group, a terpene alcohol chains long with the position of the molecules in the membranes. The terpenes have been long associated with the term essential oils. Essential oils have antiseptic properties and are active against a wide range of bacteria, antibiotic-resistant, fungi and yeasts [3]. The presence of double bonds, allows electrons to delocalize in the pi- orbital of molecules and increases capture of photons giving many energy levels which are important for efficient energy capture and transfer producing a complex absorption spectrum. The prominent

peaks of absorption spectra for chlorophyll a are found at 662 and 430nm. The structure of chlorophyll a [4] is shown in figure 1.

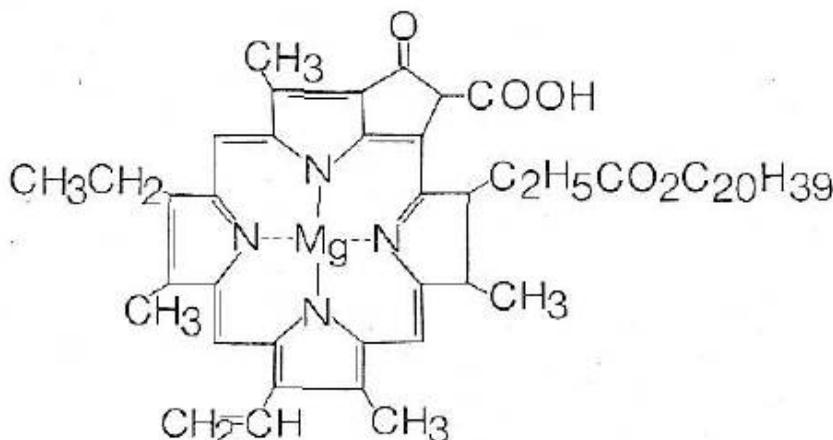


Figure 1:- Structure of chlorophyll a

Chlorophylls have been extracted from plant tissues using various organic solvents. Acetone and ethanol are the most commonly used solvent for plant pigments [5].

The objective of the current study is to extract and characterize chlorophyll a present in spinach leaves using solvent extraction method, thin layer chromatography and UV-Visible spectrophotometer.

2. Methods

A variety of chromatographic procedures, including thin layer chromatography (TLC) [6], conventional column chromatography [7], high performance chromatography (HPLC) [8], have been used for quantitative and qualitative separation of chlorophylls associated pigments, their derivatives and products of degradation, in many species of photosynthetic bacteria, algae and higher plants. In view of the high cost of HPLC and other problems associated with use of ion



exchange chromatography and size exclusion chromatography, the present work utilized solvent extraction and TLC for the extraction and separation of chlorophyll a. In spinach leaves the purity and identity of chlorophyll a are confirmed by UV-visible spectrophotometer.

2.1. Extraction of pigments

Fresh spinach leaves of open foliage, common cabbage and cauliflower were obtained from the local market in ambo town. The leaves were first separated from the mid ribs and washed with cold water. They were then crushed using smaller mortar and pestle. A mixture of 4ml petroleum ether and 2ml of ethanol were added to the grinded leaves (10gm) and mixed thoroughly. The extracted liquid was transferred to a test tube using a pipette. The extract was swirled gently with an equal volume of water and the aqueous layer was discarded. The organic layer was transferred to Erlenmeyer flask and anhydrous sodium sulphate was added to the flask. After 5-10 minutes the solution was decanted from the drying agent.

2.2. Thin layer chromatography

The petroleum ether layer was subjected to thin layer chromatography analysis. The sample was spotted on the TLC plate (2 x 10cm), 1cm from the bottom of the plate using a capillary tube. The plate was placed in a developing chamber containing 100 percent ethanol. After about one hour the plate was removed, the position moved by the solute and the mobile phase were marked and the plate allowed to air dry. The various positions were used to calculate the retardation factor (R_f) value of the separated spots as:

$$R_f = \text{distance moved by solute} / \text{distance moved by solvent}$$



2.3. Spectroscopic determination

The petroleum ether layer was analyzed by UV-Visible double beam spectrophotometer between 400-700nm. The method used was simple and less expensive, which is an advantage over the more expensive techniques.

3. Result and discussion

3.1. Identification of pigments by TLC

From the colour of the separated spots chlorophyll a (blue-green), chlorophyll b (green), carotenes (orange), and xanthophylls (yellow) were identified [9]. The calculated R_f value of the isolated pigments are presented in table 1.

Table 1: R_f values of isolated pigments from spinach leaves

Components	retardation factor value			
	open foliage cabbage	cauliflower cabbage	common cabbage	average
chlorophyll a	0.71	0.81	0.72	0.75
chlorophyll b	0.63	0.60	0.57	0.60
Xanthophylls	0.41	0.47	0.42	0.43
Carotenes	0.90	0.90	0.91	0.90

Retardation factor value depends on the relation between the nature of solvent used and the nature of the chlorophyll found in the sample. i.e both the polarity as well as the molecular weight of the chlorophyll determine R_f value. If the molecular weight of the chlorophyll present in the solute is higher than the other substance present in the solute, the distance moved by it become lower which decrease the R_f value of the chlorophyll. From table 1, carotenes showed the highest average R_f value of 0.90 while xanthophylls have an average value of 0.43 in all the

spinach leaves. Chlorophyll a and b have average value of 0.75 and 0.6 respectively in all leaf samples.

The differences in the Rf values can be associated with varying migration of the pigments as a result of differences in their relative molecular masses. The thin layer plate of all types of spinach leaves used and their average value of retardation factor is can be drawn by using chemdraw software presented in fig 2 to fig 5.

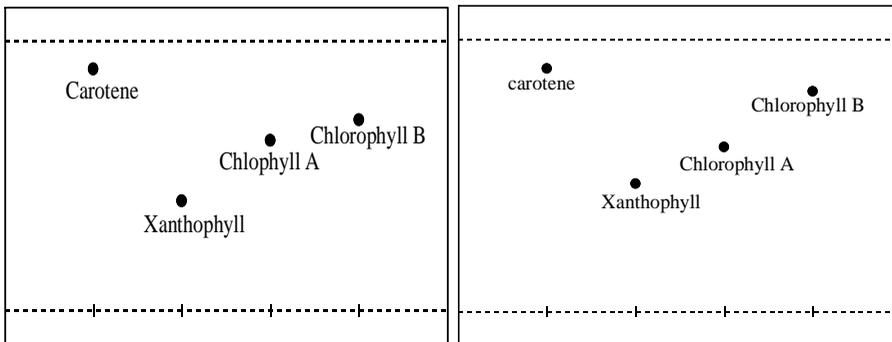


Fig 2: Thin layer plate of open foliage cabbage **Fig 3:** Thin layer plate of cauliflower cabbage

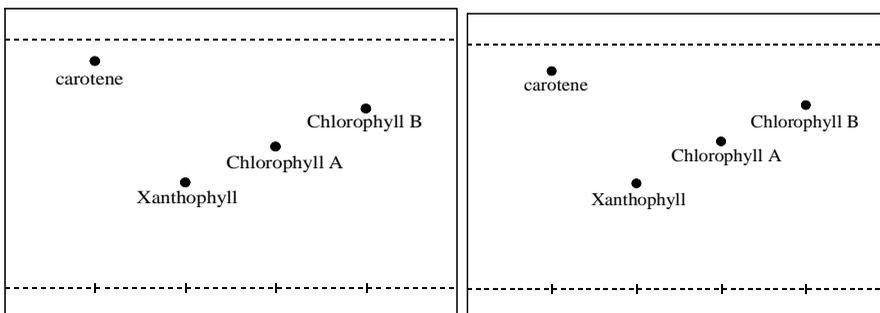


Fig 4: Thin layer plate of common cabbage **Fig 5:** Thin layer plate of average of spinach leaves

UV- Visible spectrum

The spectra of Chlorophyll extracts of the three samples showed several absorption bands between 400-700 nm indicating a mixture of several pigments. The visible spectra of extracts of the three types of spinach leaves are presented in figure 6-8. The spectra shows five observable bands at 418, 436, 468, 619, and 662 nm. The selected absorption bands are presented in table 2. The bands were found to be close to the value obtained from literature [10] which is considered as a confirmation of the identity of the isolated pigments.

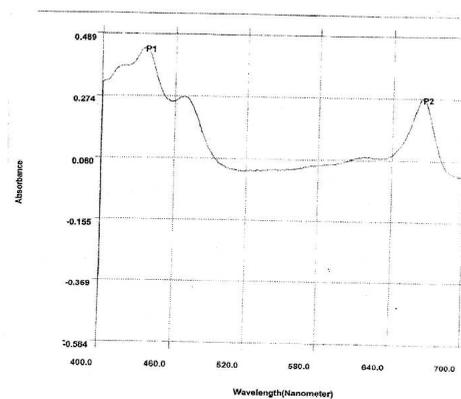


Figure 6:- Visible spectra of chlorophyll extract of common cabbage

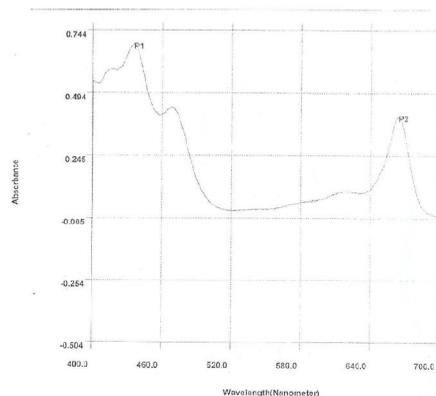


Figure 7:- Visible spectra of chlorophyll extract of open foliage cabbage

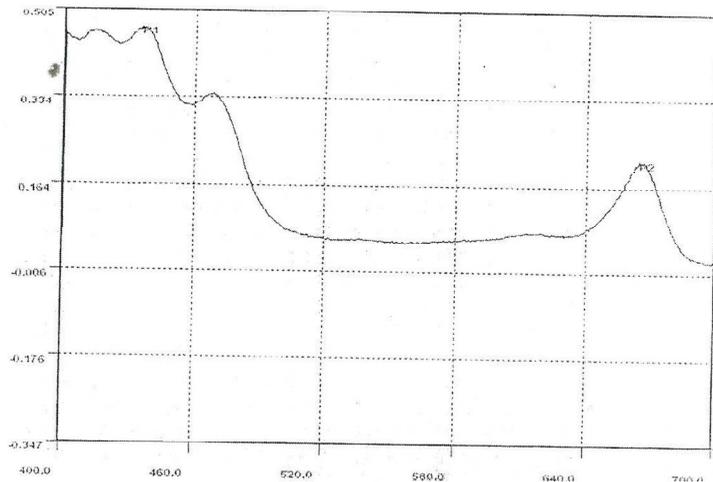


Figure 8:- Visible spectra of chlorophyll extract of cauliflower cabbage

The above spectra show five observable bands at 418, 436, 468, 619, and 662 nm. The selected absorption bands are presented in table 2. The bands were found to be close to value obtained from literature⁹ which is considered as a confirmation of the identity of the isolated pigments. i.e electronic spectral data for chlorophyll a obtained from this study of Common cabbage, Open foliage cabbage and Cauliflower cabbage and values obtained from different literature for spinach leaves. When we compare the value obtained in this study with the value from different literature at 662nm the values are exactly the same and the values at 436nm, 468nm and 619nm of this study approximately related with 431nm, 450nm and 617nm of literature value respectively.



Table 2: Electronic spectral data for Chlorophyll a in spinach samples

Component	Observed bands in nm of chlorophyll a						
Literature values		431	450	534	580	617	662
Common cabbage	418	436	468	-	-	619	662
Open foliage cabbage	418	436	468	-	-	619	662
Cauliflower cabbage	418	436	468	-	-	619	662

4. CONCLUSION

Chlorophyll a was isolated from three spinach leaves using solvent extraction. Chlorophyll a and xanthophylls in the extract were identified using thin Layer Chromatography and UV- Visible spectrophotometer. The R_f values of the pigments were determined and the selected electronic spectral wave length of the absorption bands agreed closely with literature values. The method used was simple and less expensive than the other techniques, which is an advantage over the more expensive one. Plants that have terpene molecules also used as source of essential oils. Essential oils have antiseptic properties and are active against a wide range of bacteria, antibiotic-resistant, fungi and yeasts.

References

1. Pandey SN, Swaha BK, Plant physiology 3rd edition.1995, 206-210.
2. Goedheer J. C: Fluorescence bands and chlorophyll a forms. Biochim. biophys. Acta . 1964, 88, 304-317.



3. Ennigrou A, Hosni K, Casabianca H, Vulliet E, Smiti S: Leaf volatile oil constituents of schinus molle terebinthifolius and schinus molle from Tunisia. C. N. Rech. S. 2010, 69, 360.
4. Fischer H, Wenderoth H: Isolation of Chlorophyll A from Spinach Leaves Annalen, 1940, 50, 879.
5. Venketeswaran S: Studies on the isolation of green pigmented callus tissue of tobacco and its continued maintenance in suspension cultures. Physiol Plant, 1965, 18:776–789.
6. Bernard F, Joseph S: Thin Layer Chromatography. Marcel Dekker. Inc. New York, Basel 4th edition. 1999.
7. Omata T, Murata N: preparation of chlorophyll a chlorophyll b and bacteriochlorophyll a by column chromatography with EEAE-sepharose CL-6B and sepharose CL-6B. Plant Cell Physiol. 1983, 24, 1093.
8. Malcolm T, Liana H. Warwick F: Extraction of chlorophyll and carotenoid pigments from Antarctic benthic mats for analysis by HPLC. Journal of Applied phycology. 1993, 5, 623.
9. Pavia, D.L.; Lampman, G.M.; Kriz, G.S.; Engel, R.G. Introduction to Organic Laboratory Techniques: A Microscale Approach 3rd Edition Saunders College Publishing: New York, NY, 1999.
10. Kalyana. Sudaram K. Photochemistry of polyridine and porohyrin complexes, Academic press; 1992,430.



EFFECT OF HAMSTRING AND LOWER BACK MUSCLES FLEXIBILITY ON LEG ELASTIC STRENGTH PERFORMANCES OF MEKELLE UNIVERSITY STUDENTS

Samson Wondirad

Department of Sport Science
College of Natural Sciences
Jimma University, Jimma, Ethiopia

INTRODUCTION

Sports performance is the result of the interplay of various mental and physical factors. One of the main factors to improve and maximize athletic performance is the development of physical abilities. The capabilities of fitness are strength, speed, endurance and flexibility [Bakirtzoglou, Ioannou & Bakirtzoglou, 2010]. Flexibility has been defined in many ways. It is using the term joint mobility indicates the degree of bending the normal range or scope of a joint or series of joints [Bakirtzoglou, Ioannou & Bakirtzoglou, 2010]. Adequate flexibility is an important characteristic of physical and health related fitness [Fabunmi et al, 2008]. Flexibility and stretching comprise what can essentially be recognized as the cornerstone of injury prevention, muscle recovery, and increased mobility for exercise enthusiasts [Fabunmi et al, 2008]. Stretching is an important therapeutic and exercise training modality for increasing joint range of motion [Knudson, 2010]. Stretching is often prescribed for athletes in the belief that a stretched muscle helps reduce muscular injuries [Brian, 2001].

In the world of sports, and sports training institute, sports research field the vertical jump is one of the most important skill, to be known as. It is proposed that vertical jump depends on many factors, like muscle mass, flexibility, isometric muscle strength, age, height, weight. During vertical jump action in different sports activity the flexibility of hamstring and lower back muscles is one of the big concerns.



A number of studies have been investigated on power and athletic performance and also relationship of strength and speed with power [Johnson & Nelson, 1986]. There has been extensive research on the effects of various stretching programs that have documented the clinical effectiveness of these techniques in modifying flexibility [Knudson, 2010]. Although different warm-up and flexibility routines are often prescribed before physical activity, little research has been conducted to determine what effects these routines have on athletic performance in activities [Brian, 2001].

Numerous studies have shown that stretching routines can induce strength and force deficits, although the amount of stretching needed to cause these deficits remains unclear [Robbins & Scheuermann, 2008]. The study done recently Stated that hamstring flexibility and jump height did not change significantly even after, assigned a 6 week stretching program [Craig et al, 2007]. Whereas, Vertical jump height decreased after static and PNF stretching and there was a smaller decrease after ballistic stretching [Bradley, Olsen & Portas, 2007]. But, whereas the controversial statement found as conclusion greater muscle stiffness and less power in the muscle are associated with the greater running economy [Richter et al, 2010]. The researcher wants to analysis this controversy the question arises whether there is any relationship between flexibility of hamstring and lower back muscles with respect to vertical jump. The researcher hypothesized that boys had stronger leg elastic strength and girls had better hamstring and lower back muscle flexibility. Thus my null hypothesis is there will be an effect of flexibility of hamstring and lower back muscle over vertical jump performance.

2, MATERIALS AND METHOD

2.1. Data collection



To analysis this thesis it took 4 weeks to study, At first word to word advertisement done in Mekelle University among Dept of sports sciences shown good response and 300 voluntaries (boys and girls) are responding. For first two week the procedure was explained individually in the local language (Tigrinia/Amaharic) by the help of local staff and as well in English. The volunteers were requested to sign on concern form and given an assurance to be taken care if they were injured during the procedure.

The voluntaries' were first analyzed as inclusion criteria were between 18-25 years, and he or she was ruled out of any kind of orthopedic/neurological related problems or any injuries within past 4 months, or any kind of congenital deformities, with a help of Physiotherapist and followed by physicians. Finally an end of 2nd week of study we have collected 286 students (206 boys and 80 girls) and fixed a day for the test, and approximately 54 volunteers were appointed per day and 5consecutive days were taken for testing at Mekelle University Gymnasium (indoor). With an instruction to wear half sleeve loose T-shirts and shorts. The subjects were selected using non-randomized convenience sampling technique.

2.2. Instructions

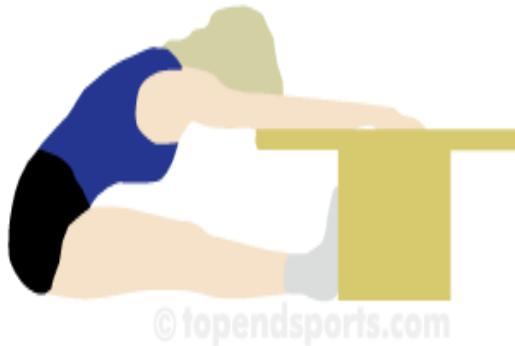
On the 3rd week of study, we again instructed the students about their dress wearing and asked them to do standardized warm-up exercises, for 5 minutes prior to the 15 min before the test, and advised them, not to involve and vigorous activity or exercises for past 48 hrs and take normal diet and fluid.

2.3. Testing method.

The subject was asked to warm up for 5min and rest for next 10 min before the test starts and the subject were explaining the procedure and activity in their local language, before the test starts. The subjects were advised to be relaxed and asked to perform sit and

reach test and followed by vertical jump. To avoid the error in procedure, the test performance has been repeated three times. The data were collected by final year students of the sports sciences department.

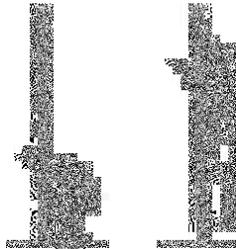
2.3.1. Hamstring and lower back flexibility measure



Figure_1. Sit and reach test

This test involves sitting on the floor with legs stretched out straight ahead. Shoes should be removed. The soles of the feet are placed flat against the box. Both knees should be locked and pressed flat to the floor - the tester may assist by holding them down. With the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward along the measuring line as far as possible. Ensure that the hands remain at the same level, not one reaching further forward than the other. After some practice reaches, the subject reaches out and holds that position for a one-two seconds while the distance is recorded. Make sure there are no jerky movements.

2.3.2. Vertical jump test



Figure_2. Sergeant jump

Stand with one arm fully extended upward. Do this with the arm you would use to grab an object at the height of your lap. Press your outstretched arm and the corresponding side of your body against a wall. Mark the height of your reach with chalk. Step away from the wall. Stand only as far away from the wall as is necessary not to come into contact with it during your vertical leap. Put chalk or a safe colored substance on your fingertips that will not stain the wall. Jump as high as you can and touch the highest point of the wall as possible. Record the difference between your reach marker and the marker from the height of your lap. Vertical jump test three times; the best of three vertical jump heights to nearest to half of centimeter was recorded.

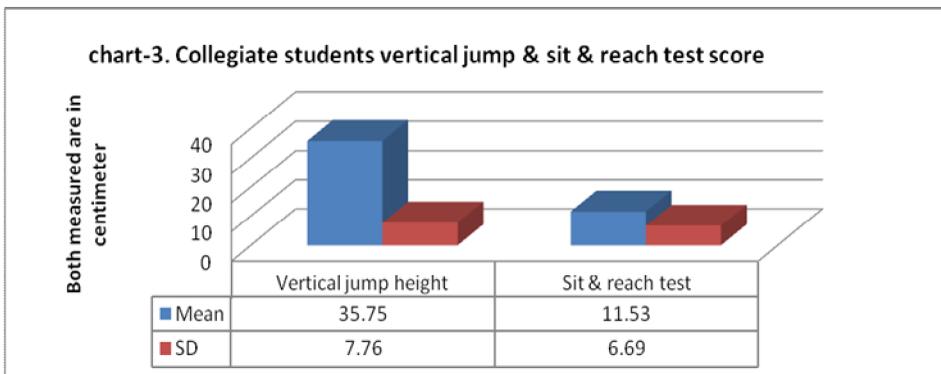
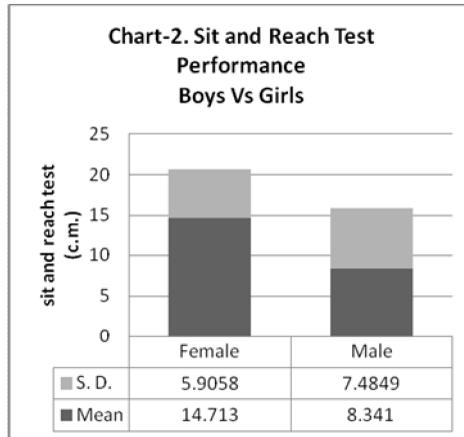
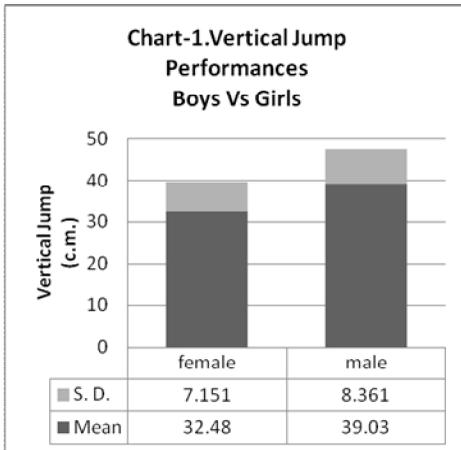
2.4. Data Analysis

The Statistical analysis was performed with the Statistical Package for Social Science (SPSS 20.0). Mean and standard deviations were calculated for each variable. Further, their bar chart has been drawn. Pearson Product Moment Coefficient of Correlation (r) was used to establish the relationship between powerful performances and the independent variable. For all statistical tests; an alpha level of $p < 0.001$ level of significance was set. Forward multiple regressions were calculated.



3. Result

The number of both male and female student's vertical jump performance and hamstring and low back flexibility as well as their Mean, Standard deviation and bar chart has been shown in the table chart-1 and 2.





Table_1. Pearson Correlation matrix for both boys and girls (N=286)

Variables	Vertical jump height
Sit and reach test	-0.204**

** . Correlation is significant at the 0.01 level (2-tailed).

Table_2. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.204 ^a	.041	.038	8.388

a. Predictors: (Constant), flexibility

Table3. ANOVA summary of the effects of hamstring and low back flexibility on vertical jump performance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	864.134	1	864.134	12.281	.001 ^b
	Residual	19982.901	284	70.362		
	Total	20847.035	285			

a. Dependent Variable: vertical jump

b. Predictors: (Constant), flexibility



Table_4. Forward multiple regression analysis of hamstring and low back flexibility on vertical jump performance

Variables	B	Std. Error	T	Sig.
(Constant	39.507	.825	47.877	.000
Flexibility	-.228	.065	-3.504	.001

a. Dependent Variable: vertical jump

The result of 80 females shows that 14.713 ± 5.9058 cm flexibility during sit and reach test, with ranged from 8.8072 cm to 20.6188 cm, and showing the performance of vertical jump of 32.48 ± 7.151 cm, with ranged from 18 cm to 50 cm.

Whereas 206 boys showing 8.341 ± 7.4849 cm flexibility during sit and reach test, with ranged from 0.856cm to 15.825 cm, and showing the performance of vertical jump of 39.03 ± 8.361 cm, with ranged from 30.669 cm to 47.391 cm.

The Pearson correlation of 286 subjects showing negative correlation between flexibility and vertical jump, on further analysis, boys are showing weak positive relation between flexibility of hamstring and lower back muscles and vertical jump performances, but women are showing the negative relation between two variables (jump and flexibility), there was a significant relationship between vertical jump performance and flexibility of hamstring and lower back muscles, $r = -0.204$, $p < 0.001$

The linear regression show that hamstrings and lower back muscles was a significant predictor of vertical jump height, $r = -0.204$, $r^2 = 0.041$, adjusted $r^2 = 0.038$, $F(1, 284) = 12.281$, $p < 0.001$. Subject to



that our interpretation is 4.1% variation of vertical jump height is explained by the flexibility of hamstring and lower back muscles.

4. DISCUSSION

The purpose of this study was to investigate the effect of flexibility of hamstring and lower back muscles on leg elastic strength performances of Mekelle University students.

This study suggests that flexibility of hamstring and lower back a muscle is more flexible with compared to boys. We have found similar results in previous studies stated that females had better lower back and hamstrings flexibility than males [Adegoke et al, 2012]. There was a difference between boys and girls for both measures in flexibility of the hamstring muscle [Cornbleet & Woolsey, 1996]. The cause of women flexibility dominance is due to hormonal, body structure, lifestyle, shortness of muscle length, physical activity participation and working area [Cornbleet & Woolsey, 2006]. Moreover, boys and girls have significant differences in their development, body alignment, how they use their bodies, and muscle recruitment patterns as they undergo changes in puberty [Thompson, 2009].

Contradicting to lower limb power, boys show better vertical jump performances to compare to girls. Furthermore, previous studies show that Vertical jump power performances of boys are statistically better than those of girls [Antonakopoulou, Mavvidis & Piliandis, 2009]. The male athletes demonstrated increased vertical jump height with maturation female athletes did not [Quatman et al, 2005]. Boys and girls were due boy's skeletal structure being more dense and muscle power is more due to their more physiological cross-section of muscles, number of motor unit recruitment in the muscles [Temfemo et al, 2009]. Both collegiate boys and girls hamstring and lower back flexibility were found to be good (Topendsports, 2013).



But as per the relation between flexibility of hamstring and lower back muscles and vertical jump power this study found negative relation in girls and boys. In previous study also shows similar results are observed an acute dynamic warm up can enhance children's fitness performance in activities that require a high power output whilst maintaining joint range of motion. However, participation in an acute static warm up is detrimental to the performance of activities where high power output is needed [Duncan & Woodfield, 2010].

Static stretches did not improve dynamic hamstring flexibility; however, dynamic stretching helps to improve both dynamic and static flexibility. This has implications for the specificity of stretching in sport [Craig et al, 2007)]. The previous study also found that Performing PNF [Brian, 2001]. And Static stretches [Robbins & Scheuermann, 2008]. Before a vertical jump test would be less detrimental to performance. Vertical jumping height was significantly higher during the dynamic stretching condition with compared to static stretching and no stretching. Whereas, there is no difference between no stretches and static stretches. Athletes in sports requiring lower-extremity power, by using dynamic stretching techniques in warm-up to enhance flexibility while improving performance [Taylor, 2009].

5. Conclusion

This study suggests that there is no utility of static stretching exercises prior to the explosive type of sports and games. Boys were stronger leg elastic strength, while, girls had better hamstring and lower back muscle flexibility. However we could not find any gender and age influence over our study and due to lack of fund could not generalize the study on different working and physical activity background.



6. Recommendations

Collegiate students were advised to engage in regular exercise, such as, explosive strength, plyometric exercises and dynamic exercises in order to improve their leg elastic strength and hamstring and lower back muscle flexibility.

References

1. Adegoke et al. (2012). Normative values of lower back and hamstring flexibility for Nigerians using the modified sit-and-reach test. *Journal of Musculoskeletal Research*. 15(3), September 2012.
2. Antonakopoulou, S., Mavvidis, A., & Piliandis, T.(2009). *Biology of exercise*. 5(2),2009.d.o.i: <http://doi.org/10.4127/jbe.2009.0026>.
3. Brian et al. (2001).Effect of Warm-Up and Flexibility Treatments on Vertical Jump Performance. *Journal of Strength and Conditioning Research*, 2001, 15 (3), 332–336
4. Bakirtzoglou, P., Ioannou, P., & Bakirtzoglou, F. (2010). Evaluation of hamstring. *SportLogia 6* (2010) 2: 28-32.
5. Bradley, P., Olsen, P and Portas, D. (2007). The Effect Of Static, Ballistic, and Proprioceptive Neuromuscular Facilitation Stretching On Vertical Jump Performance. *Journal of Strength and Conditioning Research*, 2007, 21 (1), 223–226 _ 2007.
6. Craig et al. (2007). The Effects of Hamstring Stretching on Vertical Jump in Healthy Young Adults. Faculty: Barbara Smith.
7. Cornbleet, L. and Woolsey, B.(2006). Assessment of Hamstring Muscle Length in School-aged Children Using the Sit-and-Reach Test and the Inclinator Measure of Hip Joint Angle. Washington University School of Medicine.
8. Cornbleet, L. & Woolsey, B. (1996). Assessment of Hamstring Muscle Length in School-aged Children Using the Sit-and-Reach



- Test and the Inclinator Measure of Hip Joint Angle. PHYS THER. 1996; 76:850-855.
9. Duncan, J and Woodfield, A (2010). Human Performance Laboratory, Department of PE and Sports Studies. Newman College of Higher Education, Birmingham, England, B32 3NT. Journal of Exercise Physiology online, 9(3), 2006.
 10. Fabunmi et al. (2008). Flexibility: Relationship between Straight Leg-Raise and Backsaver Sit and Reach Tests. Fourth International Council for Health, Physical Education, Recreation, Sport and Dance (ICHPER-SD) Africa Regional Congress, 14-17 October, 2008.
 11. Johnson, B. And Nelson, J. (1986). Practical measurement and evaluation in physical education. 4th Ed. United State of America: MacMillan publishing company. 7-9_{pp}
 12. Knudson, D. (2010). Acute effects of warm up protocol on flexibility and vertical jump in children. The Biomechanics of Stretching California State University, Chico, Department of Kinesiology, First and Normal St., Chico, CA 95929-0330, USA .
 13. Quatman et al. (2005). Maturation Leads to Gender Differences in Landing Force and Vertical Jump Performance A Longitudinal Study. AJSM Preview, published on December 28, 2005 as doi: 10.1177 /036 3546505281916
 14. Richter et al. (2010). Effects of age, gender and activity level of counter movement jump performance and variability in children and adolescents. Germany.
 15. Robbins, J. and Scheuermann, B. (2008). Varying amounts of acute static stretching and its effect on vertical jump performance. J Strength Cond Res. 2008 May; 22 (3): 781-6. Do: 10.1519/JSC.0b013e31 816a 59a9



16. Taylor, E. (2009). The Effects of Static and Dynamic Stretching on Reaction Time and Performance in a Counter Movement Jump. Oregon State University. Unpublished. Msc thesis.
17. Temfemo et al. (2009). Relationship between vertical jumping performance and anthropometric characteristics during growth in boys and girls. European Journal of Pediatrics. April 2009, Volume 168, Issue 4, pp 457-464.
18. Thompson, S. (2009). Variance between Boys and Girls in Relation to ACL Injuries. Sport and Spine Therapy of Marin.



SYNTHESIS OF CUO NANOPARTICLES BY PRECIPITATION METHOD AND CHARACTERISATION

V.Ranjith Kumar

Lakireddy Bali Reddy College of
Engineering
L.B.Reddy Nagar, Mylavaram
Krishna District, Andhra
Pradesh

Dr.P .Vijaya Kumar

Lakireddy Bali Reddy College of
Engineering
L.B.Reddy Nagar, Mylavaram
Krishna District, Andhra
Pradesh

B. Sudheer Kumar

Lakireddy Bali Reddy College of Engineering
L.B.Reddy Nagar, Mylavaram
Krishna District, Andhra Pradesh

INTRODUCTION

Copper oxide (CuO) is one of potential p-type semiconductors and gains considerable attentions due to its excellent optical, electrical, physical, and magnetic properties. CuO with narrow band gap of 1.2 eV is extensively used in various applications such as catalysis , solar energy conversion , gas sensor and field emission . However, these novel properties can be improved by synthesis in CuO nanostructures that shown excellent performance comparing to bulk counterpart. Different nanostructures of CuO are synthesized in form of nanowire, nanorod, nanoneedle, nano-flower and nanoparticle. In the past decades, various methods have been proposed to produce CuO nanoparticles with different sizes and shapes such as thermal oxidation , sonochemical , combustion and quick-precipitation . Among these processes, precipitation method is a facile way which attracts considerable interest in industries because of low energy and temperature, inexpensive and cost-effective approach for large scale production and good yield.

1.2 WHAT IS NANOTECHNOLOGY

Nanotechnology is science, engineering, and technology conducted at the nanoscale, which is about 1 to 100 nanometers. Nanoscience and nanotechnology are the study and application of extremely small things and can be used across all the other science fields, such as chemistry,



biology, physics, materials science, and engineering. The ideas and concepts behind nanoscience and nanotechnology started with a talk entitled "There's Plenty of Room at the Bottom" by physicist Richard Feynman at an American Physical Society meeting at the California Institute of Technology (CalTech) on December 29, 1959, long before the term nanotechnology was used. In his talk, Feynman described a process in which scientists would be able to manipulate and control individual atoms and molecules. Over a decade later, in his explorations of ultraprecision machining, Professor Norio Taniguchi coined the term nanotechnology. It wasn't until 1981, with the development of the scanning tunneling microscope that could "see" individual atoms, that modern nanotechnology began.

It's hard to imagine just how small nanotechnology is. One nanometer is a billionth of a meter, or 10^{-9} of a meter.

WHAT ARE NANOMATERIALS

Nanomaterials are cornerstones of nanoscience and nanotechnology. Nanostructure science and technology is a broad and interdisciplinary area of research and development activity that has been growing explosively worldwide in the past few years. It has the potential for revolutionizing the ways in which materials and products are created and the range and nature of functionalities that can be accessed. It is already having a significant commercial impact, which will assuredly increase in the future. Nanoscale materials are defined as a set of substances where at least one dimension is less than approximately 100 nanometers. A nanometer is one millionth of a millimeter - approximately 100,000 times smaller than the diameter of a human hair. Nanomaterials are of interest because at this scale unique optical, magnetic, electrical, and other properties emerge. These emergent properties have the potential for great impacts in electronics, medicine, and other fields.

HISTORY OF NANOPARTICLES

Although, in general, nanoparticles are considered a discovery of modern science, they actually have a long history. Nanoparticles were used by artisans as far back as the ninth century in Mesopotamia for generating a glittering effect on the surface of pots.

Even these days, pottery from the Middle Ages and Renaissance often retain a distinct gold- or copper-colored metallic glitter. This luster is caused by a metallic film that was applied to the transparent surface of

a glazing. The luster can still be visible if the film has resisted atmospheric oxidation and other weathering.

The luster originated within the film itself, which contained silver and copper nanoparticles dispersed homogeneously in the glassy matrix of the ceramic glaze. These nanoparticles were created by the artisans by adding copper and silver salts and oxides together with vinegar, ochre, and clay on the surface of previously-glazed pottery. The object was then placed into a kiln and heated to about 600 °C in a reducing atmosphere.

1.5 STRUCTURE OF NANOMATERIALS

Classification of Nanomaterials

Nanomaterials have extremely small size which having at least one dimension 100 nm or less. Nanomaterials can be nanoscale in one dimension (eg. surface films), two dimensions (eg. strands or fibres), or three dimensions (eg. particles). They can exist in single, fused, aggregated or agglomerated forms with spherical, tubular, and irregular shapes. Common types of nanomaterials include nanotubes, dendrimers, quantum dots and fullerenes. Nanomaterials have applications in the field of nano technology, and displays different physical chemical characteristics from normal chemicals (i.e., silver nano, carbon nanotube, fullerene, photocatalyst, carbon nano, silica).

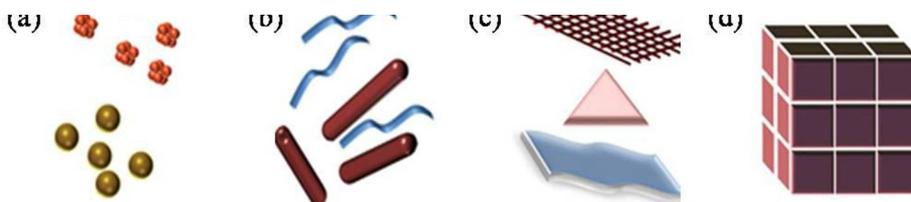


Fig. 1.5.1 Classification of Nanomaterials (a) 0D spheres and clusters, (b) 1D nanofibers, wires, and rods, (c) 2D films, plates, and networks, (d) 3D nanomaterials

Zero-dimensional nanomaterials

Materials wherein all the dimensions are measured within the nanoscale (no dimensions, or 0-D, are larger than 100 nm).

The most common representation of zero-dimensional nanomaterials are nanoparticles. Nanoparticles can:

- Be amorphous or crystalline
- Be single crystalline or polycrystalline



- Be composed of single or multi-chemical elements
- Exhibit various shapes and forms
- Exist individually or incorporated in a matrix
- Be metallic, ceramic, or polymeric

Two-dimensional nanomaterials

Two of the dimensions are not confined to the nanoscale. 2-D nanomaterials exhibit plate-like shapes. Two-dimensional nanomaterials include nanofilms, nanolayers, and nanocoatings. 2-D nanomaterials nanomaterials can be:

- Amorphous or crystalline
- Made up of various chemical compositions
- Used as a single layer or as multilayer structures
- Deposited on a substrate
- Integrated in a surrounding matrix material Metallic, ceramic, or polymeric
- **Three-dimensional nanomaterials**

Bulk nanomaterials are materials that are not confined to the nanoscale in any dimension. These materials are thus characterized by having three arbitrarily dimensions above 100 nm.

. In terms of nanocrystalline structure, bulk nanomaterials can be composed of a multiple arrangement of nanosize crystals, most typically in different orientations.

APPLICATIONS OF NANOPARTICLES:

Nanoparticles Applications in Medicine.

Nanoparticle Applications in Manufacturing and Materials

Nanoparticle Applications in Energy and Electronics

FUTURE OF NANOPARTICLES

The marriage of nanotechnology and medicine has yielded an offspring that is set to bring momentous advances in the fight against a range of diseases. Nanomedicine is actually a child well past its infancy, with two families of therapeutic nanocarriers – liposomes and albumin NPs – already firmly in clinical practice worldwide, and still more in the preclinical phases of development. In order to transform nanotechnologies from basic research into clinical products, it is important to understand how the biodistribution of NPs, which is primarily governed by their ability to negotiate biological barriers, affects the body's complex biological network, as well as mass transport across compartmental boundaries in the body. Moreover, the healthy growth of this field depends on establishing a toxicology database to

support safety determinations and risk assessments. The database should include toxicity as a function of material, size, shape, cell type or animal, duration of exposure and the methods used to assay toxicity. In addition, the ability to scale up the production of drug particles is required. The manufacturing complexity of nanodrug delivery may be an obstacle confronting generic drug companies. Lastly, storage and handling protocols must be considered. With such a database, the translation of biomedical nanotechnology from the laboratory to the general public will be significantly accelerated.

SYNTHESIS OF NANOPARTICLES

Nanomaterials deal with very fine structures: a nanometer is a billionth of a meter. This indeed allows us to think in both the 'bottom up' or the 'top down' approaches (Fig. 5) to synthesize nanomaterials, i.e. either to assemble atoms together or to dis-assemble (break, or dissociate) bulk solids into finer pieces until they are constituted of only a few atoms. This domain is a pure example of interdisciplinary work encompassing physics, chemistry, and engineering upto medicine.

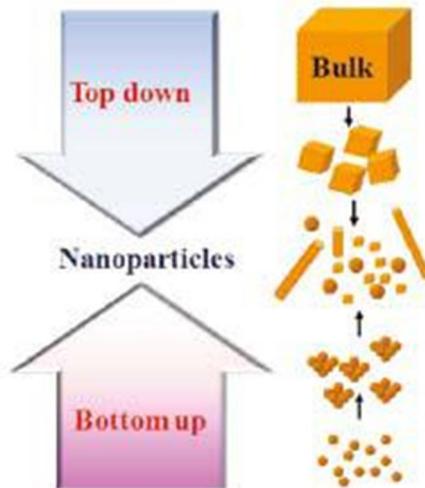


Fig. 1.2 Schematic illustration of the preparative methods of nanoparticles.

PLASMA ARCING

Plasma is an ionising gas. To produce plasma potential difference is applied across two electrodes. The gas yields up its electrons and gets ionized. Ionised gas (plasma) conducts electricity. A typical plasma arcing device consists of two electrodes. An arc passes from one

electrode to the other. From the electrode (anode) due to the potential difference electrons are emitted. Positively charged ions pass to the other electrode (cathode) pick up the electrons and are deposited to form nanoparticles. As a surface deposit, the deposit of the coating must be only a few atoms. Each particle must be nano sized and independent. The interaction among them must be by hydrogen bonding or van der waals forces. Plasma arcing is used to produce carbon nanotubes.

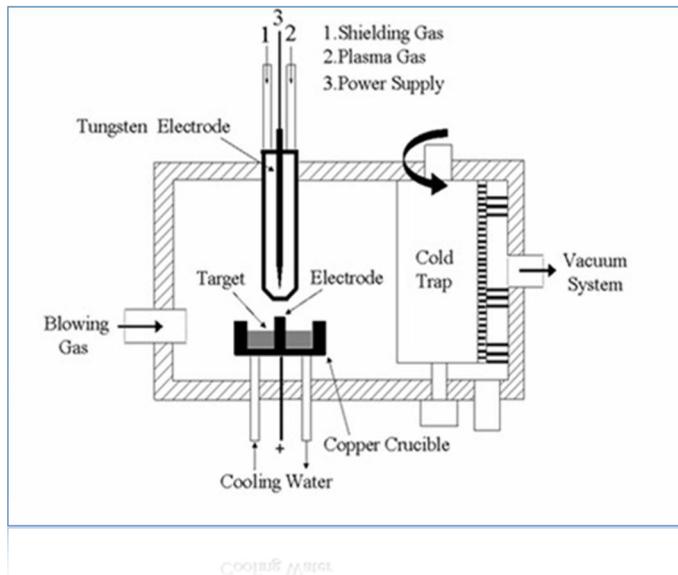


fig:1.3.plasma arcing method

CHEMICAL VAPOUR DEPOSITION:In this method nanoparticles are deposited from gas phase. Material is heated to form a gas and then allowed to deposit on a solid surface, usually under vacuum condition. The deposition may be either physical or chemical. In deposition by chemical reaction new product is formed. Nanopowders of oxides and carbides of metals can be formed if vapours of carbon or oxygen are present with the metal. Production of pure metal powders is also possible using this method. Now the metal is melted exciting with microwave frequency and vaporized to produce plasma at 1500°C. This plasma then enters the reaction column cooled by water where nanosized particles are formed. Chemical vapour deposition can be also used to grow surfaces. If the object to be coated is introduced inside the chemical vapour, the atoms/molecules coated may react with the substrate atoms/molecules. The way the atoms/molecules

grow on the surface of the substrate depends on the alignment of the atoms/molecules of the substrate. Surfaces with unique characteristics can be growth with this technique.

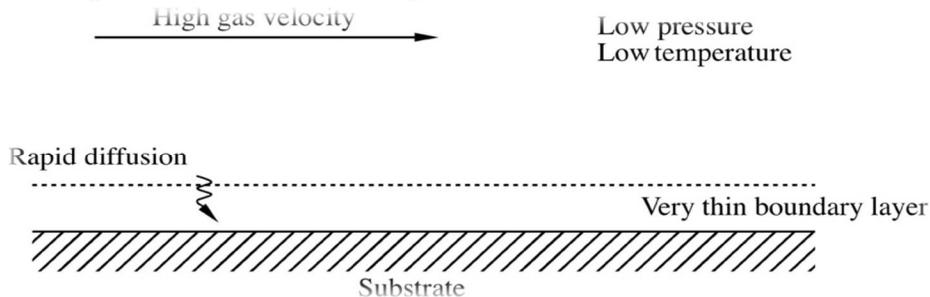


Fig 1.4: Chemical Vapour Deposition Method

3 SOL-GEL PROCESS

In solutions molecules of nanometre size are dispersed and move around randomly and hence the solutions are clear. In colloids the molecules of size ranging from $20\mu\text{m}$ to $100\mu\text{m}$ are suspended in a solvent. When mixed with a liquid, colloids look cloudy or even milky. A colloid that is suspended in a liquid is called as sol. A suspension that keeps its shape is called as gel. Thus sol-gels are suspensions of colloids in liquids that keep their shape. Sol-gel formation occurs in different stages.

- i) Hydrolysis.
- ii) Condensation and polymerization of monomers to form particles.
- iii) Agglomeration of particles. This is followed by the formation of networks which extends throughout the liquid medium and forms a gel.

The rate of hydrolysis and condensation reactions is governed by various factors such as pH, temperature, $\text{H}_2\text{O}/\text{Si}$ molar ratio, nature and concentration of catalyst and process of drying. Under proper conditions spherical nanoparticles are produced.

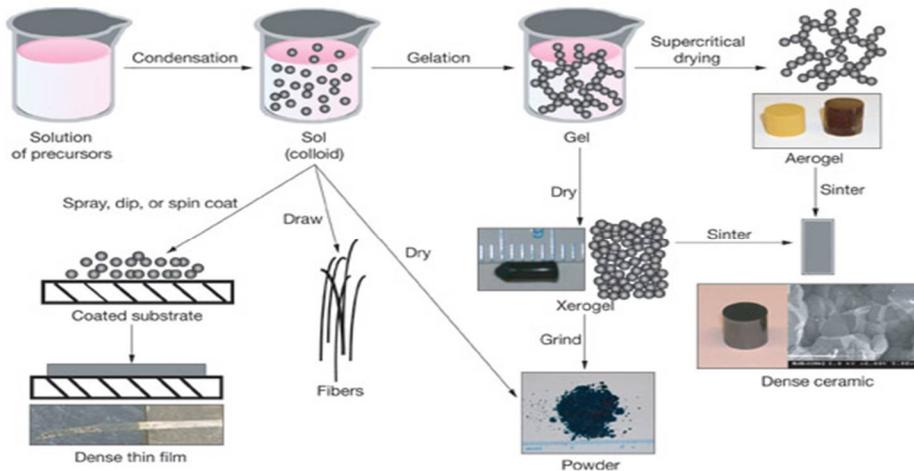


Fig 1.5: Sol-Gel Process

ELECTRODEPOSITION

Electrode position technique is used to electroplate a material. In many liquids called electrolytes (aqueous solutions of salts, acids etc.), when current is passed through two electrodes immersed inside the electrolyte, certain mass of the substance liberated at one electrode gets deposited on the surface of the other. By controlling the current and other parameters, it is possible to deposit even a single layer of atoms. Nanostructured films of copper, platinum nickel, gold etc. can be produced by electrode position. The films thus obtained are mechanically robust, highly flat and uniform. Since these films have larger surface areas, they exhibit quite different and favourable electrical properties. They have very wide range of applications. These include batteries, fuel cells, solar cells, magnetic read heads, etc.

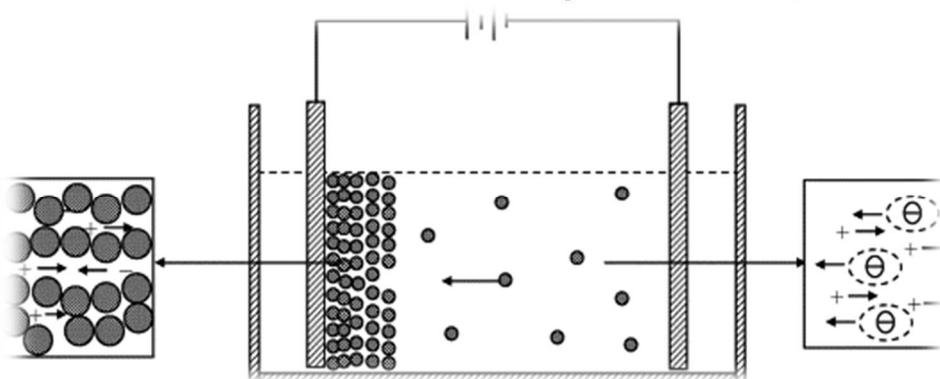


Fig 1.6: Electrode position Method

BALL MILLING

In ball milling, also called mechanical crushing, small balls are allowed to rotate around the inside of a drum and then fall on a solid with gravity force and crush the solid into nanocrystallites. Ball milling can be used to prepare a wide range of elemental and oxide powders. For example, iron with grain sizes of 10-30 nm can be formed. Other crystallites, such as iron nitrates, can be made using ammonia gas. A variety of intermediate compounds based on nickel and aluminium can be formed. Ball milling is the preferred method for preparing metal oxides.

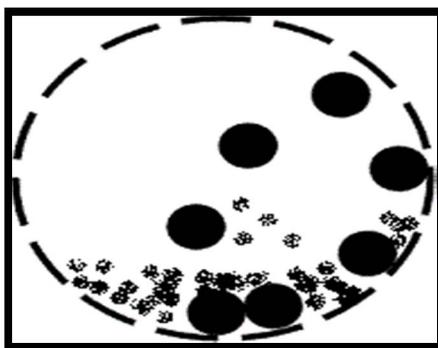


Fig 1.6 Ball Milling Method

SYNTHESIS OF CUO NANOPARTICLES MATERIALS

In this experiment the precursors used are copper nitrate and copper chloride, NaOH as a stabilising agent and ethanol for controlling pH of the solution. A magnetic capsule for stirring the solution.





Fig 3.1:materials

CHARACTERISATION TECHNIQUES

The characterisation techniques namely used for nanoparticles are Fourier transform infrared spectroscopy (FTIR), uv spectrography, x-ray diffraction, scanning electron microscope.

1FOURIER TRANSFORMATION IR SPECTROSCOPY

FT-IR stands for Fourier Transform Infrared, the preferred method of infrared spectroscopy. The prepared samples are characterized by FTIR spectroscopy. The experimental set up shown is in figure 1. In infrared spectroscopy, IR radiation is passed through a sample. Some of the infrared radiation is absorbed by the sample and some of it is passed through (transmitted). The resulting spectrum represents the molecular absorption and transmission, gives information of type of bonding in the sample. This makes infrared spectroscopy useful for several types of analysis.

- FTIR can identify unknown materials
- FTIR can determine the quality or consistency of a sample
- FTIR can determine the amount of components in a mixture.

The original infrared instruments are of the dispersive type. These instruments separated the individual frequencies of energy emitted from the infrared source. This are accomplished by the use of a prism or grating. A grating is a more modern dispersive element which better separates the frequencies of infrared energy. The detector measures the amount of energy at each frequency which has passed through the sample. This results in a spectrum which is a plot of intensity vs. frequency.



Fig.3.1: Fourier transforms infrared (FTIR) spectrometry

Fourier Transform Infrared (FT-IR) spectrometry is developed in order to overcome the limitations encountered with dispersive instruments. The main difficulty is the slow scanning process. A method for measuring all of the infrared frequencies simultaneously, rather than individually, is needed. A solution is developed which employed a very simple optical device called an interferometer. The interferometer produces a unique type of signal which has all of the infrared frequencies "encoded" into it. The signal can be measured very quickly, usually on the order of one second. Thus the time element per sample is reduced to a matter of a few seconds rather than several minutes.

UV-V SPECTROSCOPY: The CUO nanoparticles are characterized in a Perkin-Elmer UV-VIS spectrophotometer, Lambda-19 to know the kinetic behavior of CUO nanoparticles. The spectrophotometer is equipped with "UVWinlab" software to record and analyze data. Base line correction of the spectrophotometer is carried out by using a blank reference.

X-RAY DIFFRACTION METHOD:

X-ray diffraction is a non-destructive and analytical method for identification and quantitative analysis of various crystalline forms of ZnO, also known as phases of the compound present in the samples. Diffraction occurs when the waves collide with a regular structure in which the repeating distance is approximately same as the wavelength of the wave. It happens that X-rays have wavelengths "n" the order of a few angstroms. This means that the X-rays can be easily diffracted from materials which, are crystalline and have repeating and regular atomic structures.

1. When the required parameters met, the X-rays that get scattered from a crystalline solid can interfere

constructively, thus producing a diffracted beam of light. In 1912, W. L. Bragg derived a relationship among several factors:

- (a) The interatomic spacing which is known as d-spacing and is measured in angstroms.
 - (b) The angle of diffraction which is known as the theta angle and is measured in degrees.
 - (c) The wavelength of the incident X-rays, denoted by the lambda and, in this case, is equal to 1.54 angstroms.
2. Here XRD can be done by the X-ray diffraction of the samples using the diffractometer. X-Ray diffraction patterns are records from 20 degrees to 90 degrees with a PANalytical system diffractometer (Model: DY-1656) using CuK using an accelerating voltage of 40 KV. Data can be collect at a rate of 1 degree/min. The Kdoublets are then resolved. The size of the crystallites can be find out using the Scherrer's formula

$$P = 0.9\lambda / \beta \cos \theta$$

Where P - Crystallite size

λ - Wavelength (1.54 Armstrong)

β - Full maxima half width

θ - Diffraction angle

SCANNING ELECTRON MICROSCOPE (SEM):

The scanning electron microscope uses a beam of high-energy electrons to produce a variety of signals at the surface of specimens used. The signals show information about the sample including chemical composition, and crystalline structure, external morphology (texture) and orientation of materials which make up the sample.



Fig.3.2: SEM (JEOL-JSM 5800)



SEM analysis is normally considered to be non-destructive because the x-rays generated do not lead to loss of volume of the sample, so it becomes possible to repeatedly analyze the same materials. A scanning electron microscope is a kind of electron microscope which images a sample by scanning it using a high-energy electron beam. The electrons then interact with the atoms making up the sample, thus producing signals which reveal information about the sample's composition, surface topography and other properties such as electrical conductivity.

Various types of signals produced by a SEM include back-scattered electrons (BSE), secondary electrons, characteristic X-rays, specimen current, light (cathodoluminescence) and transmitted electrons. Back-scattered electrons (BSE) are the electrons which are reflected by elastic scattering from the sample. Because the intensity of the BSE signal is related to the atomic number of the specimen, BSE images can provide information about the different elements distribution in the sample very accurately. Characteristic X-rays are released when the electron beam removes an electron from the inner shell of the sample, thus causing a higher energy electron to occupy the shell and hence release energy in the form of X-rays. These characteristic X-rays are in turn used to find out the composition of the material and also measure the presence of elements in the sample as well as the level of impurities.

Magnification in a scanning electron microscope technique can be controlled over a range of about 6 orders of magnitude from approximately 10 to 500,000 times. Assuming that the display screen has a fixed size, higher magnification is obtained by reducing the raster size of the specimen, and vice versa. Magnification is hence controlled by the voltage supplied to the x, y deflector plates or the current supplied to the scanning coils and not by objective lens power.

PROCEDURE FOR SYNTHESIS OF CUO NANOPARTICLES

Dissolution, Homogenisation, Centrifusing, Thermal treatment

DISSOLUTION

- With the help of the molarity formula the weight of copper nitrate and copper chloride are calculated.

$$\text{Molarity (M)} = \frac{\text{Weight (in g)}}{\text{Molecular Weight (in g)}} \times \frac{1}{\text{Volume (Litres)}}$$

- 1.8gms(0.1m) of Cu(no3)2 is dissolved in 100ml deionised water and wait till it is completely soluble in water.
- 0.39gms(0.1m) of Naoh is dissolved in 100ml deionised water and wait till it is completely soluble under magnetic stirrer.



FIG 3.3: Stirring of two solutions $\text{Cu}(\text{NO}_3)_2$ and NaOH

- It takes about 30 to 45 minutes.

HOMOGENISATION

- In this step the NaOH solution is added drop by drops to the $\text{Cu}(\text{NO}_3)_2$ solution until pH reaches 14 and it is checked by pHmeter.
- After homogenisation the solution is washed with ethanol until it reaches pH 7.
- After attaining pH 7 it is followed by centrifusing action

CENTRIFUSING

- In this step whatever the solution is obtained after homogenisation is taken in test tubes and is kept in centrifusing equipment
- After centrifusing the precipitates get settle down and remaining liquid is on upper side of test tube.
- The liquid is poured off and the precipitates are collected and the process continues.
- This process is repeated till no solvent comes from the test tubes.



Fig 3.4: centrifusing action of solutions in test tube

THERMAL TREATMENT

- The precipitates obtained are heated in a furnace at 80 degrees for 16 hours.
- Later the powder that is obtained is dried in atmospheric air for sometime.
- The dry precipitate is then grinded by means of hand and then stored.



Fig 3.5:hot air oven.

The packed samples are



Fig 3.6 : cuo powder in tubes

USES OF CUO NANOPARTICLES

The key applications of copper oxide nanoparticles are as follows:

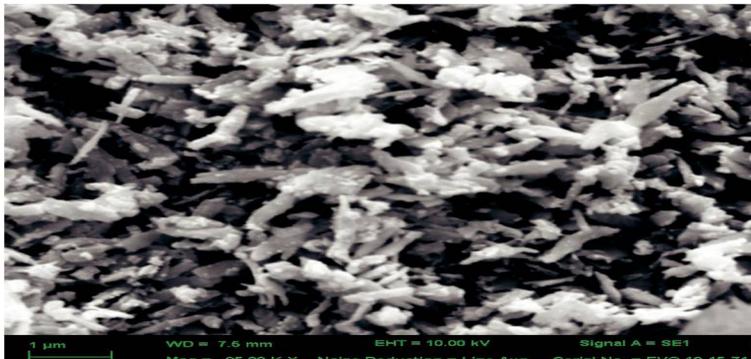
- As burning rate catalyst in rocket propellant. It can greatly improve the homogeneous propellant burning rate, lower pressure index, and also perform better as a catalyst for the AP composite propellant. Can be applied to the catalyst, superconducting materials, thermoelectric materials, sensing materials, glass, ceramics and other fields
- As ceramic resistors, magnetic storage media, gas sensors, near-infrared filters, photoconductive and photothermal applications
- As semiconductors, solar energy transformation, and high-tech superconductors.
- CUO nanoparticles acts as nanofluid and used as coolant in the radiators.
- Can be used as refrigerant in refrigeration system by mixing with the refrigerant.
- Can be used as brake fluid also by mixing with oils. Can be used as a coating to solar cells for absorbing huge amount of heat.
- Conductive paste: Nano copper has superior performance than micro copper and can be widely used in electronic paste. Sintering additives: In the powder metallurgical industry, it can be used as sintering additive to reduce sintering temperature in production of ceramic and diamond tools. Medicine and anti bacteria: Nano copper can be used widely in medical industry and to play antibacterial role. Lubricant

addictive:Nano copper can be dispersed into lubricant to decrease the surface friction and repair micro defects of the friction surface.

RESULTS AND DISCUSSION:

SEM IMAGES OF CUO FROM CU(NO₃)₂ (COPPER NITRATE)

At 2500x

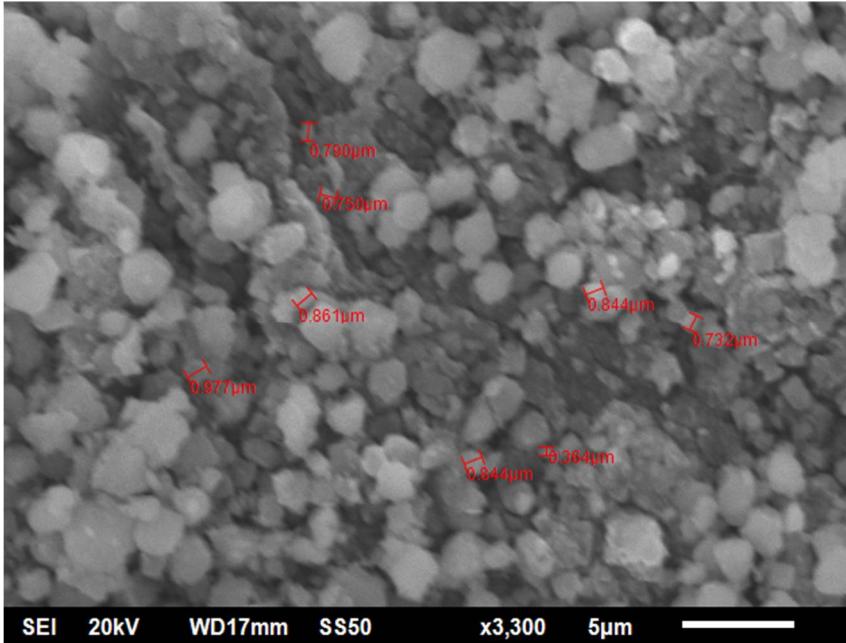


At 3300x

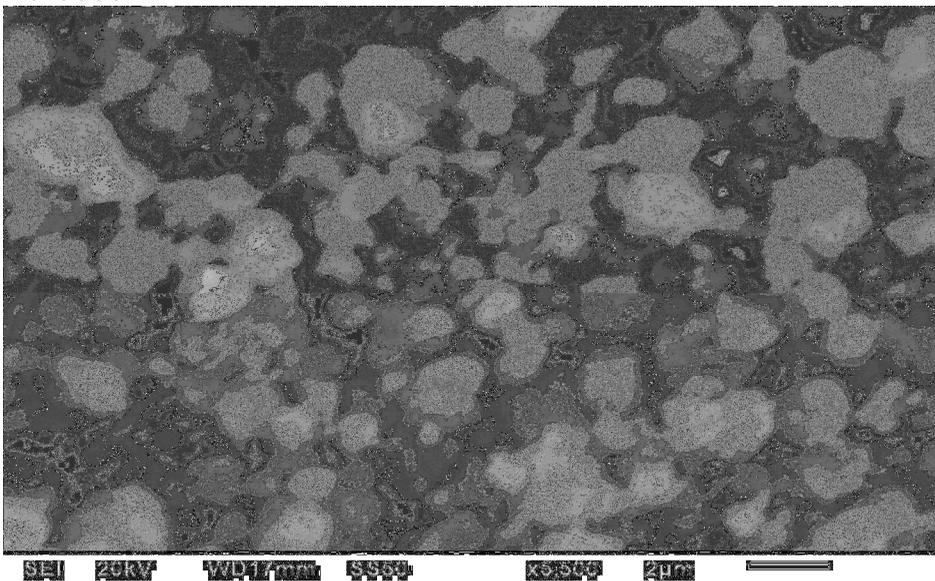


SEM IMAGES OF CUO FROM CUCL2 (COPPER CHLORIDE)

At 3300x



At 5500 X





SEM micrographs of the synthesized CUO are shown in the above figure. These pictures confirm the formation of CUO nanoparticles. These pictures substantiate the approximate spherical shape to the nanoparticles and most of the particles exhibit some faceting. The morphology observed in the sample shows the fine grains of CUO which are of size 2~5 μm .

CONCLUSION:

In this report, we have done synthesis of CUO nanostructures using a single- step and low cost sol-gel process and were characterized by SEM .SEM images show the formation of spherical particles of sizes between scale of 1-5 μm .The sol-gel route employed in this work is simple, cost effective and free of pollution and therefore, the technique can be extended to prepare many other important semiconducting metal oxide nanoparticles. These CUO nanoparticles Can be used as a coating to solar cells for absorbing huge amount of heat.



DESIGN SYNTHESIS AND BIOLOGICAL ACTIVITY OF ((S)- 4,5,6,7-TETRAHYDRO-N₆-PROPYL,2,6- BENZOTHAZOLEDIAMINE)METAL COMPLEXES

G.Harisha

M.S. Engineering College
Navaratna Agrahara ,Bangalore

R.Vijaykumar

M.S. Engineering College
Navaratna Agrahara ,Bangalore

R.Mallikarjuna Rao

Geethanjali Institute of Science & Technology
S.P.S.R, Nellore

INTRODUCTION

Schiff bases are very good complexing agents. A perusal of literature survey reveals that the field of Schiff base metal complexes is vast and fast developing on account of numerous applications in various important fields and the wide variety of structures possible for the ligands depending upon the aldehydes, ketones and amines. Metal complexes of Schiff bases and their applications Schiff base complexes have been used as pesticides^[3], as antiviral and antibacterial agents^[4,5] and as catalysts^[6-8]. The thermal behavior of transition metal complexes of Schiff bases has been widely investigated^[9-11]. The applications of such complexes depend to a large extent on their molecular structure. The author in the present study provides a new series of metal complexes of Cu (II) Ru(III) and La(III) with Schiff base ligand derived from ((S)-4,5,6,7-Tetrahydro-N₆-propyl,2,6-benzothiazolodiamine) and 2,4 -Di Hydroxy Acetophenone(2,4 DHAPP). These complexes were characterized by , IR, NMR, UV- Vis Spectrometer, ESR, VSM, TGA-DTA and Conductometric measurements to determine the mode of bonding and geometry, biological activities of the ligands and metal complexes were also carried out



Material and Methods

INSTRUMENTATION

The percentage compositions of the elements (CHNO) for the compounds were determined using an element analyzer CHNO model Fison EA 1108. The Infra-red spectra were recorded as potassium bromide (KBr) discs using a JASCO FT/IR-5300. The ^1H (400Hz) nuclear magnetic resonance spectra were recorded using the ACF200 Broker Germany Spectrometer. Ultraviolet Spectra were recorded using Prekin-Elmer lab India UV-Vis Spectrometer. The Electron spin resonance spectra were recorded using the JES-FA Series and TG-DTA spectra were recorded using the SPTQ600 PA. Thermo gravimetric analyses of the metal complexes were carried out by using the Perkin Elmer system in thermal analysis centre Stick Cochin and ethyl alcohol were used as solvent. All chemicals used in the present investigation were pure Aldrich chemicals.

Preparation of Ligands and its Metal complexes.

(Preparation of ((S)-4,5,6,7-Tetrahydro-N6-propyl,2,6-benzothiazolodiamine) and 2,4 - Dihydroxy acetophenone Schiff base (2,4 DHAPP)):

((S)-4,5,6,7-Tetrahydro-N6-propyl,2,6-benzothiazolodiamine), 4.22g (0.02mole) and 2,4 Di Hydroxy-acetophenone 3.04g (0.02mole) were dissolved in 25ml of methanol were taken in 250ml borosil reflection flask and 1 ml of triethylamine. The mixture was refluxed for 3 hour on water bath and then cooled to room temperature, light brown colored sharp needles were separated out and washed with methanol and dried in vacuum desiccators over CaCl_2 anhydrous

For the Preparation of Cu(II), Ru(III) and La(III) metal chloride salts were used. Dissolve 3.2947g(0.01 Mole) of newly synthesized ligand in adequate of methanol. To this solution, aqueous solution of 1.3434



g(0.01Mole) and 1.718g (0.01Mole) metal chlorides, and 1 ml of Sodium acetate. The mixture was refluxed for 6 hours in a water bath and then cooled to room temperature, dark green colored, dark brown colored sharp needles were separated out. The coloured metal complexes were washed with water and then methanol, and were recrystallised from ether and dried in vacuum desiccator over CaCl₂ anhydrous. The elemental analysis was carried out for the newly synthesized ligand metal complexes. The prepared metal complexes were in 1:2 ratio. Ligands and metal complexes analytical data was tabulated in Table-1.

Table-1: Analytical data of the ligand and their metal complexes

			Complex			
			2,4 DHAPP	Cu(2,4DHAPP))2X2	Ru(2, 4DHAPP) 2X2	La(2, 4DHAPP) 2X2
Molecular weight			329.479	789.488	828.01	889.488
Co lour			Light bro wn	Dark green	Dark brown	green
Yield			76	74	72	84
M.P			210-212	230-232	250-252	175-180
Elemental Analysi s	C %	Calculat ed	65.52	54.71	52.17	51.17
		Found	62.00	54.05	52.00	48.00
	H %	Calculat ed	6.65	6.33	6.03	6.00
		Found	6.05	6.22	6.00	5.57
	N %	Calculat ed	12.15	10.63	10.14	9.85
		Found	12.01	10.34	10.01	9.58
	O %	Calculat ed	9.26	12.15	11.59	10.56
		Found	9.20	12.00	11.52	10.88
M %	Calculat ed	-	8.04	11.20	10.56	
	Found	-	7.99	10.98	10.54	



RESULT AND DISCUSSION

Infrared spectral analysis:-

Infrared spectra were recorded with a JASCO FT/IR-5300 Spectrometer (4000-400 cm^{-1}) using KBr pellets. By utilizing this spectroscopy, the presence of important functional groups in the compound can be identified. Table 2 through light on the observation made in analyzing IR spectra of ligand and metal complexes.

Interpretation of 2,4 DHAPP and Cu(II), Ru(III) and La(III) complexes:

The Infrared spectrum of the ligand was compared with the spectra of Cu(II), Ru(II) and La(III) complexes. The data was summarized in table along their assignment. The typical IR spectra were shown in Fig. 1, 2 and 3. The IR spectrum of the ligand has shows broad band at 1632 cm^{-1} [14] which was assigned to due $\nu\text{C}=\text{N}$ stretching of azomethine group. In complexes this band was shifted to lower regions, 1647 cm^{-1} , 1657 cm^{-1} and 1668 cm^{-1} [15] for Cu(II), Ru(II) and La(III) complexes respectively, suggesting the involvement of azomethine group ($>\text{C}=\text{N}$) group in complexation. This was due to the reduction of electron density on Nitrogen. There by indicating the coordination of the metal in through the nitrogen atoms.

The IR spectra of metal chelates shows the disappearance of the $\nu(\text{OH})$ [16] bond at 3303 cm^{-1} . It indicates the proton displacement from the phenolic (OH) group on complexation. Thus bonding of the metal ions to the ligands under investigation takes place through a covalent link with oxygen of the phenolic group. The IR spectra of Cu(II), Ru(III), La(II) metal complexes exhibit a broad band [17] around 3300 cm^{-1} , 3309 cm^{-1} , 3305 cm^{-1} respectively, which can be assigned to $\nu(\text{OH})$ of water molecules associated with complex formation. The two weaker bands at 817.50 cm^{-1} and 807.20 cm^{-1} were attributed to OH rocking and wagging vibrations of coordinated water molecules. The complexes



display a sharp band in the $946\text{-}968\text{cm}^{-1}$ region due to the $\nu(\text{V}=\text{O})$ mode. New bands were observed in the complexes, which were not observed in ligand. The bands at 600 cm^{-1} to 685 cm^{-1} were assigned to stretching frequencies of (M-O), the band at 454 cm^{-1} to 584 cm^{-1} ^[18] were assigned to the stretching frequencies (M-N) respectively^[19-21].

Table-2: The important IR bands of the Ligand and Their Metal Complexes

Compound	OH(Water)	νOH (Phenolic)	$\nu\text{C}=\text{N}$	$\nu\text{N-H}$	$\nu\text{M-O}$	$\nu\text{M-N}$	$\nu\text{C-H}$
2,4 DHAPP	-	3303	1632	3303	-	-	2700
Cu(2,4DHA PP) ₂	3309	-	1647	3300	685	454	2986
Ru(2,4 DHAPP) ₂	3331	-	1651	3309	608	544	2879
La(2,4 DHAPP) ₂	3331	-	1668	3305	600	584	2800

NMR Spectrum of 2,4 DHAPP Ligand and its Metal complexes:

The ^1H NMR spectra of ligand and metal complexes in DMSO- d_6 as solvent. The chemical shift values of the ligand and metal complexes were shown in Table-3. Ligand shows a singlet at 2.71 ppm ^[21], which is due to protons bonded to Schiff base group. On complexation this band was shifted to low field regions 2.573 ppm and 2.4 ppm for Cu (II), Ru (III), La(III) complexes respectively. This shifting indicates the shielding of azomethine. The aromatic ring protons

forms a multiplet at $6.37\text{-}6.41\text{ ppm}$, methylene protons form a singlet in the region 1.70 ppm hydroxyl proton^[22] shows a doublet at 5.65-



8.2ppm, which was disappeared in the complexes. In the ¹H NMR spectrums of the Cu (II) , Ru (III) and La(III) complexes the signal due to azomethine protons were shifted 2.71ppm to 2.8ppm . This shifting indicates the shielding of the azomethine group. The aromatic ring protons that are seen in the 7.2 - 7.3 ppm^[22] become broad and less intense compared with the corresponding Schiff base. In complexes the aromatic ring protons at 6.3-7.98 ppm become broad and less intense, compared with Schiff base. The following complexation in the case of Cu(II), Ru (III) and La(III) complexes indicates the complexation of water molecules by coordination with metal ion.

Table-3: ¹H NMR Spectrum of the ligands and its metal complexes in DMSO-d₆ in ppm

Compound	CH ₃ - C= N	Ar- H	OH- H ₂ O	C H 2	Ar- OH	N-H
2,4DHAPP	2.71	6.37- 7.65	-	1.7 0	5.65	9.01
Cu(2,4DHAP P) 2	2.73	6.64- 6.62	12. 34	1.7 3	7.45	8.85
Ru(2,4 DHAPP) 2	2.8	6.41- 7.59	11. 02	1.8 1	7.9	8.4
La(2,4 DHAPP) 2	2.76	7.2- 7.98	13. 00	2.4 5	8.2	8.5

Conductivity measurements:

The molar conductance of complexes in DMF (~10⁻³ M) was determined at 27±20°C using Systronic 303 direct reading conductivity bridge. A known amount of solid complexes is transferred into 25ml standard flask and dissolved in dimethyl formamide (DMF). The contents are made up to the mark with DMF.



The complex solution is transferred into a clean and dry 100ml beaker. The molar conductance's of the complexes were less than $20 \text{ Ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ indicating the Non-electrolytic nature. These values suggest on-electrolytic nature of the present complexes. The molar conductance values of these metal complexes are given in the Table-4

Table-4: Conductance data for Metal-2,4 DHAPP Complexes: Cell constant: 1.00

S.No	Metal Complex	Conductance Ohm^{-1}	Specific Conductance $\text{Ohm}^{-1} \text{ cm}^{-1}$	Molar Conductance $\text{Ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$
1.	Cu(2,4DHAPP) ₂	0.00017×10^{-3}	0.00027×10^{-3}	27
2.	Ru(2,4DHAPP) ₂	0.00020×10^{-3}	0.00050×10^{-3}	50
	La(2,4DHAPP) ₂	0.00040×10^{-3}	0.00040×10^{-3}	40

Electronic spectra:

In UV-Visible electromagnetic radiation, the transitions are associated with the electronic energy levels of the compound under investigation. The electronic spectra were recorded on a Thermo Spectronic Heylos a spectrophotometer. The transition metal ions occur in a variety of structural environments. Because of this, the electronic structures are extremely varied. The electronic structures have been identified with UV-Visible spectroscopy 2,4 DHAPP and its metal complexes:

The electronic spectral of ligand and its metal complexes were given in the transitions were reported in the Table-5. Ligand shows signal band at 290 nm, assigned to $\pi-\pi^*$ transition. In complexes this band was shifted to higher wavelength regions. New bands were observed in the complexes at corresponding to the charge transfer transitions. In high



concentration spectra of complexes d-d transitions were observed in visible region

Table-5 : UV spectral data

Complexes	λ_{max} of the complex	λ_{max} of the ligand in nm
Cu(2,4 DHAPP)	316	285
Ru(2,4 DHAPP)	330	287
La(2,4 DHAPP) 2	332	290

Electronic spin resonance spectra:

In the present study the X-band (~9.3GHz) ESR spectra of Cu(II), Ru(III) and La(III) complexes in DMF were recorded at room temperature and at liquid nitrogen temperature (LNT) on a JES-FA SERIES spectrometer. DPPH radical was used as a field maker.

Analysis of 2,4 DHAPP through ESR spectra of Cu (II) complex:

The ESR spectra of the complex in poly crystalline state exhibit only one broad signal, which is attributed to dipolar broadening and enhanced spin lattice relaxation. Anisotropic spectra obtained for these complexes in DMF at LNT and representative ESR spectra of Cu (II) complexes were presented in Fig.7. In this low temperature spectrum, four peaks of small intensity have been identified which are considered to originate from g_{\parallel} component

The spin Hamiltonian, orbital reduction and bonding parameters of the Cu(II) complex was presented in Table 6. The g_{\parallel} and g_{\perp} are computed from the spectrum using DPPH free radical as g marker. Kvelson & Neiman^[23] have reported that g_{\parallel} value is less than 2.3 for covalent character and is greater than 2.3 for ionic character of the metal-ligand bond in complexes. Applying this criterion, the covalent bond character can be predicted to exist between the metal and the ligand complexes^[24]. The trend $g_{\parallel} > g_{ave} > g_{\perp} > 2.0023$ observed for the complex suggest that the unpaired electron is localized in $dx^2 - y^2$ and dz^2 orbital of the



copper (II) ions for the complex. It is observed that G value for these complexes are greater than four and suggest that there are no interactions between metal-metal centers in DMF medium.

The ESR parameters g_{\parallel} , g_{\perp} , A_{\parallel}^* and A_{\perp}^* of the complexes and the energies of d-d transition are used to evaluate the orbital reduction parameters (K_{\parallel} , K_{\perp}) the bonding parameters (α^2), the dipolar interaction (P)^[25]. The observed $K_{\parallel} < K_{\perp}$ indicates the presence of out of plane π -bonding. The α^2 values for the present chelates lie in the range 0.42-0.48 and support the covalent nature of these complexes. Giordano and Bereman suggested the identification of bonding groups from the values of dipolar term P . The reduction of P values from the ion value (0.036cm^{-1}) might be attributable to the strong covalent bonding. The values of P obtained for the present complexes in between $0.029\text{-}0.036\text{cm}^{-1}$ and remain consistent with bonding of metal ions to oxygen and nitrogen donor atoms respectively. The shape of ESR lines, ESR data together with the electronic spectral data suggest an octahedral geometry for these complexes^[26].

Table-6 : Spin Hamiltonian and orbital reduction parameters of copper and Manganese complexes in DMF solution

Parameters	La(2,4DHAPP)2
g_{\parallel}	2.05559
g_{\perp}	1.98000
gave	2.00853
G	3.7201
A_{\parallel}^*	0.0172
A_{\perp}^*	0.0022
A_{ave}^*	0.0081
d-d	13500
K_{\parallel}	0.8891
K_{\perp}	0.9924
P^*	0.046



α 2	0.430
------------	-------

Magnetic susceptibility measurements of copper (II) Ruthenium(III) and Lanthum (III) complexes:

The effective magnetic moment values for all the complexes are represented in the Table.7. There are considerable orbital contribution and effective magnetic moments for octahedral complex at room temperature. The magnetic moments of the present (2,4 DHAPP)₂ Cu complex is 4.82 B.M. and the value is less than the spin only value, it shows reduced Para magnetism, which suggest the formation of low-spin complex having octahedral geometry. The magnetic moments of the present (2,4 DHAPP)₂ La complex is 1.76 B.M. and this value is equal the spin-only value, showing paramagnetic, which suggest the formation of low-spin complex having square planar

Table-7: Magnetic moments of copper and Manganese

		Effect. In B.M.	
		Theoretical	Observed
1.	Cu(2,4 DHAPP) ₂	4.90	4.82
2.	Ru(2,4 DHAPP) ₂	1.72	1.70
	La(2,4 DHAPP) ₂	1.76	1.75

Thermal analysis:

The thermal studies of these complexes are carried out to know the stability of the complexes on thermal decomposition, as well as to know the different final products that are obtained in thermal decomposition having novel catalytic properties

Study of 2,4 DHAPP and its Cu (II), Ru (II) and La(III) metal complexes by TGA-DTA spectra:



Thermoanalytical data of metal complexes were given in the Table.8. The representative thermograms were shown in the fig.8 and 9. The Cu complexes are thermally stable upto 160°C. The first stage of the decomposition corresponding to endothermic dehydration of the complex and the two lattice water molecules are lost in the temperature range 160-170°C to give anhydrous complex^[28]. The second decomposition stage with two endothermic is known as stable intermediate formed around 180-350 °C^[29-30]. Exothermic decomposition express to give the corresponding metal oxides as final decomposition product at a high temperature i.e. above 360-720°C .The decomposition behavior of the complexes was observed in nitrogen atmosphere. All the experimental mass loss has shown Table.8. The Ru complexes are thermally stable up to 150°C. The first stage of the decomposition corresponding to exothermic dehydration of the complex and the two lattice water molecules are lost in the temperature range 150-170°C to give anhydrous complexes. The second decomposition stage with two exothermic is known as stable intermediate formed between 180-350°C. Exothermic decomposition express to give the corresponding metal oxides as final decomposition product at a high temperature i.e. above 520°C .The decomposition behavior of the complexes was observed in nitrogen atmosphere. All the experimental mass loss has shown Table.8. At high temperatures, the corresponding metal oxides were formed, as stable products. All the experimental percentage mass loss was compared with the calculated weights. Based on thermal data it was shown that the stability order of the complexes was Cu (II) > Ru (II) and La(III)



Table 8 : Thermal analytical data of the Ligand and their metal complexes

Complex X=H ₂ O	Molecular weight in gms	Weight of the complex take in mgs	Temperature Range during weight loss in 0C	%of fraction of weight	Probable assignment
[Cu.L ₂ .X ₂] L= C ₁₈ H ₂₃ N ₃ SO - 2	789.48	8.1910	140-160.46 200-380 500-850	12.95 42.89 7.6	Loss of 2H ₂ O molecule. Loss of two L molecules. Remaining residue Corresponds to CuO.
[Ru.L ₂ .X ₂] L= C ₁₈ H ₂₃ N ₃ SO - 2	828.01	12.1630	150-170 180-350 Above 520	10.56 57.16 10.39	Loss of 2H ₂ O molecule. Loss of two L molecules. Remaining residue Corresponds to RuO.
[La.L ₂ .X ₂] L= C ₁₈ H ₂₃ N ₃ SO - 2	889.01	11.1630	170-190 230-340 Above 440	9.56 67.16 11.39	Loss of 2H ₂ O molecule. Loss of two L molecules. Remaining residue Corresponds to RuO.

Biological activity:

The author in this present investigation attempted to find out antibacterial activity of ligand and their metal complexes against Salmonella typhi, Enterococcus faecalis and Escherichia coli choosing serial paper disc method Table 9. The results of the biological activity of the metal complexes indicated the following



facts. A comparative study of the ligand and their complexes indicates that the metal chelates exhibited higher antibacterial activity than that of the free ligand. The increase in the antibacterial activity of metal chelates was found due to the effect of metal ion on the metal chelates which could be explained on the basis of overtones concept and chelation theory. On chelation the polarity of the metal ion reduced to a greater extent due to the overlap of the ligand or bital and partial sharing of positive charges of metal ion with donor groups. It was further noted that the delocalization of electrons over the whole chelate ring enhanced the lipophilicity of the complexes. This increased lipophilicity^[31] enhanced the penetration of the complexes into lipid membrane and blocking the metal sites on enzymes of microorganism. The zones of inhibition of the ligand metal complexes were in the Table.9. The activity was compared with zone of inhibition was measured in mm and reported in of Cu (II), Ru(III), La(III) Complexes of Schiff, is found to be more.

Table 9: Antibacterial Activity of the Metal complexes Total Area of Zone of clearance in mm

S.No	Compound	Salmonella	Enterococcus	Escherichia
1	2,4 DHAPP	12	14	15
2	Cu(2,4	17	19	18
3	Ru(2,4	16	18	19
	La(2,4	18	17	22



CONCLUSION

The above study results reveals that, it can be concluded that Schiff base of O-Vanillin with aminenamelyp-Toulic hydrazide acts as a very good complexing agent towards many transition metalions. By using above spectral studies these behave bidentate during complexation. All the metal complexes carry no charge and are thermally stable. As such no single technique is independent of predicting final structures of the complexes.

References

1. R.Saito and Y.Kidani , Chem.Lett., 128 (1976) .
2. S.Yamada , Coord. Chem. Rev., 190, 537 (1999).
- 3.X.D.Zhu, C.G.Wang, Y.L.Dang,H.B.Zhou, Z.S. Wu, Z.J.Liu, D.L. Ye and Q.C.Zhou, Syn. React,Inorg.Met.,30,625 (2000).
- 4.M.Kanthimathi, A.Dhathathreyan and B.U.Nair, Chem.Phys.Lett., 324, 43 (2000).
- 5.Z.H.Chohan, M.A.Farooq,A.Scozzafara and C.T.Supuran, J.Enzyme Intib. Med. Chem., 17 1,(2002).
- 6.M.Carazzini, G.Pozzi, S.Quici and I.Shepperson, J.Mol. Catal.A: Chem., 204-205,433 (2003).
7. M.Wang, H.Zhu, K, Jin, D. Dai and L.Sun, J.Catal., 220, 392 (2003).
- 8.D.E.White and E.N.Jacobsen, Tetrahedron: Asymmetry 14, 3633 (2003).
- 9.E.T.G.Caralheiro,F.C.D.Lemos, J.Zukerman Schpector and E.R.Dockal, Thermochion. Acta., 370, 129 (2001).
10. D.Fatu and V.Popescu, J.Therm.Anal.Cal., 71 521 (2003).
- 11.A.M.Donia, H.A.El-Boraey and M.F.El-Samalehy, J. Yjerm. Anal. Cal., 73 987 (2003).
12. W.J.Geary; J.Coord.Chem.Rev., 7, 81 (1971).
13. M.N.Patel, S.H.Patel; J.Macromol.Sci.A, 16, 1420 (1981).
14. M.Lever; Anal.Chem.Acta, 65, 311 (1973).
15. W.J.Geary; J.Coord.Chem.Rev., 7, 81 (1971).
- 16.R.Sreenivasulu, J.Sreeramulu, K.Sudhakar Babu; J.Electro.chem.Soc., India, 54, 11 (2005).
- 17.M.E.Hossain, M.N.Alam, J.Begum, M.Akbar Ali, M.Nagimuddin, F.E.Smith, R.C.Hynes; Inorganic chimicaActa,249, 207-213 (1996).



18. T.J. Mabry, K.R. Markham; in the Flavonoids, edited by J.B. Harborne, T.J. Mabry, H. Mabry, Chapman and Hall, London p.78 (1975).
19. W. Heiber, P. John; J. Chem. Ber., 103, 2161 (1970).
20. Z. Jawarska, C. Jose, J. Urbanski; J. Spectrochim. Acta, 30a, 1161 (1974).
21. B. Singh, R.D. Singh; Ind. J. Chem., 21, 648 (1982).
22. Tarek M.A. Ismail; J. of Coordination Chem., 59(3), p. 255-270 (2006).
23. A.H. Maki, B.R. Mcgarvey; J. Chem. Phys., 29, 31- 35 (1958).
24. M.A. Halcrow, L.M.L. Chia, X. Liu, E.J.L. McInnes, J.E. Davies, et al.; Chem. Commun., 2465 (1998).
25. M.R. Wagner, F.A. Walker; J. Inorg. Chem., 22, 3021 (1983).
26. J. Costa, R. Delgado, M.C. Figuera, R.T. Henriques, M.C. Teixeira; J. Chem., Soc., Dalton Trans., 65(1997).
27. J.M. Bret, P. Castan, G. Commeges, J.P. Laurent, D. Muller; J. Chem. Soc., Chem. Commun., 1273(1983).
28. Maurico Cavicchioli, P.P. Corbi, Petr Melnikov, Antonic C. Massabni; J. Coord. Chem., 55(8), pp.951- 959 (2002).
29. M.M. Abou-Sekkina, M.G. Abou El-Azm; Thermochim. Acta, 79, 47 (1984).
30. D. Broadbent, D. Dailimore, J. Dollimore; J. Chem. Soc. (A), 451 (1980).
31. K.P. Bslasubramanyam, R. Karvembu, V. Chinnuswamy, K. Natarajan; Ind. J. of Chem., 44A, pp.2450-2454(2005).



SYNTHESIS AND LIQUID CRYSTALLINE PROPERTIES OF FLAVONOID TRIESTER

Salah Hamza Sherif

Department of Organic Chemistry
Foods, Drug & Water
Andhra University
Visakhapatnam, India

Siddaiah Vidavalur

Department of Organic Chemistry
Foods, Drug & Water
Andhra University
Visakhapatnam, India

M. Suri Babu

APL Research Centre-II
Analytical Research Department
Hydrabad, India

Y.L.N. Murthy

Department of Organic Chemistry
Foods, Drug & Water
Andhra University
Visakhapatnam, India

1. Introduction

Liquid crystalline materials have many practical applications in scientific and technological areas, in particular as display devices, organic light emitting diodes, photoconductors, semiconductor materials¹⁻⁴ and in Pharmaceutical Application.⁵

Strong demand of new liquid crystals (LCs) for applications has led to the preparation and study of numerous mesogens in particular, thermotropic LCs⁶

Organic compounds exhibit thermotropic liquid crystalline (LC) properties when the molecules possess rod- or disc-like structure.⁷ Such structure allow the molecules to form partially ordered bulk materials characterized by long range orientational ordering but lacking the 3-dimensional long range positional order characteristic of typical solid crystals⁸

Variety of liquid crystalline compounds consisting of rodlike (Nematic) and disclike(Discotic) have been synthesized Particularly, rodlike



molecules showing the nematic phase have been widely studied because of their application to flat panel displays⁹⁻¹²

Rod-like (calamitic) molecules are typically composed of a rigid core comprising several rings (aromatic, aliphatic or heterocyclic) joined by linkages^{13,14}

The phase transition behavior, the stability, and the textures of the mesophases essentially depend on the chemical structure and molecular geometry of the mesogenic units, the nature and length of the flexible spacer, the molecular polarity, and the synthesis conditions¹⁵

Terminal substituents have significant impact on the properties of liquid crystals¹⁶, the long alkyl/alkoxy chains add flexibility to the rigid core structure that tends to reduce melting points and allow liquid crystal phases to be exhibited. Additionally the alkyl/alkoxy chains are believed to be responsible for stabilising the molecular orientations necessary for liquid crystals phase generation, alkyloxy and thioalkyl groups can influence the melting points and mesophase types, etc¹⁷ Therefore, the nature of the terminal substituents or end groups in the molecule of the mesogen have profound influence on the liquid crystal properties of the compound.^{18,19} It is known that terminally substituted compound exhibited more stable mesophase as compared to unsubstituted mesogenic compounds²⁰. Various types of terminal substituents have been studied, including either polar substituent or a fairly long hydrocarbon chain.²¹

In order to study the role of flavonoid group in liquid crystalline properties, we synthesized four series of compounds with flavonoid core and long chain ester terminal substituent and their liquid crystalline properties was studied using differential scanning calorimetry (DSC) and polarizing optical microscope (POM).



2. Materials and Methods

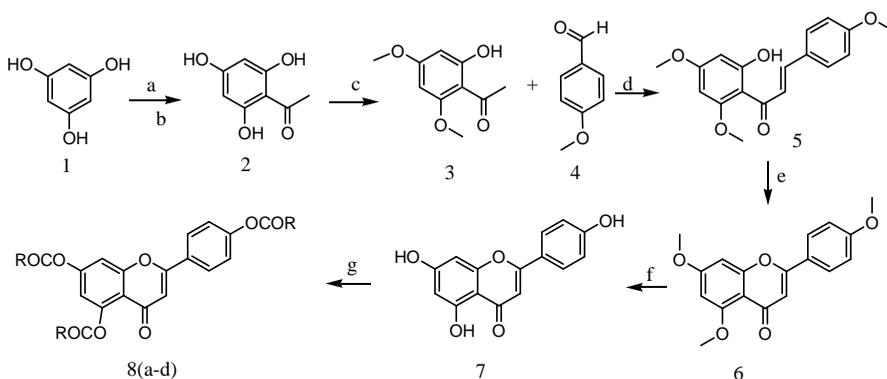
All chemicals and solvents were purchased from Sigma Aldrich and used without further purification; the reaction process was monitored by TLC silica gel plates, the purification of the products was performed using column chromatography using silica gel (100-200 mesh). Melting points were measured in open capillary tubes and were uncorrected; NMR spectra were recorded on Bruker (400 MHz) spectrometer and Jeol JNM EX-90 NMR spectrometer using TMS as the internal standard, mass spectra were recorded on an Agilent 110 Lc/MSD. Elemental analyses were performed on a Vario EL-III. Liquid crystalline properties of the target compounds were studied using differential scanning calorimetry (DSC) and polarizing optical microscope (POM).

3. Experimental

3.1. Chemistry

The titled compounds 8 (a, d) described in this study were synthesized as outlined in Scheme I

Acylation of phloroglucinol (1) gave phloroacetophenone (2) which on methylation and condensation with anisaldehyde (4) gave the intermediate chalcone (5). 5,7,4'-trimehoxy flavones (6) was obtained by cyclization of (5) subsequent demethylation of (6) yield the core flavonoid (7) in good yield, the desired compounds 8(a-d) obtained by esterification of (7) with appropriate carboxylic acid



8a, R: C₁₇H₃₅,

8b, R: C₁₅H₃₁,

8c, R: C₁₃H₂₇,

8d, R: C₁₀H₂₁,

Scheme1. Reagent and conditions: a) CH₃CN, ZnCl₂, HCl_(g), Et₂O, b) H₂O, reflux c) Me₂SO₄, K₂CO₃, (CH₃)₂CO, d) KOH, EtOH, RT, 12 hrs e) DMSO, I₂, 160°C, 4 hrs f) Py/HCl, 170°C, 6 hrs g) RCOOH, SOCl₂, TEA, THF 24 hrs

3.2. Synthesis and characterization

3.2.1. Synthesis of phloracetophenone (2)

In a 250 ml 3-necked round bottom flask fitted with calcium chloride tube and an inlet tube for hydrogen chloride gas, were placed (10 g, 0.08 mol) of phloroglucinol (**1**) 6.5 g. (0.16 mol) of acetonitrile, 2 g. of anhydrous zinc chloride in 100 ml of anhydrous ether. The flask was cooled in ice and hydrogen chloride gas passed through the mixture for 2 hours stirring continuously. The mixture was allowed to stand in refrigerator overnight and again hydrogen chloride gas passed through the mixture for another 2 hours. The mixture was allowed to stand in refrigerator for three days. The ether was decanted from the orange-yellow precipitate after washing twice with ether the solid was hydrolyzed by heating with 100 ml of water for one hour. On cooling, filtering with suction filtration and drying in oven pale yellow phloracetophenone was obtained



Yield: 73%; **Mp:** 218–220 °C; ESI-MS: m/z 169 [M + H]⁺; ¹H NMR (400 MHz, DMSO): 12.26 (s, 2H, OH), 10.41 (s, 1H, OH), 5.8 (s, 2H, Ar-H), 2.50 (s, 3H, COCH₃); Anal. Calcd for C₈H₈O₄: C, 57.14; H, 4.80; O, 38.06; found: C, 57.06; H, 4.85; O, 38.09

3.2.2. Synthesis of 2-hydroxy-4, 6-dimethoxyacetophenone (3)

To a solution of phloroacetophenone (**2**) (8 g, 0.473 mol) in 30ml acetone, potassium carbonate (19.6g, 0.142 mol) was added and then DMS (15.4g, 0.118 mol) was added slowly and refluxed for about 2 hours, after completion of the reaction (monitored by TLC) the solution was filtered and concentrated, the crude product was purified by column chromatography using eluent hexane : ethylacetate, (9:1)

Yield: 82 %; Mp: 78–80 °C; ¹H NMR (400 MHz, CDCl₃): δ 13.96 (s, 1H), 6.01(d, J = 2.0 Hz, 1H), 5.89 (d, J = 2.0 Hz, 1H), 3.81(s, 3H), 3.79(s, 3H), 2.57(s, 3H); ESI-MS: m/z 197 [M + H]⁺

Anal. Calcd for C₁₀H₁₂O₄: C, 61.22; H, 6.16; O, 32.62; found: C, 61.12; H, 6.20; O, 32.68

3.2.3. Synthesis of 2'-Hydroxy-4,4',6'-trimethoxychalcone (5)

To a solution of 2-hydroxy-4,6-dimethoxyacetophenone (**3**) (4 g, 0.02 mole) and 4-methoxy benzaldehyd (**4**) (3.2g, 0.023mole) in ethanol an alcoholic solution of potassium hydroxide(2.2g, 0.04 mole) was added, stirred at room temperature over night after completion of the reaction (monitored by TLC) ethanol was removed under reduced pressure, the mixture was poured in to ice cold water, acidified with dilute HCl, Extracted with ethylacetate and concentrated, the crude product was crystallized from hexane.

Yield: 76 %; Mp 110–112 °C; ¹H NMR (400MHz, CDCl₃): δ 14.42 (s, 1H), 7.76 (d, J = 1.2 Hz, 2H), 7.52 (d, J = 8.8 Hz, 2H), 6.89(d, J = 8.8 Hz, 2H), 6.07 (d, J = 2.4 Hz, 1H), 5.93 (d, J = 2.4 Hz, 1H), 3.87(s, 3H), 3.81 (s, 3H), 3.79(s, 3H); ¹³CNMR (100 MHz, CDCl₃): δ 192.5, 168.3,



162.5, 161.3, 142.3, 130.0, 128.32, 125.15, 114.37, 106.36, 93.91, 91.1, 55.77, 55.47, 55.34; ESI-MS: m/z 315 $[M + H]^+$; Anal. Calcd for $C_{18}H_{18}O_5$: C, 68.78; H, 5.77; O, 25.45; found: C, 68.69; H, 4.81; O, 38.14

3.2.4. Synthesis of 5,7,4'-trimehoxy flavones(6)

The chalcone (**5**) (2 g, 6.4 mmol) was suspended in DMSO (10 ml), catalytic amount of iodine was added and refluxed for 2 hours at about 160 °C. the reaction mixture was cooled and poured in ice water, extracted with ethyl acetate. The organic layer was washed with sodium thiosulphate, dried and purified by crystallization from ethanol.

Yield: 78 %; **Mp:** 153–154 °C; 1H NMR (400 MHz, $CDCl_3$): δ 7.98 (d, J = 8.8 Hz, 2H), 7.08 (d, J =8.8 Hz, 2H), 6.83 (d, J = 1.2 Hz, 1H), 6.65(s, 1H), 6.49(d, J =1.6 Hz, 1H), 3.89(s, 3H), 3.84(s, 3H), 3.82(s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 175.5, 163.5, 161.7, 160.2, 159.7, 159.1, 127.6, 123.0, 114.4, 108.3, 106.7, 96.1, 93.3, 56.0, 55.8, 55.4; ESI-MS: m/z 313 $[M + H]^+$; Anal. Calcd for $C_{18}H_{16}O_5$: C, 69.22; H, 5.16; O, 25.61; found: C, 68.98; H, 5.25; O, 38.29

3.2.5. Synthesis of 5,7,4'-trihydroxyflavone (Apigenin)(7)

A mixture of 5,7,4'-trimehoxy flavones (**6**) (1 g. 3.2 mmol) and pyridine hydrochloride was refluxed at 160-180 °C in oil bath for 5 hours. The mixture was added in ice cold water, extracted with ethylacetate, and purified by column chromatography (eluent chloroform: methanol, 9:1)

Yield: 82.4%; Mp: above 300°C; 1H NMR (90 MHz, DMSO): δ 12.8 (s, 1H, OH), 7.89 (d, J = 9.0 Hz, 2H), 6.93(d, J = 8.1 Hz, 2H), 6.63(s, 1H), 6.45(s, 1H), 6.16(s, 1H); ^{13}C NMR (400 MHz, $CDCl_3$): δ 181.68, 164.09, 163.72, 161.44, 161.12, 157.29, 128.39, 121.19, 115.93, 103.70, 102.3, 98.1, 93.92; ESI-MS: m/z 271 $[M + H]^+$; Anal. Calcd for $C_{18}H_{16}O_5$: C, 66.67; H, 3.73; O, 29.60; found: C, 66.48; H, 3.78; O, 29.74



3.2.6. General procedure for esterification of flavonoid (synthesis of flavonoid triester)

A mixture of 6 equivalent of the acid and excess thionyl chloride was refluxed at 80°C for 3 h then the excess thionyl chloride was removed under reduced pressure, subsequently dissolved in THF and added drop wise to the stirred solution of flavonoid and TEA in THF, the mixture was stirred at rt for 12 h, poured in water and filtered, the crude product was purified by column chromatography using eluent, hexane; ethyl acetate (9: 1)

5, 7-dioctadecanoyloxy-2-(4-octadecanoyloxy phenyl)-4H-chromen-4-one (8a)

¹H NMR (90 MHz, CDCl₃): δ 7.89 (d, 2H), 7.19 (d, 2H), 6.76 (s, 1H), 6.63 (s, 1H), 6.49 (s, 1H), 0.95(t, 9H, 3CH₃), 1.3(br, 90 H, 45 CH₂), 2.4 (t, 6H, 3OCOCH₂); ¹³CNMR (100 MHz, CDCl₃): δ 180.3, 171.8, 162.8, 162.1, 156.5, 156.1, 152.8, 128.9, 122.4, 122.2, 114.4, 101.2, 34.0, 31.2, 29.4, 29.3, 29.2, 29.0, 24.6, 22.8, 14.0

5, 7-dihexadecanoyloxy-2-(4-hexadecanoyloxy phenyl)-4H-chromen-4-one (8b)

¹H NMR (90 MHz, CDCl₃): δ 7.89 (d, Hz, 2H), 7.19 (d, Hz, 2H), 6.79 (d, 1H), 6.64 (s, 1H), 6.51 (d, J= 2.7, 1H), 0.81(t, 9H, 3CH₃), 1.2(br, 78 H, 39 CH₂), 2.4 (t, 6H, 3OCOCH₂); ¹³CNMR (100 MHz, CDCl₃): δ 180.1, 170.1, 163.8, 161.9, 160.2, 152.1, 150.8, 149.2, 128.3, 122.3, 112.1, 105.1, 34.0, 31.9, 29.6, 29.5, 29.4, 29.4, 29.2, 29.0, 29.6, 22.6, 14.1

5, 7-ditetradecanoyloxy-2-(4-tetradecanoyloxyphenyl)-4H-chromen-4-one (8c)

¹H NMR (90 MHz, CDCl₃): δ 7.86 (d, J = 9.0 Hz, 2H), 7.19 (t, J = 4.5 Hz, 2H), 6.79 (d, J=2.7, 1H), 6.66 (s, 1H), 6.51(d, J=1.8, 1H), 0.86(t, 9H, 3CH₃), 1.19 (br, 66 H, 33 CH₂), 2.27 (t, 6H, 3OCOCH₂); ¹³CNMR (100 MHz, CDCl₃): δ 181.2, 170.8, 164.8, 162.6, 157.4, 155.2, 151.9,



128.4, 121.4, 120.2, 114.4, 101.3, 34.2, 31.3, 29.4, 29.2, 29.1, 29.0, 24.5, 22.5, 14.2

4. Results and discussion

The mesophase formation of the synthesized compounds was examined by differential scanning calorimeter and polarising microscope.

The phase transition temperatures and associated enthalpies for the synthesized compounds shown in **Table 1** and **figure 1(a-d)**

Compound (8a)

2.78 mg of the sample was placed in 40 μ L Al pan and sealed. The compound was studied for differential scanning calorimetric data at a cooling rate of 10 $^{\circ}$ C/min in the temperature range of 30-200 $^{\circ}$ C, it exhibited two mesophases, First between the temperature 54.67-62 $^{\circ}$ C, enthalpy (ΔH) is 193 J/g, and the second mesophase between the temperature 66.93-80 $^{\circ}$ C, enthalpy (ΔH) is 8.343 J/g. (**figure 1a**)

Compound (8b)

2.64 mg of the sample (**8b**) was analyzed in the same way and it exhibited mesophase, between the temperature 62.35-67.5 $^{\circ}$ C, enthalpy (ΔH) is 227.2J/g. (**figure 1b**)

Compound (8c)

2.86 mg of (**8c**) analyzed, it exhibited two mesophases, First between the temperature 43.49-50 $^{\circ}$ C, enthalpy (ΔH) is 140 J/g, and the second mesophase between the temperature 55.87-73 $^{\circ}$ C, enthalpy (ΔH) is 8.347 J/g. (**figure 1c**)

Compound (8d)

2.31 mg of (**8d**) analyzed, it exhibited mesophase, between the temperature 43.71-48 $^{\circ}$ C, enthalpy (ΔH) is 141.1J/g. (**figure 1d**)

Table-1: DSC Thermographic data of compounds 8a-8d, DSC Q2000 V 24.1

compound	Transition temperature in °C crystal(K) mesophase(S1)	Enthalpy (ΔH) K-S1 J/g	Transition temp. in °C S1-Isotropic	Enthalpy (ΔH) S1-I J/mg
8a	54.67-62°C	193 J/g	66.93-80°C	8.343 J/g,
8b	62.35-67.5°C	227.2J/g		
8c	43.49-50°C	140 J/g	55.87-73°C	8.347 J/g
8d	43.71-48°C	141.1J/g		

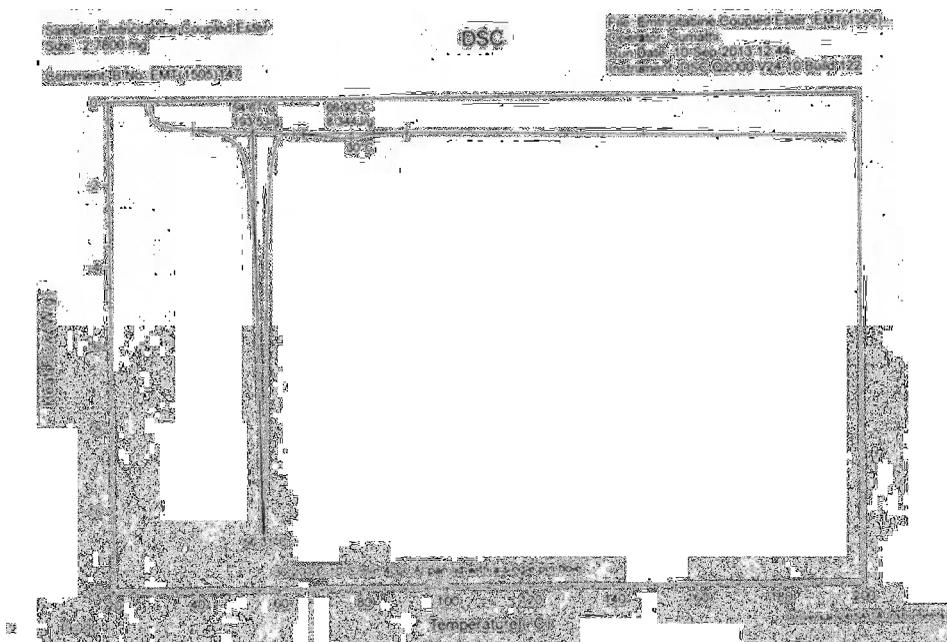


Figure 1a: DSC thermogram of compound 8a on cooling

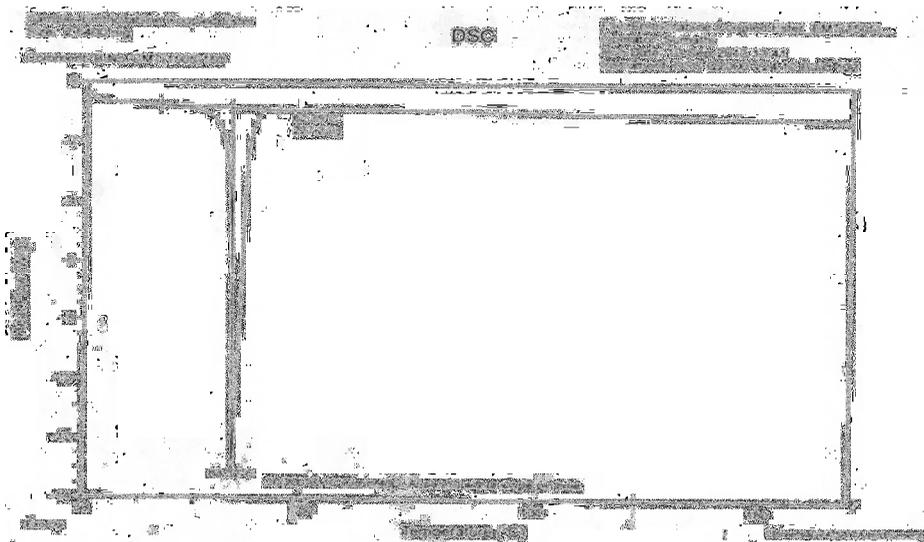


Figure 1b: DSC thermogram of compound 8b on cooling

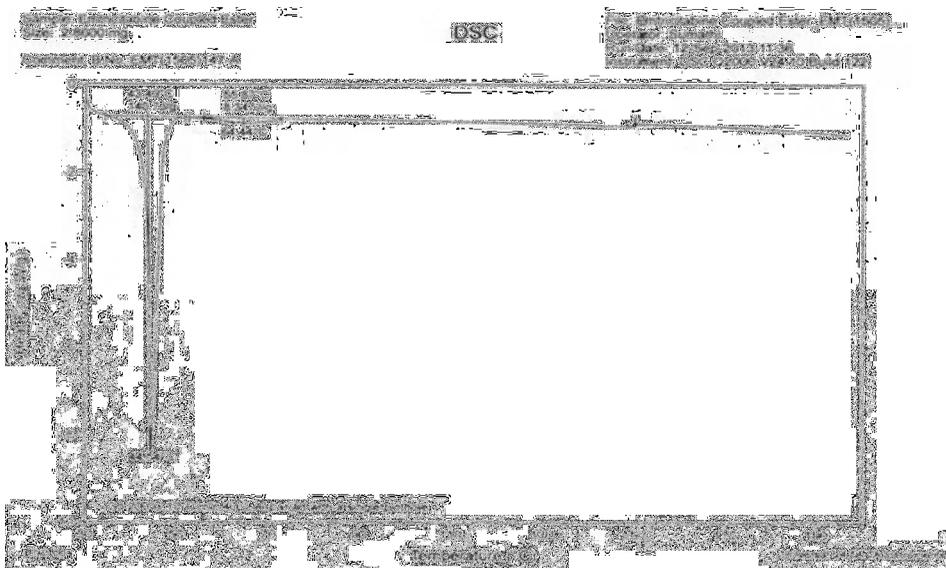


Figure 1c: DSC thermogram of compound 8c on cooling

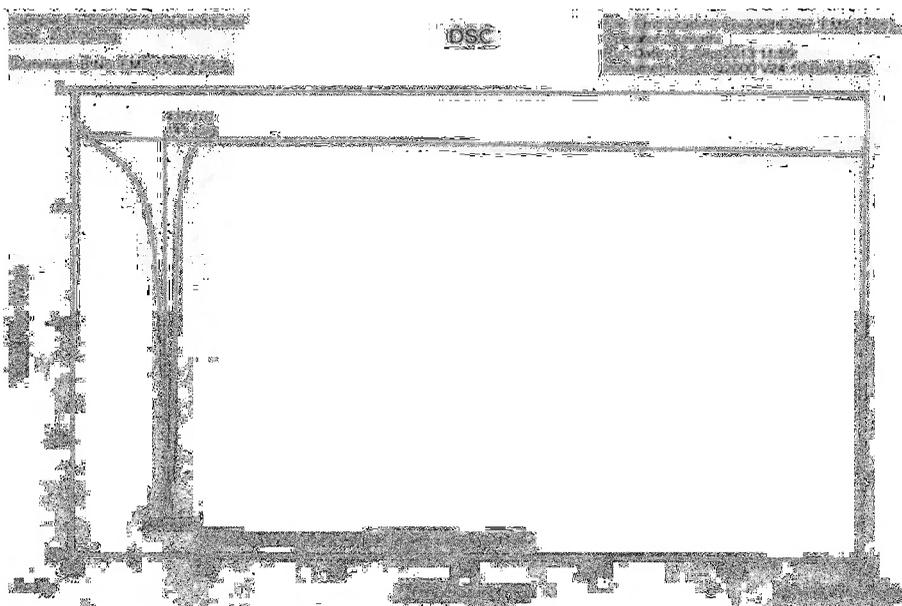


Figure 1d: DSC thermogram of compound 8d on cooling

5. Conclusion

All the synthesized compounds exhibited liquid crystalline properties. Two of the compounds (8a and 8c) exhibited two mesophases. All the compounds exhibited mesophase at lower temperature and they are potential for further study to explore room temperature liquid crystals.

References

1. G.-Y. Yeap, H. -C. Lee, W. A. Kamil Mahmood, C. T. Imrie, D. Takeuchi & K. Osakada, *Phase Transitions*, 2011, 84, 29–37
2. L. Petti, M. Rippa, A. Fiore, L. Manna, P. Mormile, *Opt. Mater.*, 2010, 32, 1011-1016
3. N. A. Shurpo, M. S. Vakshtein, and N. V. Kamanina, *Tech. Phys. Lett.*, 2010, 36, 54-59
4. Hoang M. H., Cho M. J., Kim K. H., Lee T. W., Jin J. I. and Choi D. H., *Chem. Lett.*, 2010, 39, 396



5. I. Tadwee, S. Shahi, V. Ramteke, I. Syed; International Journal of Pharmaceutical Research & Allied Sciences, 2012, 1, 6-11
6. F. Yuksel, D. Atilla, V. Ahsen, Polyhedron. 2007, 26, 4551-4556
7. B.-Y. Zhang, F.-B. Meng, M. Tian, W.-Q. Xiao, Reactive & Functional Polymers, 2006, 66, 551-558
8. I. A. Mohammed, G. Sankar, M. Khairuddean and A. B. Mohamad, Molecules, 2010, 15, 3260-3269
9. P. Kaszynski, A. G. Douglass, Journal of Organometallic Chemistry, 1999, 581, 28-38
10. S. H. J. Idziak, N. C. Maliszewsky, P. A. Heiney, J. P. McCauley, P. A. Sprengeler, and A. B. Smith, J. Am. Chem. Soc., 1991, 113, 7666-7672
11. J. Barbera, J. Jiménez, A. Laguna, L. Oriol, S. Pérez, and J. L. Serrano Chem. Mater., 2006, 18, 5437-5445
12. A. Grafe, D. Janietz, T. Frese and J. H. Wendorff, Chem. Mater., 2005, 17, 4979-4984
13. A.J. Leadbetter, in: G.W. Gray (Ed.), Thermotropic Liquid Crystals, Wiley & Sons, New York, 1987,
14. K.J. Toyne, in: G.W. Gray (Ed.), Thermotropic Liquid Crystals, Wiley, New York, 1987
15. C. Racles, M. Cazacu, M. Vasiliu, and V. Cozan., Polymer-Plastics Technology and Engineering, 2005, 44, 1049-1058.
16. B. T. Thaker, J. B. Kanojiya, and R. S. Tandel, Mol. Cryst. Liq. Cryst., 2010, 528, 120-137,
17. U. J. AL- Hamdani, M. A. AL-Ameen; Der Chemica Sinica, 2012, 3(6):1522-1529



18. G. W. Gray "Molecular Structure and the Properties of Liquid Crystals", Academic Press Inc., New York, 1962.
19. S.-T. Ha, T.-L. Lee, S.-L. Lee, S. S. Sastry and Y.-F. Win, Scientific Research and Essays, 2010, 5, 3018-3026,
20. Xin-Jiu Wang, Qi-Feng Zhou, liquid crystalline polymers, 2004.
21. Kumar S. Liquid Crystals: Experimental Study of Physical Properties and Phase Transitions. Cambridge University Press, Cambridge, 2001.



TEACHER EDUCATION IN THE WAKE OF GLOBALIZATION

Dr. (Mrs.) Vipinder Nagra

Assistant Professor

D.A.V. College of Education

Hoshiarpur

Introduction

At this great juncture of time which is tagged with rapid changes, the role and responsibilities of teacher is assuming new significance as well as becoming more and more critical. On the one hand, the changing global economy endorses for a teacher who is well versed and acquainted with knowledge and skills and on the other hand conversant with latest technologies and tools. They should also bear in mind that the new strides engulfing the globe demands for professional competence and commitment. To inculcate the desired qualities in them teacher education system is a powerful means. It is the teacher education system that generates not only quality human resources i.e., teacher educators and teachers but also provides them with effective physical resources. It is the quality teacher educators and teachers that play pertinent role in the upliftment of the educational standards of the country.

But truly speaking, the present scenario of teacher education depicts a contradictory status, that is, it has failed to attain the required quality standards. The policies followed by them had become obsolete and demands for changes and modifications to be made in accordance with the high speed transformations. Although quality improvement in teacher education system has been highlighted by various committees and commissions and particularly by NCTE, AICTE etc. but still the state is not praiseworthy. The reason can be attributed to the fact that there is lack of strong commitments, lack of willingness and eagerness to change, indifferent approach insurgency etc. The educational planners, policy makers and teacher educators



have to introspect so as to mitigate the maladies afflicting the teacher education system. They are left with no choice then to set new aims and objectives to fulfill the mission of quality – quality in teacher education institutions and its products. It thus, becomes necessary to revolutionize the teacher education system before it is too late. In the context of globalization, following major dimensions of teacher education system needs restructuring and reorganization to meet the future challenges.

Teacher Educator

Teacher education institutions have created multiple barriers in the quality development of teacher educators by following faulty selection and recruitment methods, creating job insecurity, providing relatively low salaries and incentives, creating inhospitable and sometimes dangerous work environments, providing no or improper infrastructure facilities, inadequate advancement opportunities, lack of in-service training, lack of financial, government and above all public support. As a result of these flaws majority of the efficient teacher educators are shifting towards other professions and some they are leaving the country in search of better job opportunities and incentives. If this state continues then time is not far away when we will find complete deterioration of the teacher education system.

- The need of the hour is to attract and retain competent and committed teacher educators to face the challenges of global economy. In this regard, recruitment of teacher educators in the institutions should be done objectively on the basis of merit taking care of their educational qualifications, teaching and research experience. Attention should be paid during selection that they should have cleared NET/SLET. Ph.D holders must be preferred. At the time of interview, their knowledge, command over subject matter, pronunciation of words, teaching skills must be thoroughly



checked. It must be ensured that the selection and recruitment should be according to the norms of University, UGC or NCTE. To check their competency level, situational test in the form of actual teaching must be taken and even language speaking test can be taken. Subjectivity and favoritism should not be given any space as that can lead to faulty recruitment which will be deleterious for the institution and even the country. They will fail to stand and stay ahead in the competitive era.

- Even the pay scales, service conditions and performance incentives are not commensurate with their social status and professional responsibilities. They draw meager salaries even less than that of the peon and daily wagers. To facilitate the teacher educator in discharging his/her duties effectively the salary package for them should illustrate the critical importance of the teacher educator as an active frontline change agent. A performance based emolument criteria, incentives and grievance-removal mechanisms for teacher educators throughout the country should be implemented. Objectivity in the service conditions with respect to postings and transfers will be an effective step to tackle the crisis of teacher placement in rural and distant areas. Opportunities in the form of advanced training, formal recognitions and promotions to higher grades can be given. Attractive packages of support including transport and residential options can also be provided as incentive.
- The global challenges also demands to iteratively integrate measures which address competence, motivation and opportunities among teacher educators. They should be given extensive learning opportunities to innovate, devise appropriate methods of communication and fully engage in the change and reform activities to equip themselves with new theories of learning. Information and Communication Technology (ICT) has come up as a new technology that has to be used frequently as a teaching learning resource. High



percentages of teacher educators, frankly speaking, are ignorant and phobic about this technology. They have to be well informed, trained to use the computer, internet, WWW services, CD ROMS etc. in their class room teaching. In this regard, all pre-service and in-service teacher education programmes can foster motivation and inculcate desirable competencies of being ICT literates in them. Refresher courses, seminars, conferences, workshops, extension lectures, extensive library facilities, etc. can facilitate them with new approaches and methods of teaching, skill inculcation techniques (manipulative, communicative as well as analytical skills) and also can train them to use various assessment or diagnostic tools. In some cases, the teacher educators are themselves reluctant to attend such courses and if they do they do attend under compulsion. These opportunities can do wonders if they are incorporated with autonomy. Along with this, facilities to enhance coordinated and intensive research efforts through proper support services from NCTE, UGC or NCERT can make the teacher educators competent with the future advancements.

Physical Infrastructure

Maximum colleges of education in the country are not in a position to even provide necessary resources to the teacher educators. An average institution do not even fulfill the demand of a single table and chair for the teacher educator and what to talk about providing separate provision of a cabin or room. There is lack of proper building, office room, reading room facilities, sports room, common room, library room with computer facilities and well equipped laboratories mainly ICT laboratories. Although institutions are being scrutinized by NAAC but the institutions find many temporary ways to boast for the availability of quality human as well as physical resources. The mushrooming growth of teacher education institutions are more inclined to money generation than quality generation.



- To foster quality in teacher educators, necessary resource allocations have to be first of all improved by following a systematic trend exercise to detain evidence on allocation patterns and inform policy. New resource templates have to be designed and even the financing requirements for this critical area of human resource development have to be revised. Such an exercise can be undertaken jointly with interested development partners who are willing to provide financial alignment to this area. A proper earmarking of budget provisions is the priority to provide minimum if not maximum infrastructure in the form of proper building equipped with all the necessary resources and equipments.
- Along with the budget allocation, the second priority should be proper accreditation of the teacher education institutions for quality assessment. The National Council of Teacher Education provides the necessary resources and capability to accredit institutions of teacher-education and provide guidance regarding curricula and methods. Through appropriate techniques these agencies can uplift the quality of teacher education by developing desirable competencies in them. The haphazard establishment of teacher training colleges should be checked thoroughly on quality norms to ensure effective utilization of funds. Networking arrangements has to be created between institutions of teacher education and university departments of education for proper sharing of resources.

Instructional Material

It's unfortunate to mention that proper instructional material is not available in the teacher training colleges and if by chance it is available it is found to be generally obsolete. Teacher educators and student teachers generally get books and reading material that contains



outdated data. Even there is no regular subscription for the journal, reference books and encyclopedia. Curricula taught to them contains those topics that has no relevance with the current trends and lack skill orientation. Even the examination and evaluation norms are overlooked and are of poor standards. Teacher educators are more inclined in giving note dictation to the pupils and very few of them use demonstration or experimentation method. The reason can be attributed to the fact that they themselves lack the proper skill of teaching which is generally ignored at the time of their recruitment. Another reason can be non availability of proper infrastructure.

- In this computer age, the stress should be on the instructional material that is compatible with information technology. There should be provision of computers with internet facility, CDs, video packages, on-line library facilities, audio-visual aids, OHP, transparencies, printers, zerox machines etc. The availability of these materials can help teachers to use them and become literate and confident to establish links at the international level.
- The subjects taught should be changed for instance, there is need to teach topics that are related with the applied aspect of teacher education or training. The methodology should incorporate audio/video materials, group or panel discussions, and even brain storming techniques. Tele conferencing mode can also be substituted as a part of effective teaching learning discourse. Curricula developed and revised must incorporate those subjects and topics that has practical utility and trains the perplexed student teachers to confront the issues emerging at a high pace. There should be integration of theory and practice as well as content and pedagogy in the curriculum. An open, participative and data-based monitoring and evaluation process



can bring about dynamic changes in the implementation of need based instructional material.

Apart from this, The National Council of Teacher Education (NCTE), The National Council of Educational Research and Training (NCERT), The State Council of Educational Research and Training (SCERT), District Institute of Education (DIET), Council of Teacher Education, and other Non- Government Organizations etc. can coordinate among themselves to provide and fulfill all the necessary requirements to meet the global challenges.

Conclusion

Last but never the least, its high time for us to wake up and do the needful to fulfill the emerging needs of the society. But it will be a mere Utopia until and unless policies are revamped and reorganized both at micro and macro level to keep moving towards the destined goal. Therefore, to make it a relevant tool in consonance with the changes, it becomes imperative to revitalize and strengthen up this important factor of Human Resource Management through appropriate education and training programmes. Thus, a paradigm shift in teacher education has become the need of the hour.

References

1. Hooda,R.C.,Nivedita, Kumar,R. (2009). Higher Education In New World Trade Order in the Age of Globalization- A Conceptual Study. University News, 47 (01), 25-29.
2. Mohanty Jagganath, (2003). Teacher Education. Deep and Deep Publication, New-Delhi.
3. Talesra, H.and Ruhela, S. (2001). Agenda for Action. Kanishka Publication, New-Delhi.



TRIBALS AND THEIR SOCIO-ECONOMIC AND POLITICAL INSTITUTIONS

Dr.V.Jarnardhana Rao Naidu
Principal
Government Degree College
Veeraghattam

The Indian political system which is committed to the values of democracy and constitutionalism has been providing an opportunity to the people of the Scheduled Tribes, besides other sections of the society, to prove their ability in the political and electoral processes. After independence, various efforts were made to improve the socio-economic conditions of the tribals and to sustain the constitutional safeguards given to them. A number of commissions, committees, working groups or study teams were formed from time to time to evaluate the condition of the scheduled tribes. These study team reports, working group reports and similar other reports or discussions often guided and helped to reformulate the development strategy with reference to the tribals. Many programmes and schemes have been initiated by the government during the different plan periods. An attempt is made in this chapter to examine socio-economic and political conditions of Tribals in India and their institutions.

India has one of the largest concentration of tribal population in the world. They constitute more than 8.20 per cent of the population of the country according to 2001 census. There are about 636 tribes and sub-tribes in different parts of India. They speak about 105 languages and 225 subsidiary languages. They are scattered along the length and breadth of the country. The tribals in India are classified on the basis of language, race, culture, economy, geographical distribution, etc. Ethnologists have classified tribes of India into four major groups. The tribes of Eastern India belong to the



mongoloid ethnic stock; the tribes of Bihar and Orissa being proto australoids; the tribes of western and central Himalayas being Mediterranean Nordic; and the tribes of South India who have strain of Australoid, Negroid and Alpine. The different tribal communities are found in most of the states of India. The most numerically strong are the Bhils of Madhya Pradesh, Maharashtra, Rajasthan and Gujarat and the smallest tribal community which is receiving considerable attention at the national level is the great Andamanese.

Some of the large tribal communities are distributed in a wide region and often profess varied occupations. Again, a few tribal groups are divided into a number of sub groups which are practically distinct tribal groups. In many cases some distinct tribal groups have identical names. Besides these, the scheduling of tribes has also created a problem as in many cases, a tribe may be scheduled in one state and not so in another state. For all these reasons, any classification needs careful endeavour. Still it can be said that the tribal communities belong to different racial stocks, speak languages of different families and show considerable variation in their basic economy.

Though the tribal communities are distributed in most of the states of India there are a few concentration points of regional distribution. Roy Burmon and Vidyarthi has suggested a more or less identical five-fold classification on the basis of regional distribution of the tribal population.² Dube and Atal have suggested a four-fold classification. Broadly, the tribals are concentrated in the following regions of India.³

North-eastern region : The tribes of Abor, Garo, Khasi, Kuki, Mismi, Naga, etc., who mostly belong to Mangolian racial stock, live in the mountain valleys and other areas of north-eastern India, covering



the States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura.

1. **Himalayan region:** The tribes like Depcha and Rabha live in the sub-Himalayan region covering parts of North-Bengal, Uttar Pradesh and Himachal Pradesh.
2. **Central India Region :** Many tribal communities like the Bhumj, Gond, Ho, Oraon Munda and Santhal mostly belonging to Proto Australoid racial stock live in the older hills and Chotanagapur plateau, along the dividing lines between peninsular India and the Indo-Gangetic basin covering the States of Bihar, Orissa, Madhya Pradesh and West Bengal.
3. **Western Indian Region :** A number of tribal communities live in western region covering the states like Rajasthan, Maharashtra, Gujarat, Goa, Dadra and Nagar Haveli. The most important of them being the Bhil, racially belonging to the proto-australoid group.
4. **Southern India Region :** The tribes like Kota, Chenchu, Irula, Kadar, Kurumba, Toda etc., having Negrito, Caucasoid, Proto-australoid or mixed physical features. Live in Southern Region covering the states of Karnataka, Andhra Pradesh, Tamilnadu and Kerala in the Nilgiri hill and covering lines of the ghats.
5. **Island Region :** A number of small tribes like the Andamanese, Onge, and Sentinelese live in Island region covering Andaman, Nicobar and Lakshadweep islands. Baring Haryana, Jammu and Kashmir, Punjab, Chandigarh, Delhi and Pondichery, all other states and union territories have scheduled tribes population.



Some states have high concentration of tribal population whereas other states have a very low percentage of tribal population. States like Kerala, Tamil Nadu have very low concentration whereas states like Madhya Pradesh, Orissa, Nagaland have higher concentration of tribal population. The states of Orissa, Bihar, Madhya Pradesh, Andhra Pradesh, Maharashtra, Gujarat and Rajasthan have a sizeable concentration of Scheduled Tribes and collectively constitute about 79 per cent of tribal population of the country. The states which have major tribal concentration have been given in the following table.

Table 2.1
Major Tribal Concentrations

Name of the state	Total Tribal population in lakhs	% to the total population of the state
Madhya Pradesh	98.15	20.00
Orissa	50.75	23.10
Bihar	49.33	08.80
Gujarat	37.57	14.00
Maharashtra	33.41	05.90
Rajasthan	31.35	12.10

From the distribution of tribal population in different states and union territories a number of interesting features emerge. In a number of regions for example in Nagaland, the tribals constitute only 1.26 per cent of the total tribal population of India, but 83.99 per cent of the population of Nagaland, in Mizoram the tribals constitute 93.55 per cent of the population of Mizoram though having only 0.89 per cent of the total tribal population of India. Again there are a number of states with more tribal population but covering proportionately less percentage of population in the state. In Table 2.2 we have information about states where tribal population is the smallest in absolute numbers.



Table 2.3
Major Tribes of India

Name of the Tribe	States where mainly found
1. Bhil	Madhya Pradesh, Maharashtra, Rajasthan and Gujarat
2. Gond	Madhya Pradesh, Maharashtra, Andhra Pradesh, Gujarat, Orissa and Uttar Pradesh.
3. Santhal	Orissa, Bihar & West Bengal
4. Oraon	Bihar, Orissa and West Bengal
5. Mina	Madhya Pradesh and Uttar Pradesh
6. Munda	Bihar, Madhya Pradesh and West Bengal
7. Khonds	Orissa, Bihar, Andhra Pradesh, Madhya Pradesh

There are also tribes like the Andamanese with less than 50 individuals. It is quite likely that the development programmes and problems for the different tribal communities having various population strength would be different. Though the tribal population indicated an increase higher than the national average, that is not a general trend among all the tribal communities. In fact among a number of small or very small tribes, the most important question is the survival of the group.

There are 7 major tribes in India they are (1) Bhils, (2) Gonds, (3) Santhals, (4) Oraons, (5) Minas, (6) Mundas and (7) Khonds.

The Bhils:

The Bhils constitute the largest tribal group in India. They are also known as the Bhilala and the Bhil Garasia. They have been specified as the Scheduled Tribe in the States of Madhya Pradesh, Maharashtra, Andhra Pradesh, Gujarat, Karnataka, Rajasthan and



Tripura¹. The main concentration of the Bhil population is in West Madhya Pradesh comprising the districts of Jhabua, Dhar, Kragoon, Khandwa Ratlam and the East Gujarat districts of Panchamahar, Dang, Bharuch, Sabarkantha, Banaskantha and the South Rajasthan district of Dungarpur, Banswada and Udaipur. Thus, there is a contiguous belt of the Bhil population running across the areas of three States of Gujarat, Madhya Pradesh and Rajasthan. These areas have also been specified as Scheduled Areas under the Fifth Schedule of the Constitution.

The Bhils is one of the ancient tribes. We come across many references to it in the ancient vedic and Epic literature. The term 'Bhil' appears to have been derived from a Dravidian Word 'Bheel' meaning an arrow. In Tamil the word 'Bil' means a bow. The term also signifies their vigour and alacrity. The Bhils are excellent bowmen and their arrows fly straight. A Bhil boy, Lalji from Rajasthan stood first in the All India Rural Archery competition held in February 1980 at Coimbatore (Tamil Nadu). Excellence in bowmanship of a famous Bhil Ekalavya of the Mahabharata fame is well known. He mastered archery by practising in front of the idol of Dronacharya after the great sage refused to teach him. As a devoted and loyal pupil he later on cut off the thumb of his hand to offer it as a gurudakshina to his Guru, and still commanded excellent mastery over archery with his left hand.

The Bhils are a martial race. They had their kingdoms of Dungarpur, Banswada and Pratapgarh in Rajputana. The State of Kota was also established by a Bhil chief. Subsequently, they were subjugated by the Rajputs. It was a custom in the old states of Dungarpur, Banswada, Deolia (Pratapgarh) and also Kota on the part of the Bhil Chiefs to put thumb marks in blood on the foreheads of the Rajput kings on the occasion of their coronation. That custom symbolized forceful seizure of power by the Rajputs from the Bhils. In



Gujarat and Madhya Pradesh also Bhil's chiefs were rulers at several places.

2. The Gonds:

The Gonds are the second largest tribe in the country and are believed to belong to the Dravidian stock. They have been specified as the Scheduled Tribe in the States of Madhya Pradesh, Andhra Pradesh, Maharashtra, Bihar, Gujarat, Karnataka, Orissa and West Bengal. The Gonds are concentrated in the Central region popularly known as Gondwana which includes the Satpura Plateau, a portion of the Nagpur plain area and the Narmada valley. The main districts in Madhya Pradesh having significant Gond population are Bastar, Bilaspur, Sarguja, Chhindwara and Mandla. In Maharashtra, the Gonds are found in the districts of Chanda and Yeotmal. In Andhra Pradesh their main concentration is in the districts of Adilabad, Karim Nagar and Warrangal. In Maharashtra, Madhya Pradesh and Andhra Pradesh, a section of the tribe was also known as Raj Gond. The term Raj Gond, was widely used in 1940's but has now become almost obsolete, probably because of the political eclipse of the Gond Rajas. The kingdom of the Gonds was once spread over Old Central Provinces and Barar covering the Districts of Chhindwar, Mandla, Chanda, Adilabad and Warrangal. The Deogarh dynasty of Chhindwara and the Kheria dynasty of Warrangal were well known and enjoyed an independent ruling status for a considerable time until they were overthrown by the rise of the Marathas. The rulers of Chanda in Maharashtra were very powerful till 1749. Their dominion included a large part of Adilabad district of Andhra Pradesh. A number of princely states in Chhattisgarh region were ruled by the Gond Rajas till 1947. After Independence these were merged with the State of Madhya Pradesh.



The Gonds are divided into exogamous sects and clans. They do not marry in their own sect. Each clan worships its own deity described as persapan. The important village functionaries who play important role in the worship of clan deities and performance of rituals are phardangs, bards and chroniclers. In Bastar and other adjoining areas, Baradeo is an important deity.

The literacy among the Gonds is low. Due to low literacy rate, the representation of the Gonds in Government and semi-Government services is not commensurate with their population. Low literacy is one of the important factors attributing to their exploitation. The Gonds generally speak Gondi dialect. They also speak Chhattisgarh and other local dialects. The Gondi language belongs to Dravidian family of languages and is considered to be closer to Tamil.

3. The Santhals:

The Santhals, like the Bhils are believed to belong to the 'pre-Aryan' period. They are the third largest tribe of India. They have been specified as the Scheduled Tribe in the states of Bihar, West Bengal, Orissa and Tripura. The Santhal concentration in the three states of Bihar, West Bengal and Orissa is spread over a contiguous belt. This stretch is also coterminous with scheduled areas in the States of Bihar and Orissa. The Santhal in Bihar, constitutes about 37 per cent in Orissa, 9 per cent and in Tripura, 0.50 per cent. The Santhals speak Santhali language which has its own script known as Olchiki. They are generally bi-lingual. Apart from speaking their Santhali mother tongue they also speak Oriya in Orissa, Bengali in Bengal and Hindi in Bihar.

4. The Minas:

The Minas have been specified as the Scheduled tribe in the states of Rajasthan and Madhya Pradesh. In Rajasthan they are the largest tribe constituting about 50 per cent of the total tribal



population of the State. In Madhya Pradesh, the Minas have been specified as the Scheduled Tribes.

The Minas of Rajasthan were a ruling tribe. They have several large and small kingdoms and chieftainship in erstwhile Rajputana. They had a power to reckon with. Loss of their power is a matter of long history which begin with a treachery of a fugitive Rajput and ended with British Government declaring them a criminal tribe. They were harrassed to such an extent that their entire socio-economic fabric was completely shattered. The Government of India, in consideration of their educational, economic and political backwardness, provided them Constitutional protection by declaring them as Scheduled Tribe.

5. The Oraons:

The Oraons are believed to belong to the Dravidian stock. They generally speak Kurukh language. They have been specified as the Scheduled Tribe in the States of Bihar, Madhya Pradesh, Maharashtra, Orissa and West Bengal.

In Bihar it was about 12.14 lakhs, in Madhya Pradesh 5.44 lakhs, in West Bengal 5.36 lakhs and in Orissa 1.65 lakhs. In Bihar they are mainly concentrated in Chhotangapur area covering the districts of Ranchi, Lohardaga, Gumla, Palamau and Dhanbad. In Madhya Pradesh they are found mainly in Sarguja and Raigarh districts. In West Bengal the main districts having Oraon tribal population are Bankura, Midnapore, Purulia, Jalpaiguri and 24 Parganas. The Oraons mainly depend on agriculture and are believed to have first introduced plough cultivation in the Chhotanagpur Plateau. Recently there has been decline in the percentage of the Oraon cultivators which indicates a disturbing trend.

The marriages among the Oraons are generally with the mutual consent of a boy and a girl. However, the parents arrange the ceremonies including the bride price. The marriages are performed by



their own priests known as Pahan. Pahans and Mahats are important village functionaries. They derive authority from their ritual status and by dint of their seniority in the hierarchy of lineage elders. A bachelor is debarred from being selected as a Pahan.

6. The Mundas:

The Mundas are one of the ancient tribes and are believed to belong to the Kolarian stock. They have been specified as the Scheduled Tribe in the states of Bihar, Madhya Pradesh, Orissa, Tripura and West Bengal. In Bihar, they are mainly found in the Chhotanagpur region, in the districts of Ranchi, Singhbhum, Gumla and Lohardaga. In Orissa they are found in Sundergarh and Sambalpur and in West Bengal in the districts of Jalpaiguri, Midnapore, West Dinajpur and 24 Parganas.

About 62 per cent of the total Munda population is concentrated in the State of Bihar.

Their main language is Mundari. In Mundari a Munda means a man of prestige and wealth. They also speak Hindi, Oriya and Bengali in their respective states. The literacy among the Mundas, as per the 1991 census, was about 20 per cent. With the spread of education the Mundas have taken to Government and Semi-Government jobs.

The Mundas are essentially agriculturist people. Initially, the ownership of land was on community basis. They cleared the virgin forests for their cultivation and the land became their Khuntkatti. Such lands were rent free. In due course, various other forms of land tenure system known as 'Utakar, Chattisa', etc. emerged in which the rent was paid only for the year in which the land was cultivated.

7. The Khonds:

The Khond tribe is believed to belong to the Dravidian stock. They have been specified as the Scheduled Tribe in the States of Orissa,



Bihar, Andhra Pradesh, Maharashtra, Madhya Pradesh and West Bengal. In Madhya Pradesh and Maharashtra they are known as the Khonds or Kandhs and in Andhra Pradesh as the Kondhs. The Khond tribe is predominantly found in Orissa especially in the districts of Kalahandi and Koraput.

The Khonds are very simple and speak the Kondhi dialect. However, most of them understand Oriya also. Earlier the Khonds led a nomadic life and subsisted on roots and fruits. But now they have settled down in plains as well as on the hills. They are mainly agriculturists. The Kutiya and Dongaria, Khonds practise shifting cultivation which is known as Poduchas. Those Khonds who do not own land mainly work as labourers. Their agricultural technology is very crude and old. Their economy is mainly agro-forest based. They grow maize, millet, paddy and pulses. Their main crop is turmeric. In Khond areas the barter system is still prevalent. Weekly haats serve as their bartering centres where they exchange items of their daily needs with agricultural and forest produce.

The traditional tribal village organisation of the Khonds was fairly strong. The head of the village was called the Gontia. But now in most of the villages there is no Gontia. His place has been taken by a sarpanch of the village panchayat who is elected by the villagers and he settles most of the village disputes. The Khonds are generally animist. But they believe in the Supreme being as the creator of the universe, called Burapenu, the god of light or Belapenu, the Sun god. The Khonds are mostly monogamous but some of them practise polygamy. They do not marry within their own Kuda or Bons (Gotra). Bride price is very common. Arranged marriages are generally preferred. In some areas in institution of bachelors' dormitory still exists though, it is gradually dying out. The Khonds are generally fond of drinking Mahua liquor. They are also fond of joint dancing by males and females. The



Khond festivals are related to the cropping operations. Fiabanand falling in September/October is a festival on which new rice is cooked.

References:

1. Census of India 2001, India Population Profile and Key Indicators, Directorate of ensus Operations, Andhra Pradesh, Hyderabad.
2. B.K. Roy Burmon, 'National Movement Among the Tribes', in K.K. Gangadharam (ed.), Indian National Consciousness : Growth and Development, Kalamkar Prakasan, New Delhi, 1972, pp. 25-26.
3. L.P. Vidyarthi (ed.) , The Tribal Culture of India, Concept Publishing Company, Delhi, 1977, pp. 15,16.



SPECIATION OF TERNARY COMPLEXES OF CA(II), MG(II) AND ZN(II) WITH L-ASPARAGINE AND L-GLYCYLGLYCINE IN ETHYLENE GLYCOL-WATER MIXTURES

Bogi Srinu
School of Chemistry
Andhra University
Visakhapatnam

Dr.B B V Sailaja
School of Chemistry
Andhra University
Visakhapatnam

Introduction

Calcium is an important component of a healthy diet and a mineral necessary for life. Calcium is present in the animal's skeleton, teeth, egg shell and in the corals¹. Calcium plays an important role in human body, in building stronger, denser bones early in life and keeping bones strong and healthy later in life. Calcium deficiency leads to rickets and poor blood clotting. An overlooked source of calcium is egg shell²⁻³. Magnesium plays a role in the stability of all polyphosphate compounds in the cells, including those associated with ATP, DNA and RNA synthesis. Magnesium ions are required in hundreds of enzymes and present in every cell type in every organism. Different cell types maintain different concentrations of magnesium⁴⁻⁵ in animals and plants⁶⁻⁷. Magnesium deficiency in the body leads to asthma, diabetes and osteoporosis⁸. Zinc is a versatile ion as it can bind to different combinations of ligand types resulting in a broad range of stability, reactivity and functions. Thousands of proteins contain zinc⁹ and the structures of over 200 zinc-containing enzymes have been characterized¹⁰.

Asparagine is one of the 20 amino acids commonly found in animal proteins. The clinical use of L-asparaginase in the treatment of certain cancers¹¹⁻¹² is based on the degradation of L-asparagine, which is required for cellular proliferation¹³⁻¹⁴. A relationship of L-asparagine

and protein synthesis to the enzymes involved in RNA and DNA synthesis has been suggested by several studies¹⁵⁻¹⁶.

Glycylglycine is the best-known substrate for gamma-glutamyltransferase (gamma GT) and it has anticonvulsant activity because it can decrease the incidence and severity of seizures induced by L-methionine-RS-sulfoximine or electroconvulsive shock.¹⁷ Triorganotin (IV) derivatives of glycylglycine is used as anti-inflammatory and antimicrobial agents.¹⁸ It is used in the preparation of single stable hemodialysis and peritoneal dialysis solutions containing bicarbonate, calcium and magnesium. Bicarbonate with glycylglycine forms a buffer with a constant pH of 7.4 that prevents reaction with calcium or magnesium and the formation of insoluble carbonate salts. This bicarbonate-based solution is stable over long periods and can be used with the same simplicity and convenience as lactate solution for peritoneal dialysis in humans.¹⁹

Ethylene glycol is a protophilic dipolar protic solvent and acts as a structure former. Having two hydroxyl groups EG is distinctly different from monohydric alcohols. It is more acidic than water^{20, 21} due to electron withdrawing effect²² of CH₂ group. Very few studies have been reported in the literature on effect of dielectric constants in organic solvent- water mixtures.²³⁻²⁵ Hence, speciation studies of the title systems have been undertaken based on their involvement in various physiological reactions.

Results and Discussion

Chemical Speciation

The models containing different number of species were tested from the primary alkalimetric data. The stoichiometries and stability constants of the complexes formed were determined by trying various models for the title systems. The calculations were restricted to data obtained in a pH range where no precipitation occurred. The model



selected was that which gave the best statistical fit to and which was chemically consistent with the titration data, without giving any systematic bias in residuals. The ternary species detected were MLX, and MLXH for Ca(II), Mg(II) and Zn(II). The parameters of the best-fit models are given in Table 1. Low standard deviation (SD) in log values of overall stability constants ($\log \beta$) indicates the precision of the parameters. The small values of U_{corr} (sum of squares of deviations in the concentrations of metal, ligands and hydrogen ion at all the experimental points corrected for degrees of freedom) indicate that the models represent the experimental data. Small values of mean, standard deviation and mean deviation for these systems corroborate that the residuals are around a zero mean with little dispersion. The values of skewness recorded in Table 1 are between -1.64 and 5.09. These data indicate that the residuals form a part of normal distribution. Hence least-squares method can be applied to the present data. The sufficiency of the model was further evident from the low crystallographic R-values recorded.

Effect of Systematic Errors on Best-fit Model

Effect of errors on the stability constants of ternary metal complexes was studied on some representative systems by introducing errors explicitly in the concentrations of the ingredients (mineral acid, ligand, metal and alkali). The results (Table 2) emphasize that errors in the concentrations of alkali and acid affect more than other factors. With the introduction of errors, the standard deviations were found to increase, inferring the appropriateness of experimental conditions and correctness of analytical concentrations.

Effect of Dielectric Constant on Stability of Ternary complexes

Ethylene glycol(EG) is an amphiprotic and coordinating solvent. It is a structure former and it enhances the water structure in EG-



water mixtures. Hence it removes water from coordination sphere of metal ions, making them more reactive towards the ligands. As a result, the stability of the complexes is expected to increase. It is also a coordinating solvent and competes with the ligands for coordinating the metals. This decreases the stability of the complexes. Hence, the stability of complex is expected to either increase or decrease.

The variation of overall stability constant values or change in free energy with cosolvent content depends upon two factors, viz., electrostatic and non-electrostatic forces. Born's classical treatment²⁶ holds good in accounting for the electrostatic contribution to the free energy change. According to this treatment, the energy of electrostatic interaction is related to dielectric constant. Hence, the $\log \beta$ values should vary linearly as a function of reciprocal of the dielectric constant of the medium. The linear trend observed in the present study (Fig. 1) indicates that electrostatic forces are dominating the equilibrium process under the present experimental conditions. The linear increase in the stabilities of the complexes with $1/D$ confirms the dominance of structure forming nature of EG over its coordinating nature.

Stability of ternary complexes

The change in stability of ternary complexes as compared to their binary analogues was quantified²⁷⁻³⁰ based on the disproportionation constant ($\log X$) given by Equation 1.

$$\log X = 2 \log K_{MLX}^M - \log K_{ML_2}^M - \log K_{MX_2}^M \quad \dots (1)$$

This corresponds to the equilibrium



$$\log X_{MLXH} = 2 \log \beta_{MLXH} - \log \beta_{ML_2H} - \log \beta_{MX_2H} \quad \dots (3)$$

Under the equilibrium conditions one can expect the formation of 50% ternary complexes and 25% each of the binary complexes statistically



and the value of $\log X$ shall be 0.6^{31} . A value which is greater than this, accounts for the extra stability of MLX and MLXH.

The $\log X$ values are calculated from binary and ternary complexes using the equations given in Table 3. Various possible $\log X$ values obtained from these equations are given in Table 4. These values could not be calculated for some systems due to the absence of relevant binary species. In the present study, the $\log X$ values range from 6.14 to 30.82 for Ca(II), 7.78 to 29.84 for Mg(II) and 0.14 to 26.81 for Zn(II) and all values are found to be higher than those expected on statistical bases (0.6). These higher values account for the extra stability of the ternary complexes. The reason³² for the extra stability of these ternary complexes may be due to interactions outside the coordination sphere such as the formation of hydrogen bonds between the coordinated ligands, charge neutralisation, chelate effect and stacking interactions. The extra stability of ternary complexes makes them more amenable for metal transport. The less stable binary complexes make the metals bioavailable.

Effect of Influential parameters on stability constant

An investigation was made by introducing pessimistic errors in the influential parameters like concentrations of alkali, mineral acid, ligand and metal on stability constant. The results are given in Table 5. The order of the ingredients that influence the magnitudes of stability constants due to incorporation of errors is acid > alkali > Asparagine > Glycylglycine > metal. Some species were even rejected when errors were introduced in the concentrations. Rejection of species and increased standard deviations in the stability constants on introduction of errors, confirms the appropriateness of the chosen best-fit models. This study also indicates the relative sensitivities of model parameters.

Complex Equilibria and Distribution diagrams



MLX is increasing. For MLXH species is formed by protonation of MXH association with LH_2 (Equilibrium 10) and MLH association with XH_2 (Equilibrium 9). Based on the protonation and deprotonation equilibria of Asparagine and Glycylglycine, depending on the coordinating sites in the ligands, nature of the metal ions and basic coordination chemistry principles, the possible structures of the ternary complexes are proposed as shown in Figure 3.

Structures of Complexes

In aqueous solutions, Ca(II), Mg(II) and Zn(II) are coordinated by six water molecules $[\text{M}(\text{H}_2\text{O})_6]^{2+}$. Amino acids replace the coordinated water and form metal-amino acid complexes through carboxyl oxygen and amino nitrogen. Amino nitrogen can associate with a proton at physiological pH. Hence there is often significant competition between proton and metal ion for this donor site, resulting in the formation of protonated species. Depending upon the nature of the ligands and metal ions and based on the basic chemical knowledge tentative structures of the complexes are proposed as shown in Fig. 3.

Experimental

Materials and Solutions

Aqueous solutions of L-Asparagine (Qualigens, India), L-Glycylglycine (Qualigens, India), Ca(II), Mg(II) and Zn(II) chlorides (Qualigens, India) were prepared in triple distilled water by maintaining 0.05 mol L^{-1} hydrochloric acid concentration to increase the solubility. Ethylene glycol (Qualigens, India) was used as received. The strengths of acid and alkali were determined using the Gran plot method³³. To assess the errors that might have crept in to the determination of the concentrations, the data were subjected to analysis of variance of one way classification (ANOVA)³⁴.



Apparatus

ELICO-120 digital pH meter was used to perform alkalimetric titrations with varying compositions of EG (0.0-60.0% v/v) maintaining an ionic strength 0.16 mol L^{-1} with sodium chloride at $303.0 \pm 0.1 \text{ K}$. Amounts of L-Asparagine and L-Glycylglycine in the titrands are 0.250, 0.375 and 0.500 mmols. 0.05 mol L^{-1} Potassium hydrogen phthalate and 0.01 mol L^{-1} borax solutions were used to calibrate the pH meter. The glass electrode was equilibrated for several days in a well stirred EG-water mixture. Strong acid was titrated against alkali to check the complete equilibration of the glass electrode at regular intervals. The calomel electrode was refilled with EG-water mixture of equivalent composition of the titrand.

Procedure

For the determination of stability constants of metal-ligand ternary species, initially titrations of strong acid with alkali were carried out at regular intervals to check whether complete equilibration was achieved. Then the calomel electrode was refilled with EG-water mixture of equivalent composition as that of the titrand. Titrations with different metal-to-ligand ratios (1:2.5, 1:3.75, 1:5.0) were carried out with 0.40 mol L^{-1} sodium hydroxide.

Modeling Strategy

The computer program SCPHD³⁵ was used to calculate the correction factor. The stability constants of ternary complexes were calculated from the pH metric titration data using MINQUAD75³⁶, which exploits the advantage of constrained least-squares method in the initial refinement and reliable convergence of Marquardt algorithm. During the refinement of ternary systems, the correction factor, protonation constants of ligands and stability constants of binary complexes of metals with the ligands were fixed. The analytical concentrations of the ingredients are given in Table 2.



Conclusions

1. The species detected are MLX, and MLXH for Ca(II), Mg(II) and Zn(II) with Asparagine (L) and Glycylglycine (X).
2. The values of $\Delta \log X$ indicate that the ternary species have extra stability compared to the binary species, may be due to the interactions outside the coordination sphere, such as the formation of hydrogen bonds between the coordinated ligands, charge neutralization, chelate effect etc.
3. The linear increase in the stabilities of ternary complexes with decrease in the dielectric constant of the medium is due to the dominance of electrostatic forces.
4. The order of the ingredients that influence the magnitudes of stability constants due to incorporation of errors is acid > alkali > Asparagine > Glycylglycine > metal .

References

1. Weaver C.M., Heaney R.P., Shils M.E., Shike M., Ross A.C., Caballero B., Cousins R. J., (Eds) Modern Nutrition in Health and Disease. 10th ed. M.D. Baltimore: Lippincott Williams and Wilkins, 2006, 194.
2. Schaafsma A., Van Doormaal J.J., Muskiet F.A., Hofstede G.J., Pakan I. and Vander Veer E., Br. J. Nutr., 2002, 87, 267.
3. Rovenský J., Stancíková M., Masaryk P., Svík K. and Istok R., J. Clin. Pharmacol. Res., 2003, 23, 83.
4. Valberg L.S., Holt J.M., Paulson E. and Szivek J., J. Clin. Invest., 1965, 44, 379.
5. Iyengar G.V., Kollmer W.E. and Bowen H.J.M., The Elementa Composition of Human Tissues and Body Fluids, Weinheim, Verlag Chemie, NY, 1978.
6. Stelzer R., Lehmann H., Krammer D. and Luttge U., Botanica Acta, 1990, 103, 415.
7. Shaul O., Hilgemann D.W, De-Almeida-Engler J., Van M.M., Inze D. and Galili G., EMBO J., 1999, 18, 3973.
8. Vahrenkamp H., Chem. Unserer Zeit., 1988, 22, 73.



9. Vallee B.L. and Falchuk K.H., *Physiol. Rev.*, 1993, 73, 79.
10. Auld D.S., *Biometals*, 2001, 14, 271.
11. Hill, J. M., Roberts, J., Loeb, E., Khan, A., MacLellan, A., Hill, R. W. *J. Am. Med. Assoc.* 1967, 202, 882-888.
12. Oettgen, H. F., Old, L. J., Boyse, E. A., Campbell, H. A., Phillips, F. S., Clarkson, B. D., Tallal, L., Leeper, R. D., Schwartz, M. K., Kim, J. H. *Cancer Res.*, 1967, 27, 2619-2631.
13. Broome, J. D. *J. Exptl. Med.*, 1963, 118, 121-148.
14. McCoy, T. A., Maxwell, M., Kruse, P. F., Jr. *Cancer Res.*, 1959, 19, 591-595.
15. . Becker, F. F., Broome, J. D. *Science*, 1967, 156, 1602-1603.
16. . Mashburn, L. T., Gordon, C. S. *Cancer Res.*, 1968, 28, 961-967.
17. Samuels, S. Fish, I. Schwartz, S. A. *J. Neurochem.* (1983) 40, 1063.
18. Nath, M. Pokharia, S. Eng, G. Song, X. Kumar, A. *Eur. J. Med. Chem.* (2005) 40, 289.
19. Yatzidis, H. Dombros, N. V. and Digenis, G. E. *ASAIO J.* (1996) 42, 984.
20. Feakins, D. *Physico-chemical processes in mineral solvents*, Franks, F. (Ed.), Heinmann Educational Book Ltd., London; 1967.
21. Wells, C. F. *J. Chem. Soc. Faraday Trans I* 1975, 71, 868.
22. Basu-Mullik, I. N.; Kundu, K. K. *Can. J. Chem.* 1980, 58, 79
23. Devi, K. V. S.; Raju, B. R.; Rao, G. N. *Acta Chim. Slov.* 2010, 57, 398.
24. Rao, V. M.; Latha, M. P.; Rao, T. S.; Rao, G. N. *J. Indian Chem. Soc.* 2007, 84, 346.
25. Rao, G. N.; Murthy, V. L. S. N. *J. Indian Chem. Soc.* 2004, 81, 424.
26. M. Born, *Z. Phys.*, 1920, 1, 45.
27. Griesser, R. and Sigel, H. (1970) Ternary complexes in solution. VIII. Complex formation between the copper(II)-2,2'-bipyridyl 1:1 complex and ligands containing oxygen and/or nitrogen donor atoms. *Inorg. Chem.*, 9, 1238-43.
28. Griesser, R. and Sigel, H. (1971) Ternary complexes in solution. XI. Complex formation between the cobalt(II)-, nickel(II)-, copper(II)-, and zinc(II)-2,2'-bipyridyl 1:1 complexes and ethylenediamine, glycinate, or pyrocatecholate. *Inorg. Chem.*, 10, 2229-2232.



29. Sigel, H., Caraco, R. and Prijs, B. (1974) Ternary complexes in solution. XVI. Influence of the size of the chelate rings on the stability of mixed-ligand copper(II) complexes containing aliphatic ligands. *Inorg. Chem.*, 13, 462-465.
30. Sigel, H. (1975) Ternary Cu^{2+} Complexes: Stability, Structure and Reactivity. *Angew. Chem. Int. Ed. Engl.*, 14, 394-402.
31. Kida, S. (1956) Investigation on mixed complex I. Spectrophotometric study of mixed complexes formed by cupric ion and bidentate ligands. *Bull. Chem. Soc. Jpn.*, 29, 805-811.
32. Sakurai, T., Yamauchi, O. and Nakahara, A. (1976) Mixed ligand copper(II) complexes of α -amino acids with ligand-ligand interactions. *Bull. Chem. Soc. Jpn.*, 49, 169-173.
33. R. S. Rao and G. N. Rao, "Computer Applications in Chemistry", Himalaya Publishing House, Mumbai, 2005, 302.
34. B. B. V. Sailaja, T. Kebede, G. N. Rao and M. S. P. Rao, *Proc. Nat. Acad. Sci. India*, 2004, 74, 399.
35. G. N. Rao, "Complex equilibria of some biologically important metal ions in aquo-organic media", Ph. D. thesis, Andhra University, Visakhapatnam, India, 1989.
36. P. Gans, A. Sabatini and A. Vacca, *Inorg. Chim. Acta*, 1976, 18, 237.



EG % v/v	log β_{mlh} (SD)			pH- Range	NP	U_{corr} *10 ⁸	χ^2	Skew- ness	Kurt- osis	R-factor
	1110	1111								
Ca(II)										
0.0	11.29(19)	19.47(10)		1.8-8.2	37	2.35	7.57	-0.34	7.57	0.0058
10.0	9.61(37)	16.07(17)		3.2-7.5	19	2.97	4.44	-0.03	4.44	0.0051
20.0	14.53(42)	18.89(65)		2.8-8.2	56	2.12	34.07	0.15	34.07	0.0619
30.0	9.39(35)	16.13(51)		3.5-9.2	16	7.00	8.50	0.84	8.50	0.0231
40.0	14.43(51)	16.49(28)		2.1-8.4	28	19.41	29.14	-0.64	29.14	0.0484
50.0	12.14(63)	*****		2.8-8.0	25	5.77	24.32	0.88	24.35	0.1072
60.0	12.87(34)	16.17(26)		2.0-8.5	38	3.85	52.21	0.91	52.21	0.0451
Mg(II)										
0.0	13.54(15)	20.63(05)		1.8-8.0	40	2.76	20.73	-0.48	20.73	0.0065
10.0	9.07(17)	15.30(09)		2.4-9.0	22	2.43	7.27	-0.02	7.27	0.0130
20.0	14.01(62)	18.78(65)		2.8-8.2	56	3.98	34.07	0.15	30.08	0.0619
30.0	9.49(40)	16.33(58)		3.3-9.2	17	7.31	9.88	0.97	9.88	0.0256
40.0	14.03(36)	16.52(43)		2.1-8.4	28	3.29	29.14	-1.64	29.83	0.0484
50.0	12.53(80)	*****		2.8-9.6	27	2.29	46.07	0.92	46.66	0.1211
60.0	12.65(31)	16.45(36)		2.0-8.5	38	3.06	50.65	0.91	51.34	0.0451
Zn(II)										
0.0	9.16(20)	16.16(30)		1.8-7.5	36	8.75	38.33	1.47	38.33	0.0063



10.0	9.29(17)	15.44(65)		2.6-8.8	20	5.70	9.20	0.58	9.20	0.0141
20.0	10.24(35)	18.02(51)		2.7-10.0	24	3.41	30.80	5.09	30.80	0.0456
30.0	9.45(51)	16.13(79)		3.3-9.5	19	2.61	25.50	2.63	25.37	0.0346
40.0	9.46(70)	17.06(59)		2.9-9.8	23	6.16	32.72	3.02	32.10	0.0340
50.0	10.49(96)	*****		2.8-8.2	25	2.10	62.24	0.88	62.24	0.1310
60.0	9.42(87)	17.09(91)		2.8-10.5	29	3.63	61.66	0.98	61.66	0.0475

Table 1 Parameters of the best-fit chemical models of ternary complexes of L-Asparagine and L-Glycylglycine with Ca(II), Mg(II) and Zn(II) in EG-water mixtures. Temperature = 303K, Ionic strength = 0.16 mol L⁻¹



Table 2 Total initial concentrations of ingredients (in mmol) for mixed-ligand titrations in 0.0–60.0% v/v EG-water mixtures

% v/v	EG	Ca(II)		TM0	Mg(II)		TM0	Zn(II)		M: L: X
		TL0	GG		TL0	GG		TL0	GG	
		Asp	GG		Asp	GG		Asp	GG	
	00.0	0.2495	0.2510		0.2495	0.2510		0.2495	0.2510	1:2.5:2.5
		0.3742	0.3765	0.0879	0.3742	0.3765	0.0829	0.3742	0.3765	1:2.5:5.0
		0.4990	0.5020		0.4990	0.5020		0.4990	0.5020	1:5.0:2.5
		0.2500	0.2475		0.2500	0.2475		0.2500	0.2510	1:2.5:2.5
	10.0	0.3750	0.3712	0.0879	0.3750	0.3712	0.0829	0.3750	0.3765	1:2.5:5.0
		0.5000	0.4950		0.5000	0.4950		0.5000	0.5020	1:5.0:2.5
		0.2495	0.2475		0.2495	0.2475		0.2495	0.2475	1:2.5:2.5
	20.0	0.3742	0.3712	0.0879	0.3742	0.3712	0.0829	0.3742	0.3712	1:2.5:5.0
		0.4990	0.4950		0.4990	0.4950		0.4990	0.4950	1:5.0:2.5
		0.2500	0.2500		0.2500	0.2500		0.2500	0.2500	1:2.5:2.5
	30.0	0.3750	0.3750	0.0879	0.3750	0.3750	0.0829	0.3750	0.3750	1:2.5:5.0
		0.5000	0.5000		0.5000	0.5000		0.5000	0.5000	1:5.0:2.5
		0.2495	0.2500		0.2500	0.2500		0.2500	0.2500	1:2.5:2.5
	40.0	0.3742	0.3750	0.0879	0.3750	0.3750	0.0829	0.3750	0.3750	1:2.5:5.0
		0.4990	0.5000		0.5000	0.5000		0.5000	0.5000	1:5.0:2.5
		0.2495	0.2500		0.2495	0.2495		0.2495	0.2500	1:2.5:2.5
	50.0	0.3742	0.3750	0.0879	0.3742	0.3742	0.0829	0.3742	0.3750	1:2.5:5.0
		0.4990	0.5000		0.4990	0.4990		0.4990	0.5000	1:5.0:2.5
		0.2500	0.2495		0.2500	0.2495		0.2500	0.2495	1:2.5:2.5
	60.0	0.3750	0.3742	0.0879	0.3750	0.3742	0.0829	0.3750	0.3742	1:2.5:5.0
		0.5000	0.4990		0.5000	0.4990		0.5000	0.4990	1:5.0:2.5



Table 3: Calculation of log X values from overall stability constants.
 Equations for the calculation of log X

$\Delta \log X_{MLXH}$	=	$2\log \beta_{MLXH} - \log \beta_{ML2H} - \log \beta_{MX2H}$
$\Delta \log X_{MLX}$	=	$2 \log \beta_{MLX} - \log \beta_{ML2} - \log \beta_{MX2}$

Table 4: log X values of mixed ligand complexes of Ca(II), Mg(II) and Zn(II)-ASP and GG in EG-water mixtures calculated using binary constants and various possible equations given in Table 3

% v/v EG	MLXH	MLX		
Ca(II)				
00.0	25.72	8.32		
10.0	21.35	8.43		
20.0	27.15	18.53		
30.0	20.31	8.91		
40.0	30.82	18.70		
50.0	6.68	17.60		
60.0	6.14	19.60		
Mg(II)				
00.0	29.84	15.66		
10.0	20.24	7.78		
20.0	26.03	17.31		
30.0	27.34	13.66		
40.0	24.97	17.17		
50.0	13.72	8.98		
60.0	*****	25.34		
Zn(II)				
00.0	14.14	0.14		
10.0	14.69	1.99		
20.0	20.58	4.88		
30.0	16.70	3.34		
40.0	19.71	3.27		
50.0	26.81	14.57		
60.0	18.67	3.33		

Ingredient	% Error	log β (SD)		
		1110	1111	
	0	9.61(37)	16.07(17)	
Alkali	-5	7.75(68)	Rejected	
	-2	9.71(8)	16.14(19)	
	2	13.42(51)	19.46(37)	
	5	13.44(51)	19.45(37)	
Acid	-5	Rejected	Rejected	
	-2	14.06(66)	19.86(54)	
	2	10.17(21)	16.42(43)	
	5	9.08(27)	15.59(72)	
Asp	-5	12.98(47)	19.16(14)	
	-2	12.62(44)	19.11(32)	
	2	12.87(9)	19.05(29)	
	5	12.62(10)	19.00(28)	
GG	-5	12.76(47)	19.00(14)	
	-2	12.82(44)	19.05(32)	
	2	12.87(9)	19.06(29)	
	5	12.73(10)	19.09(28)	
Metal	-5	12.77(47)	19.16(14)	
	-2	12.87(44)	19.11(32)	
	2	12.73(9)	19.05(29)	
	5	12.62(10)	19.00(28)	

Table 5 Effect of errors in influential parameters on the stability constants of ternary complexes of Ca(II) with L-Asparagine and L-Glycylglycine in 10% v/v EG-water mixture

EG MIX

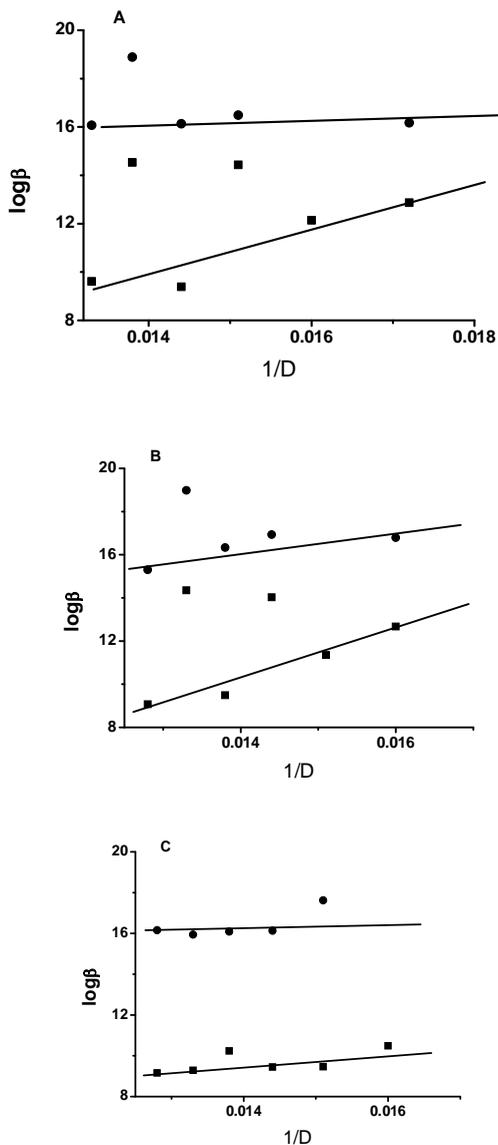


Figure 1: Variation of stability constants of ternary complexes with 1/D of EG-water mixtures (A) Ca(II) -(■)log β_{MLX}, (●)log β_{MLXH},

(B) Mg(II) $-(\blacksquare)\log \beta_{MLX}$, $(\bullet)\log \beta_{MLXH}$, and (C) Zn(II) $-(\blacksquare)\log \beta_{MLX}$, $(\bullet)\log \beta_{MLXH}$

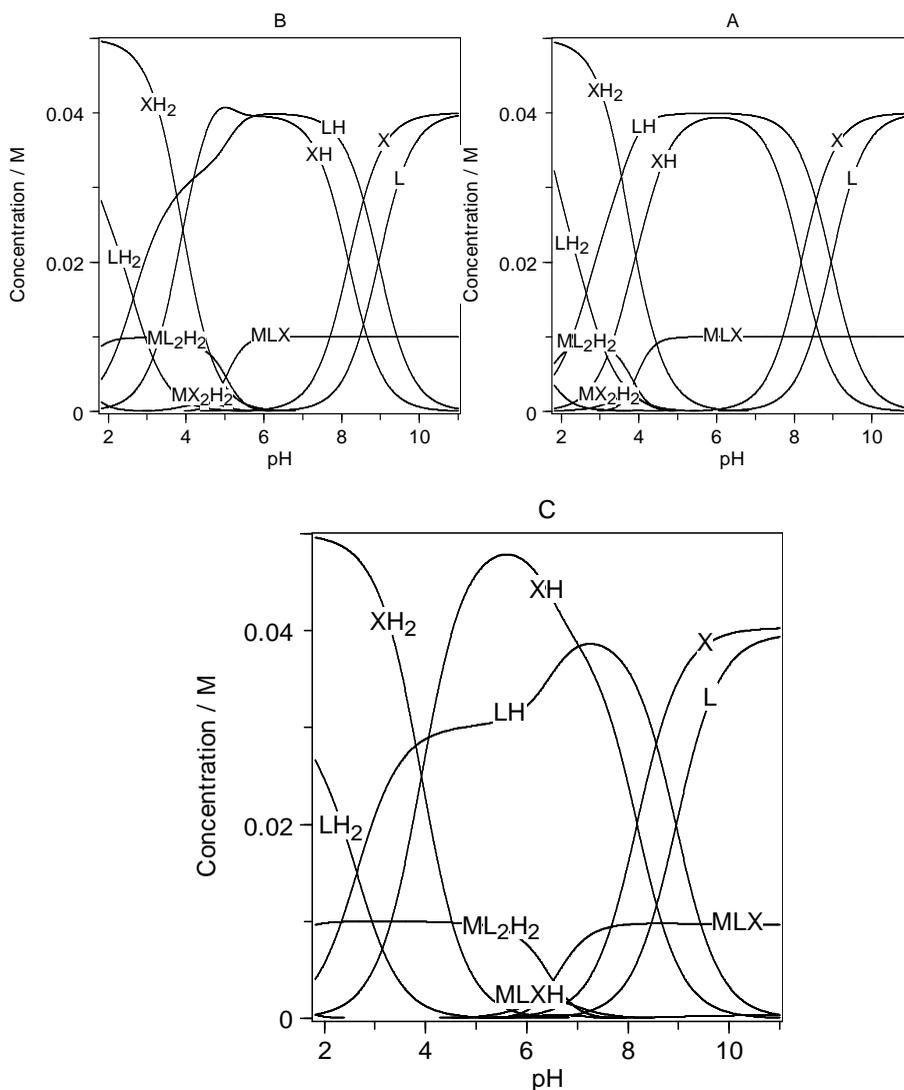
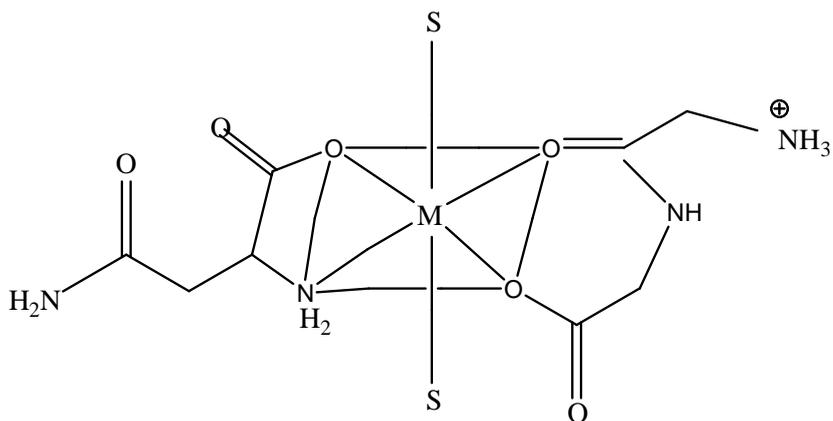
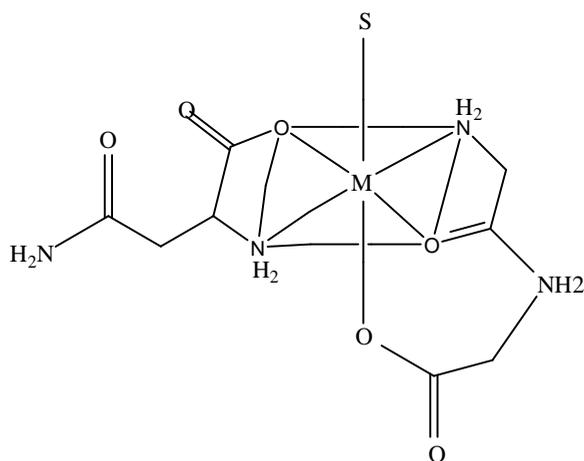


Figure 2: Species distribution diagrams of ternary complexes of L-Asparagine and L-Glycylglycine: (A) Ca(II), (B) Mg(II) and (C) Zn(II) in 20% EG-water mixture.



MLXH



MLX

Figure 3: Proposed structures of ternary complexes, where S = solvent or water; M = Ca(II), Mg(II) and Zn(II).



CONSUMER PERCEPTION ON AWARENESS AND PURCHASING BEHAVIOR OF PRODUCTS AT GIRIJAN COOPERATIVE CORPORATION

K.V. Nagaraj

Research Scholar
GIM, GITAM University
Visakhapatnam

Introduction

Consumer perception explains consumer behavior by analyzing motivations for buying or not buying a particular item or good at a particular time. There are three areas of consumer perception theory where the consumer perception can be applicable. These are: 1) Self perception, 2) Price perception and 3) Benefit perception. In these three areas, self perception means the individual opinions of the consumers on the goods or services base on satisfaction, price perception means opinions of the consumers on goods and services based on its price and benefit perception of the consumer determines the quality of goods and services. Hence, a marketing concept that encompasses a customer's impression, awareness and/or consciousness about a product or company or its offerings influence the consumers. Therefore, customer perception is typically affected by advertising, reviews, public relations, social media, personal experiences and other channels. The anticipated benefit from a consumer's perspective of a product or service. The customer perceived value stems from tangible, psychological and social advantages, and since it affects demand for a product, it needs to be taken into account when setting prices. In this context the consumer perceptions

Self Perception

Self perception theory attempts to explain how individuals develop an understanding of the motivations behind their own behavior. Self perception by customers relates to values and motivations that drive buying behavior -- which is also an important



aspect of consumer perception theory. For instance, a study by researchers at the University of Massachusetts at Amherst addressed how self perception shaped consumers' buying behavior. The study considered the question of whether consumers believed their buying decisions had a real effect on issues such as environmental impact. The researchers concluded that consumers' self perception was a driving factor in whether or not they placed a priority on socially conscious purchase and consumption practices. Consumers who viewed themselves as socially conscious tended to place more weight on issues such as environmental impact when making buying decisions than consumers who did not hold similar views of themselves.

Price Perception

While low prices leads to high demand of any product, quality of the goods is the most important factor to determine the perceptions of the consumers. Earlier researchers considered several factors, including price perception, whether consumers believed they were being charged fair prices, in determining whether purchasing of goods from organized stores or at unorganized outlets. The researchers concluded that price perception strongly influenced whether customers were satisfied with their purchases and whether they would make future purchases. Two factors that shaped price perception were the perceived quality of the merchandise or service in question and price comparisons with merchants offering similar merchandise or services.

Benefit Perception

At many times most of the consumers think before they purchase a product 'It is good', and 'it is good for you'. Many consumers are familiar with this phrase frequently associated especially with food advertising. May researchers from all over the world surveyed customers to determine how nutrition claims associated with food affected their perception of that food's nutritional value. They found



that consumers tend to reject general, unsupported claims of enhanced nutrition, especially concerning high nutritional value for foods that are traditionally viewed as unhealthy. The researchers also theorized that consumers would demonstrate a trend toward applying more scrutiny to nutrition claims and would demand more specific information about the foods they purchase.

Therefore, the consumer perception applies the concept of sensory perception to marketing and advertising. Just as sensory perception relates to how humans perceive and process sensory stimuli through their five senses, consumer perception pertains to how individuals form opinions about companies and the merchandise they offer through the purchases they make. Merchants apply consumer perception theory to determine how their customers perceive them. They also use consumer perception theory to develop marketing and advertising strategies intended to retain current customers and attract new ones.

Hence, before making any purchase decision, consumers always ask themselves what to buy, how to buy, where and when to buy, in how much quantity we should buy depends on the perception, self concept, social and cultural background and their age and family cycle, their attitudes, beliefs values, motivation, personality, social status and many other factors that are both internal and external to them. While buying, they also consider whether to buy or not to buy and, from which source or seller to buy. In some societies there is allow to affluence and, the societies can afford to buying rater quantities and at shorter intervals. In poor societies, the consumer can barely meet his barest needs.

Moreover the consumer perception is the study of how individual customers, groups or organizations perceive, buy, use, and dispose ideas, goods, and services to satisfy their needs and wants. It



refers to the opinion or response of the consumers in the marketplace and the underlying opinions for those actions. Here marketers expect that by understanding what causes the consumers to buy particular goods and services, they will be able to determine which products are needed in the marketplace, which are obsolete, and how best to present the goods to the consumers. Therefore, the present study of consumer perceptions on Minor Forest Products (MFP) available at Girijan Cooperative Corporation depots the perspective of role theory assumes that consumers play various roles in the marketing of these goods. Starting from the information provider, from the user to the payer and to the disposer, consumers play these roles in the decision process.

A basic difficulty of study on perceptions of the consumers on MFP at GCC is the lack of consensus on the definition of the terms. Debates over its definition and the underlying concept have been ongoing since the terms were coined (Neumann and Hirsch, 2000; Belcher, 2003; Pfund and Robinson, 2006). The term is associated with various concepts and objectives (e.g. ecological, cultural, or economic). Depending on the perspective, the scope and mode of production might be a more important criterion for defining NTFP than the attribute "non-timber". This might appear trivial, but it nevertheless reflects an ambiguity and confusion that inhibits progress in research and development on NTFPs (Belcher, 2003). The present study understands the terms to refer to goods of non-timber forest products origin from forests. A comparable definition is given by Chamberlain and Hammett (2002, p.16), who define MFPs as "produced from plants, parts of plants, fungi, and other biological material that are harvested from within and on the edges of natural, manipulated or disturbed forests." Accordingly, we include in our survey wooden products such as greenery, branches, and twigs used for decoration and mulches like brushwood. Declarations of the origin of MFPs are sometimes lacking, and sometimes a MFP is only one component among many others in a



product, as in herbal ointments or bath lotions. Thus for many products, consumers (and sellers) cannot clearly assess whether they are purchasing (and providing) MFP from forests. Therefore some statements of the participants may not be completely reliable.

Significance

The consumer behavior and buying habits play a crucial role in marketing strategies well as developing economies by creating demand for various goods and services of Girijan Cooperative Corporation. Particularly in a city like Visakhapatnam, which is a metropolitan atmosphere, goods of NTFP and MFP at GCC depots, marketing is considered as a potential instrument for creating effective demand and supply. The corporation while marketing its products and services has to understand the behaviour of the consumers. Through this they can better design and execute marketing strategies. A part from the well developed civilized society the underdeveloped or less developed societies like poor and middle class people are also a segment of the MFP market. The products and services of MFP marketed in the competitive atmosphere are catering the needs, wants and desires of the people. The behavioural pattern of various segments of the consumers influences the marketing strategies of the MFP. The corporation should deliver value based products for money in the process of discharging the marketing function in the society. Consumer behavior involves the psychological processes that consumers go through in recognizing needs, finding ways to solve these needs, making purchase decisions (e.g., whether or not to purchase a product and, if so, which brand and where), interpret information, make plans, and implement these plans (e.g., by engaging in comparison shopping or actually purchasing a product) sources of influence on the consumer. The consumers face numerous sources of influence on their purchasing behavior of various good and services determined to their perceptions.



Need for the study

The GCC, which was set up over five decades ago to procure minor forest produce and other products from the Girijans to prevent their exploitation by the middlemen, has now decided to adopt an aggressive marketing policy to increase the intake and offer better procurement price to the Girijans by widening its reach. The corporation has already entered into an agreement with the some state and central government outlets for supply of various products, mainly the most sought-after aloe vera soaps, rajma, white beans, and honey under the brand name 'Girijan'. These items from tribal pertaining to Minor Forest Produce (MFP) such as Tamarind, Turmeric, Gum, Honey, Brooms, etc., and with these goods products like cosmetics, herbals, etc. are manufacturing by the GCC and marketing through the corporation. While fixing these items price unilaterally, the corporation is considering the day-to-day perceptions of the consumers. In this system, consumer perception is the main thing to determine the marketing strategy and sales of the products. Hence, role of consumer perception may be the ultimate to determine the price to such items only and freedom may be given to the consumers to fetch price for their products. Therefore, there is a need to study on the perceptions of the consumers on products available at GCC. In this context the present study is undertaken GCC, Visakhapatnam as study unit and the customers of the MFP are the sample respondents whose perceptions on the products available at GCC considered for the present investigation.

Objectives

1. To study the perceptions of consumers on awareness of GCC products.
2. To study the perception of consumers on purchasing behavior of GCC products.



Methodology

The aim of the study is to analyse the perceptions of the consumers on awareness and purchasing behavior of GCC products, a pre-designed questionnaire was developed and collected data from 100 respondents. Random sampling method has been considered to collect data from the sample respondents who are the consumers of MFP available at GCC, Visakhapatnam. The GCC Visakhapatnam is famous for its activities of selling good which are produced and collected by tribals from forests.

In this context the researcher wants to acknowledge the empirical response of subjects, who are regular consumers of GCC products at the selected outlets in Visakhapatnam city, towards their awareness and purchasing behavior. In this connection the investigator has prepared pre-designed questionnaire to acquire the opinion based response from the consumers through statements relating to awareness and purchasing behavior on GCC products and their impact on its marketing strategies. The questionnaire is constituted with three areas and each area consisted with number of statements. The first one is personal details of the sample respondents where gender, age and occupation considered as independent variables and in the remaining two areas the first one is perceptions of respondents on awareness on GCC products and the second one is perceptions of respondents on purchasing behavior of GCC products. These two areas are considered as dependent variables and each one constituted with 10 statements. The statements in the dependent variables measured with Likert's five-point-scale method and the total score was considered for study the objectives. After computing the data the score of individual items tested with the SPSS software and results of each variable presented in the following tables.



Data analysis

In the part of investigation the researcher administered a perceptual study with a pre-designed questionnaire on the persons who are regularly attending the yoga and meditation practices in various centers in Visakhapatnam city. While the main objective of the study is to find out the perceptions of consumers on awareness and purchasing behavior of MFP at GCC, the data was collected and processed for results by applying t-test and ANOVA tests to achieve the results of awareness and purchasing behavior perceived by the respondents. Here the following tables present the tested results of the data.

Table-1: Distribution of sample consumers of GCC products

Independent variables	Gender	Frequency	Percent
Gender	Male	50	50.0
	Female	50	50.0
	Total	100	100.0
Age group	20-30 years	28	28.0
	31-40 years	34	34.0
	Above 40 years	38	38.0
	Total	100	100.0
Occupational status	Government employees	37	37.0
	Private employees	28	28.0
	Other	35	35.0
	Total	100	100.0

According to the table it shows that the investigator has taken equal samples from both male and females consumers of GCC products where 50 males and 50 females were considered in the present study.



The age-wise distribution of the respondents showed in the above tables indicates that more than one-third of the respondents have been covered in the age group of 31-40 years (34.0%) and above 40 years (38.0%) of age-groups. And the remaining samples are in the age group of 20-30 years (28.0%). The occupational distribution of the respondents who are coming to purchase GCC goods at outlets in Visakhapatnam city, 37.0 percent are government employees, 28.0 percent are private employees and 35.0 percent are others like retired persons, house-wives, students, professionals, etc.,.

Table-2: Gender-wise perceptions of the consumers towards awareness and purchasing practices of GCC products

Variables	Gender	N	Mean	Std. Deviation	Std. Error	t-value	p-value
Awareness of GCC products	Male	50	9.46	2.187	0.309	2.311*	0.023
	Female	50	8.46	2.140	0.303		
Purchasing practices of GCC products	Male	50	14.80	2.740	0.388	1.050	0.296
	Female	50	14.26	2.389	0.338		

*Significant at 5% level.

The perceptions of the respondents on awareness and purchasing behavior of GCC products indicate from the above table that the average awareness of male towards GCC products (9.46) and purchasing behavior (14.80) found higher than female who perceived 8.46 in awareness and 14.26 in purchasing behavior. While the tested t-value for awareness (2.311) is significant, the tested t-value for purchasing behavior (1.050) is not significant. This infers that the male respondents are having more awareness on GCC products more leads to more purchasing behavior, whereas, on the other hand while females perceived less awareness on GCC products observed less purchasing

behavior than males.

Figure -1

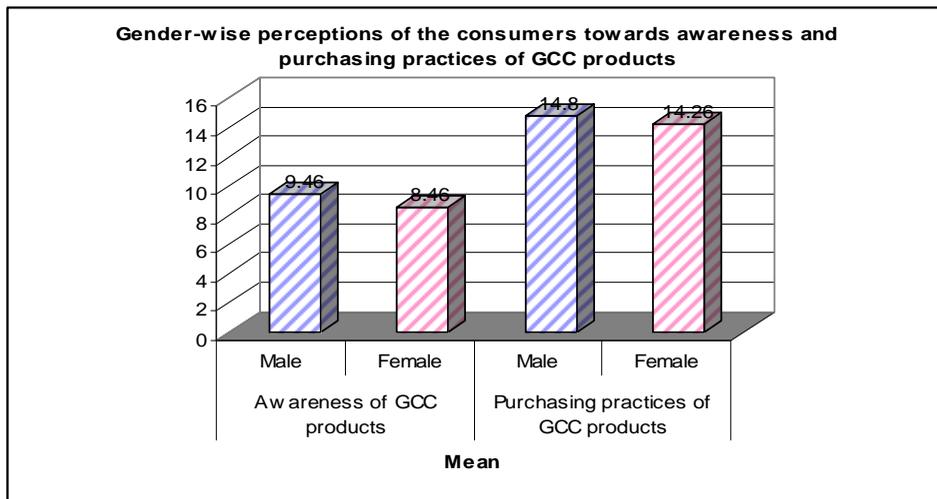


Table-3: Perceptions of different age-group consumers on awareness and purchasing behavior of GCC products

Variables	Age	N	Mean	Std. Deviation	Std. Error	f-value	p-value
Awareness of GCC products	20-30 years	28	9.07	2.071	0.391	3.891*	0.043
	31-40 years	34	8.56	1.418	0.243		
	Above 40 years	38	9.24	2.813	0.456		
	Total	100	8.96	2.211	0.221		
Purchasing practices of GCC products	20-30 years	28	13.61	1.586	0.257	40.261**	0.000
	31-40 years	34	13.29	1.767	0.303		
	Above 40 years	38	17.29	2.447	0.463		
	Total	100	14.53	2.572	0.257		

*Significant at 5% level; **Significant at 1% level.

The table analyses the awareness and purchasing behavior on



GCC products among different age group consumers who are regularly practicing in use of GCC products. Here in this table the average perceptions of above 40 years (9.24) age group persons on awareness of GCC products found significantly higher than 31-40 years (8.56) and 20-30 years (9.07) age group persons. On the other hand the average perceptions of above 40 years (17.29) age group persons on purchasing behavior found significantly higher than 31-40 years (13.29) and 20-30 years (13.61) age group persons. In both the cases the higher age group persons perceived more awareness and more purchasing behavior of GCC products and the difference in the perceptions among different age group persons found significant because the calculated f-values are 3.891 and 40.261 respectively. This is because while the awareness and purchasing practices of GCC products found high among the persons with higher age groups which determining the marketing strategies of GCC products.

Figure - 2

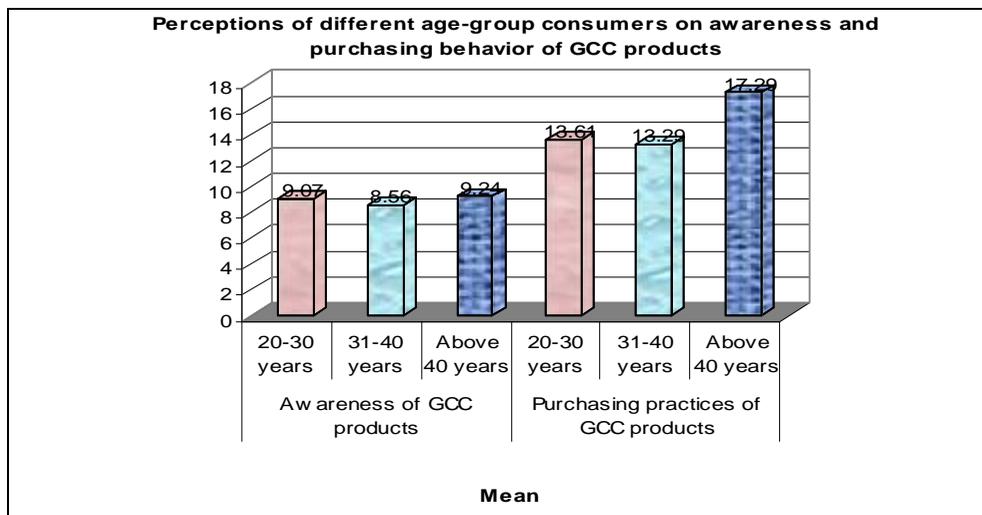




Table-4: Perceptions of different occupation group consumers on awareness and purchasing behavior of GCC products

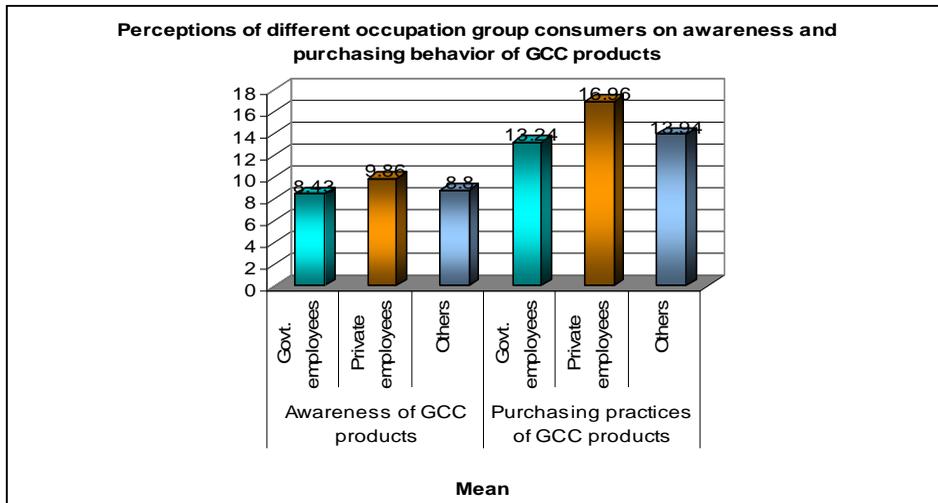
Variables	Occupation	N	Me an	Std. Deviati on	Std . Error	f- value	p- valu e
Awareness of GCC products	Govt. employees	37	8.43	0.987	0.16	3.634*	0.03
	Private employees	28	9.86	3.205	0.60		
	Others	35	8.80	2.012	0.30		
	Total	10	8.96	2.211	0.21		
Purchasing practices of GCC products	Govt. employees	37	13.2	1.480	0.24	27.916* *	0.00
	Private employees	28	16.9	2.822	0.53		
	Others	35	13.4	1.893	0.30		
	Total	10	14.3	2.572	0.27		

**Significant at 1% level, *Significant at 5% level.

The awareness and purchasing behavior of consumers of GCC products among different occupation group respondents who are practicing use of products available at GCC Visakhapatnam. Here in this table the average perceptions of private employees (9.86) on awareness of GCC products found significantly higher than government employees (8.43) and other occupational groups (8.80). On the other hand the average perceptions of private employees (16.96) on purchasing behavior of GCC products found significantly higher than government employees (13.24) and other occupational groups (13.94). In both the cases the private employees perceived higher than government employees and other occupational groups like retired persons, house wives, professionals, etc. because the calculated f-values are 3.634 and 27.916 respectively. This infers that while the awareness

on GCC products found high among the private employees reflects on their purchasing behavior which indicates more and while the awareness of GCC products found less among government employees shows less purchasing behavior.

Figure - 3



Conclusion

The various avenues of study of perceptions of the consumers on awareness and purchasing behavior reviewed in the present study indicated considerable market strategies, including demand for goods, sales, services, and influence the market economy. It also influenced the production and productivity of minor forest products. This is because the study observed male respondents who perceived more on awareness leads to more purchasing behavior, whereas, on the other hand while females perceived less awareness observed less purchasing behavior of GCC products. While the awareness on GCC products is high among the lower age group persons perceived less purchasing behavior when comparatively higher age group consumers perceived more awareness and perceived high purchasing practices. The study



also noticed that the awareness of private employees on GCC products found more and perceived high purchasing behavior when comparatively less awareness of government employees perceives less purchasing behavior.

References

1. Neumann, R.P., Hirsch, E., (2000). Commercialisation of Non-Timber Forest products: Review and Analysis of Research. CIFOR, Bogor.
2. Belcher, B.M., (2003). What isn't an MFP, *International Forestry Review* 5 (2), 161–168.
3. Pfund, J-L., Robinson, P. (Eds.), (2006). Non-Timber Forest Products between poverty alleviation and market forces. In: Series: Working Group "Trees and Forests in Development Cooperation". Inter cooperation, Berne.
4. Chamberlain, J.L., Hammett, A.L., (2002). Non-timber forest products: alternatives for landowners. *Forest Landowner* 61 (2), 16–18.



PUBLIC ATTITUDE ON JUVENILE CRIME: A STUDY IN VISAKHAPATNAM CITY

Kadim Lovakumari

Research Scholar

Department of Psychology

Andhra University, Visakhapatnam

Introduction

Juvenile crime is the crime charged by a person who is under the age of 18 years. In recent period these crimes are increasing rapidly due to many reasons and circumstances. In most of the places juveniles charged with serious crimes, such as robbery or murder which are transferred to criminal courts and tried as an adult. Sometimes prosecutors make this decision, or sometimes allow transfers require a hearing to consider the age and record of the juvenile, the type of crime, and the likelihood that the youth can be helped by the juvenile court. As a result of a get-tough attitude involving juvenile crime, many counties have revised their juvenile codes to make it easier to transfer youthful offenders to adult court.

Reformers of the constitution concerned about the harsh treatment of children urged the establishment of a separate court system for juveniles. This idea behind juvenile court was that children in trouble with the law should be helped to change their attitude rather than punished. This meant that instead of lawyers fighting to decide guilt or innocence about the juveniles, the court would act as a parent or guardian interested in protecting and helping the child for their future.

Academic experts have long recognized that crime is a young man's game. The typical criminal is a male who begins his career at 14 or 15 and continues through his mid-20s and then tapers off into retirement. The crime statistics denotes the disproportionate impact of those under the age of 18 on criminal activity; while comprising roughly



one-sixth of the country's population, they make up a full one-quarter of all people arrested and account for nearly one-third of the arrests for the seven crimes in the uniform crime index (homicide, forcible rape, robbery, aggravated assault, burglary, vehicle theft and larceny).

The statistics show that somewhere between 30 and 40 percent of children who commit crimes growing up in an urbanized area. Although they account for only a small proportion of the total population, the crime rates are increasing day-by day. The current levels of crime in India are still lower than in most of the foreign countries, nationally the level of criminality has increased significantly during the transition period (Kury and Ferdinand, 1999). Some argue that 'political turbulence' combined with the 'growth in criminality' led to an increased fear of crime among the people, as well as growing feelings of scepticism and mistrust towards government bodies and the judicial system (Roberts and Hough, 2002). In addition, the sense of insecurity has been strongly influenced among public by the media, now free to report more and more crime 'dramas' on a daily basis. Indeed, there is evidence that the media exaggerate the extent of crime in the country, in particular juvenile crime (Haines and Haines, 2001). Therefore to the extent that the media influence public attitudes, these are likely to be based on stereotypes and inaccurate figures from unrepresentative reporting.

There is very little research into public attitudes towards juvenile crime. Previous studies are limited to measuring fear of crime amongst juveniles, public opinion about the death penalty (Keil et al., 1999) or about delinquency in general (Ionescu, 2000). However, there is no study investigating on the opinions about juvenile delinquency and its treatment in the country. Where public opinion is misinformed it can compromise the fundamental principles of justice (Walker and Hough, 1988). If politicians are to give greater consideration to the 'congruence' of public opinion and punishment practice, in particular to



the level of public confidence in the administration of justice (Roberts and Hough, 2002), then the exploration of public knowledge about crime and criminal justice issues becomes important. However, policy makers need to be aware of the extent and limitations of public opinion, the media's influence in shaping people's views about punishing and the methodological limitations of studies into this area. In this regard, Visakhapatnam city is likely accession to its fast development in all sectors, and the increasing in criminal activities at various circumstances especially by juveniles, research into public attitude on juvenile crime in Visakhapatnam city is of greater significance.

Significance

Much of the international research into public opinion regarding punishment has shown that public confidence in the administration of justice is low, due in part to the discrepancy between public beliefs and the reality with regard to punishments against crimes. The public consistently misjudges trends in both adult and juvenile crime, tends to underestimate the severity of punishment, and is generally uninformed or misinformed about criminal justice policy. The media have a significant role in shaping people's conceptions about crime because of the emphasis on reporting crimes of violence. Additionally, in contrast to what politicians might think, the public support alternative punishment options when these are made salient, as well as rehabilitation and prevention efforts, especially regarding juvenile offenders. Although most of these findings emerged from studies of public attitudes towards crime and punishments in general, or studies focused only on crimes committed by adults, the lack of public knowledge about the criminal justice system is equally reflected in studies looking into public opinion about juvenile crime. Therefore, the present study aimed to analyse the public attitude on juvenile crime.



Methodology

This survey was conducted in Visakhapatnam city. The study reports on 100 respondents from all categories of people who are given structured questionnaires to complete. The questionnaire was developed from an analysis and assessment of public opinion and crime studies conducted, and drew heavily on the similar works developed through crime surveys. However, the development of the questionnaire was also influenced by the context in which the survey was to take place; respondents' feedback (via pre-testing and piloting); Visakhapatnam city's historical, political and socio-economic context, as well as contemporary practices within the juvenile justice system. Closed questions with tick-box and Likert-scale response formats were used in order to find out the following objectives.

Objectives

1. To study the socio-demographic characteristics of the respondents (e.g. age, sex, occupation, education, income etc);
2. To study the knowledge and perception of respondents on juvenile crime and punishment, as well as attitudes towards the treatment of juvenile offenders in Visakhapatnam city;

Sample and data collection

The questionnaires were distributed to 150 residents of Visakhapatnam city aged 18 and above years. The data was covered from all corners of Visakhapatnam city where the distribution followed a purposive snow-balling non-probability design, with 100 correctly completed questionnaires returned.

An important question for any public opinion survey concerns the extent to which the sample population is representative of the wider population; in other words, whether the results of the study can be generalised outside the sample group. In the current study, it is



recognised that using non-probability, as opposed to probability sampling, is a potential limitation. Non-probability sampling was chosen for a number of practical reasons including the financial costs, time and access to the target population. However, the use of non-probability sampling does not necessarily invalidate the results. Subsequent analysis showed that this sampling strategy produced a reasonably representative sample, as the socio-demographic characteristics of the sample population of this study were broadly in line with those of the population of Bucharest.

Findings

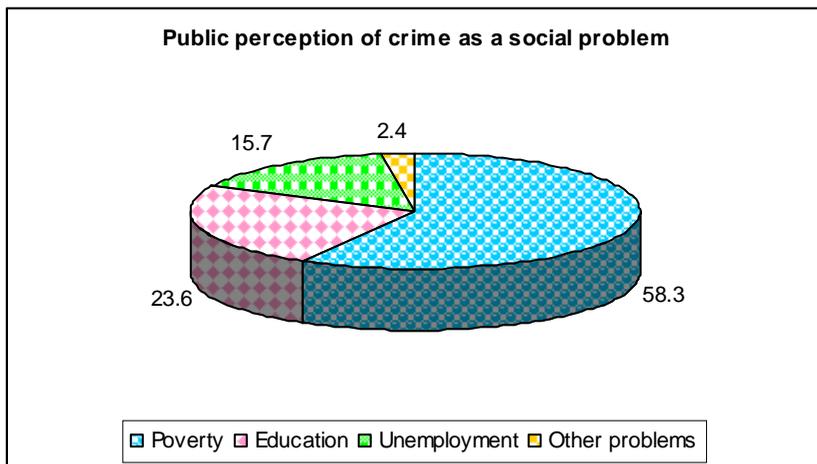
In common with most public opinion studies, findings here are presented mainly in the form of frequencies of responses. However, statistically significant associations in the data are explored, where possible. For example, relationships between various socio-demographic variables and people's opinions about juvenile crime and its punishment in Visakhapatnam city were analysed using Chi-square tests of significance.

Public perception of crime as a social problem

The results of this study show that there is public concern about law and order in Visakhapatnam city. However, in the eyes of respondents the most important social problem was not seen to be crime, but poverty. Over half (58.3%) of residents surveyed thought poverty was the most important social problem, a finding very much in line with the reality of their lives. The choice of education (23.6%) and unemployment (15.7%) as the next most important problems (after poverty) confirms once again people's dissatisfaction with their socio-economic conditions.

Table-1: Public perception of crime as a social problem

Reason for juvenile crime	Percentage
1. Poverty	58.3
2. Education	23.6
3. Unemployment	15.7
4. Other problems	2.4
Total	100.0



Juvenile crime and punishments

When asked about recent national juvenile crime trends, the majority of respondents (75.9%) believed that juvenile crime was on the increase. Only 16% of respondents were aware of changing the behaviour, while the majority (78%) thought that the number of juvenile offenders sent to prison had increased. These results illustrate that the public is ill-informed about juvenile crime and over-estimates the imprisonment rates for juvenile offenders in Visakhapatnam city.



Table-2: Public opinions on Juvenile crime and punishments

S.No.	Juvenile crime and punishments	Yes	No
1	Juvenile crime is increasing	75.9%	
2	Number of juvenile offenders sent to prison had increased	78.0%	
3	Juvenile offenders are changing their behavior	16.0%	
4	Most of the juvenile crime involves violence	91.5%	
5	Most of the juvenile crime involves theft	67.2%	

The overwhelming majority of respondents (91.5%) also substantially overestimated the extent to which juvenile crime involves violence, while underestimating the proportion of crimes involving theft (67.2%).

There are a number of possible reasons why people's estimations of crime and punishing figures are so wide of the mark. Firstly, official crime statistics are inaccessible to the public and often out of date, lack of knowledge is therefore hardly surprising. Secondly, as the media are the main source of information, public attitudes are subject to influence by unrepresentative reporting. Thirdly, discrepancies between national and local crime rates could induce differences of opinions. Hence respondents living in such an area would have been influenced by the local experience of crime when answering questions about national crime rates.

Poorer (low income or no income) respondents were more likely to overestimate the proportion of juvenile offenders engaged in violent crimes. Younger respondents tended to overestimate imprisonment

rates for juvenile offenders and the elderly underestimated the imprisonment rates for juvenile offenders who had committed theft and burglary.

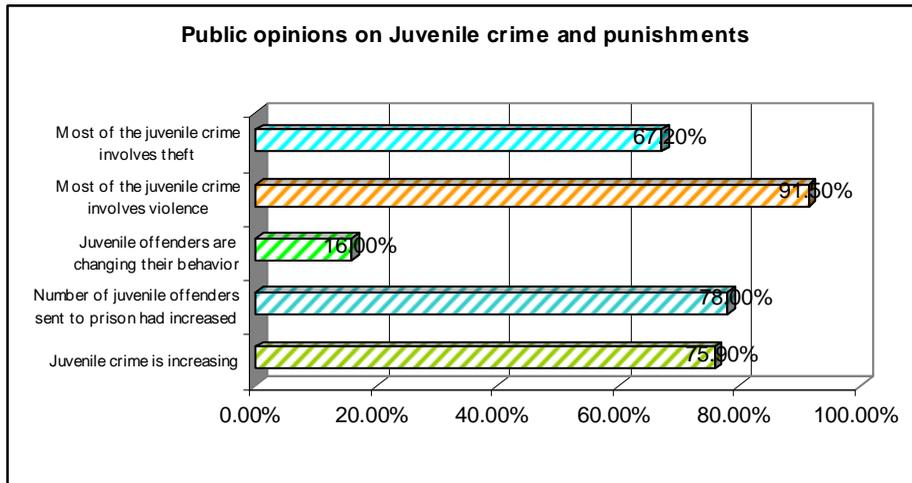


Table-3: Comment on punishments and their ability to deliver justice

Comment on punishments	%
1. Confidence in the courts	33.2
2. Somewhat neutral	33.2
3. More critical performance of courts	33.6
Total	100.0

A plurality of opinion emerged when the public was asked to comment on punishments and their ability to deliver justice. One third (33.2%) of the public expressed confidence in the courts, one third was somewhat neutral (33.2%) and one third was more critical of the performance of the courts. One could say from the data that only a third of the public expressing negative views about the courts is a positive result. This indicates that the majority of the public do not have confidence in the courts and this quite rightly should be considered a problem for a democratic country.

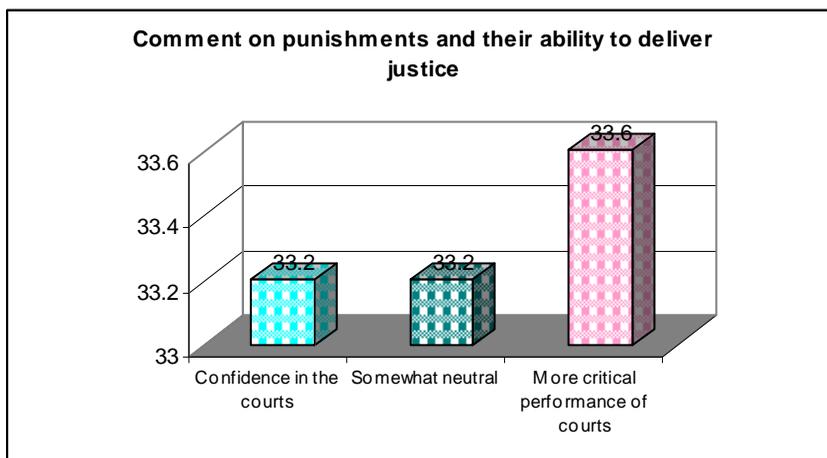
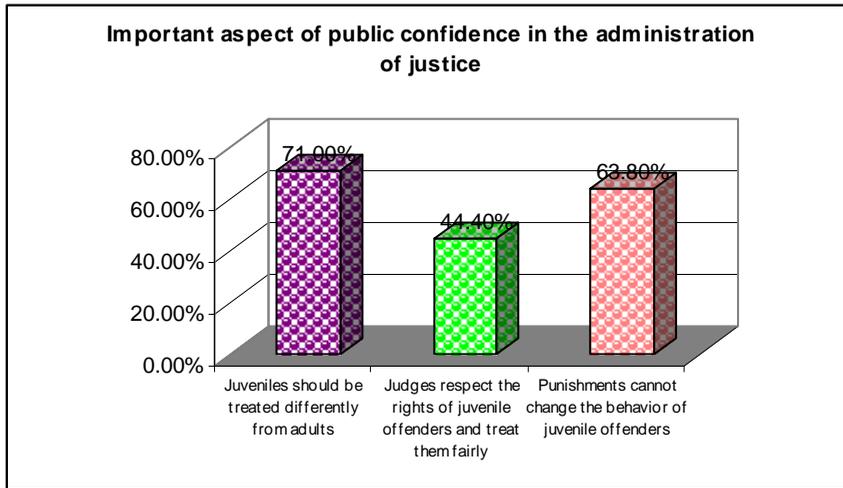


Table-4: Important aspect of public confidence in the administration of justice

S.No.	Public confidence	Yes	No
1	Juveniles should be treated differently from adults	71.0%	
2	Judges respect the rights of juvenile offenders and treat them fairly	44.4%	
3	Punishments cannot change the behavior of juvenile offenders	63.8%	

An important aspect of public confidence in the administration of justice concerns the way courts deal with juveniles. In this respect, the vast majority of the public (71%) not only believed that juveniles should be treated differently from adults, but they also believed that the courts give full expression to this principle. Furthermore, almost half (44.4%) of respondents considered that within the punishment process, judges respected the rights of juvenile offenders and treated them fairly. It is also noticed from the public opinions that above sixty percent of the respondents (63.8%) opined punishments cannot change the behavior of juvenile offenders.

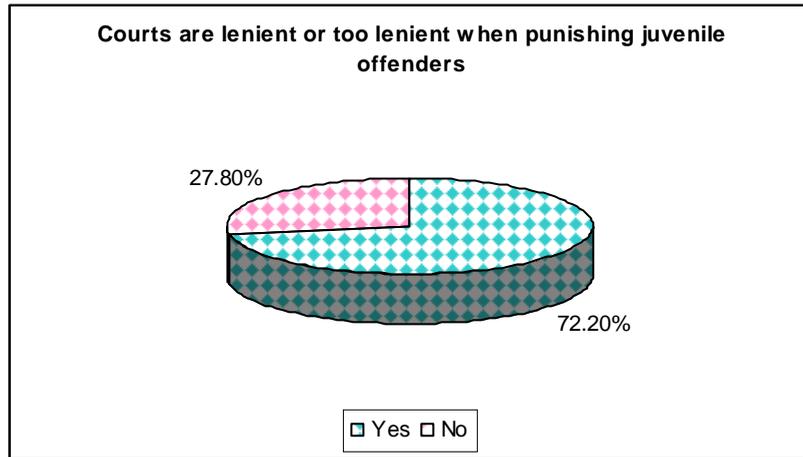


Public attitude on juvenile offenders

The survey examined whether people felt that sentences handed down by the courts were either tough/too tough, about right or lenient/too lenient. The majority of the public (72.2%) considered that the courts were lenient or too lenient when punishing juvenile offenders. However, it has been shown here and elsewhere, findings like this are believed to be influenced by the accuracy of respondents' knowledge about juvenile crime and punishing and by the fact that people answer this type of question with stereotypes of violent crimes in mind.

Table-5: Courts are lenient or too lenient when punishing juvenile offenders

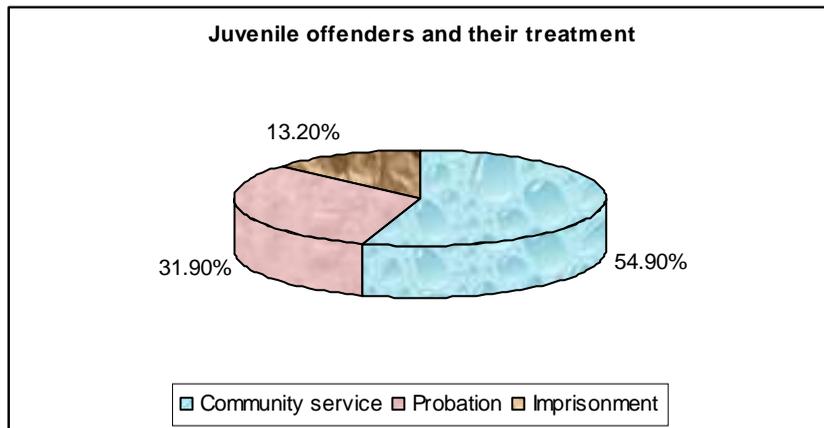
Response	Percentage
Yes	72.2%
No	27.8%
Total	100.0%



Regarding juvenile offenders and their treatment, a greatest proportion of respondents supported non-custodial punishments, such as community service (54.9%) or probation (31.9%). Only 13.2% favoured imprisonment. These findings demonstrate a considerable rise in the level of public support for non custodial penalties – particularly for minor offences such as theft.

Table-6: Juvenile offenders and their treatment

Non-custodial punishments	Percentage
Community service	54.9%
Probation	31.9%
Imprisonment	13.2%
Total	100.0%



The results indicated that people wanted more juvenile offenders to be sent to prison for violent crimes, burglary and theft. This latter result is not consistent with people's support for non custodial penalties for a particular case of minor theft. One can argue that this inconsistency within people's attitudes reflects once again the fact that, when asked about punishment in general, people tend to think about worst case scenarios, even when theft is the offence in question.

Further contradictory results emerged when people were asked other questions about juvenile offenders. In contrast with the traditional mode of punishment practice in Visakhapatnam city, which is based on a strict Criminal Code in which the sentence is based only on the offence and not the characteristics of the individual, the majority of the public (70%) thought that both the circumstances of crime and the juvenile offender's personal circumstances should be taken into account in the punishing process.

A statistically significant correlation was also found between respondent's standard of living and their attitudes to punishing juvenile offenders: people with low incomes were more likely to believe that sentences passed by the courts in Visakhapatnam city are too



lenient. Interestingly, however, people with lower incomes and lower education were also more likely to favour 'restorative' options.

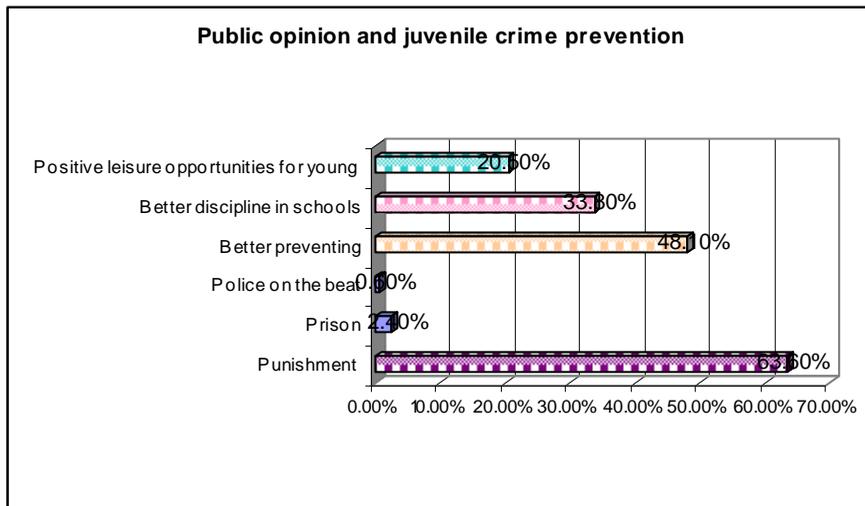
Age and education have an impact on the way people view juvenile offenders. For example, older people were more likely to support rehabilitation of juvenile offenders, as a main punishment objective. Chi-square tests indicated that people with a higher level of education were more punitive towards young delinquents: the more educated people were, the more likely they were to believe that retribution should be the primary aim of punishment.

Public opinion and juvenile crime prevention

When asked to assess the role that punishing has in preventing crime, almost two thirds of the sample (63.6%) believed that punishment was one of the major factors in preventing crime. When asked specifically what measure would do most to reduce crime, some interesting results emerged. Prison was not ranked highly as a first option for reducing juvenile crime (2.4%), nor were more police on the beat (0.6%). By far the most common response to this question was better parenting (48.1%), followed by better discipline in schools (33.8%) and more positive leisure opportunities for young people (20.5%). There was also support for greater use of non custodial sentences, such as community service and probation

Table-7: Public opinion and juvenile crime prevention

Prevention of crime	Percentage
Punishment	63.6%
Prison	2.4%
Police on the beat	0.6%
Better preventing	48.1%
Better discipline in schools	33.8%
Positive leisure opportunities for young	20.5%



Conclusion

This study has shown that it would be wrong to characterise the Visakhapatnam city public as being highly punitive in respect to juvenile crime and punishing. Although Visakhapatnam city consider that sentences handed down by the courts are not tough enough, when they are provided with specific examples and questioned in more depth, they think more closely about an issue and their responses change. In contrast to judicial practice in Visakhapatnam city, there is public support for community based punishment alternatives for juvenile offenders, especially those committing minor offences. Moreover, the public do not have a great deal of confidence in the ability of the courts to prevent crime. They believe that preventing juvenile crime is more a question of changing the family and school environment and increasing the chances of gaining employment and providing opportunities for young people to spend their spare time positively, rather than stressing more imprisonment or police on the beat. However, this does not mean the public see no role for punishment in preventing crime. As results from this survey demonstrate, punishing was perceived as a major factor in preventing juvenile crime. Interestingly, contrary to common



practice in Visakhapatnam city courts, a large proportion of the public are in favour of individualisation within the punishment process and restorative justice. A majority support elements of the restorative justice approach, such as reconciliation between victims and juvenile offenders.

Findings reported in this paper and elsewhere indicate that people tend to be punitive towards crime and punishing issues mainly because, when asked about the adequacy of sentences in general, they have in mind more serious crimes. This is coupled with the mistaken impression that juvenile crime is increasing and the perception that the amount of violent juvenile crime is much greater than it actually is. Some even argue that '... perceptions of leniency are independent of actual punishment practices. Moreover, as the media tend to report violent spectacular cases regarding juvenile crime in Visakhapatnam city, public discussion of criminality focuses mostly on serious crimes, which clearly represent only a small minority of juvenile crimes.

References

1. Haines, A. and Haines, K. (2001) 'Reprezentari ale Delincventei Juvenile in Presa Romaneasca Postcomunista' in Revista de Securitate Comunitara, Anul I, Nr. 3, Iasi: Dopler.
2. Hough, M. and Roberts, J. V. (2002) 'Public Knowledge and Public Opinion of Punishing: Findings from Five Jurisdictions', in N. Hutton and C. Tata (Ed.) Punishing and Society: International Perspectives, Farnborough: Ashgate.
3. Ionescu, C. (2000) Studiu de opinie asupra delincventei, Bucuresti: GRADO.
4. Keil, T., Vito, G. F. and Andreescu, V. (1999) 'Perceptions of Neighbourhood Safety and Support for the Reintroduction of Capital Punishment in Visakhapatnam city: Results from a



- Bucuresti survey', in: International Journal of Offender Therapy and Comparative Criminology, 43(4), 514-534.
5. Kury, H. and Ferdinand, T. (1999) 'Public Opinion and Punitivity', International Journal of Law and Psychiatry, 22 (3-4): 373-392.
 6. Roberts, J. V. and Hough, M. (Ed.) (2002) Changing Attitudes to Punishment. Public Opinion, Crime and Justice, Cullompton: Willian Publishing.
 7. Walker, N. and Hough, M. (Ed.) (1988) Public Attitudes to Punishing. Surveys from Five Countries, Aldershot: Gower.



SLICING OF AGE COMPOSITION USING MAXIMUM LIKELIHOOD FROM LENGTH FREQUENCY ANALYSIS (LFA) OF AFRICAN CATFISH (CLARIAS GARIEPINUS) IN LAKE TANA, ETHIOPIA

Zewdu Berhanie Ayele

Research Scholar
Department of Economics
Andhra University
Visakhapatnam
Andhra Pradesh, India

Dr. R Ramakrishna

Professor and BOS Chairman
Department of Economics
Andhra University
Visakhapatnam, Andhra Pradesh
India

Introduction

African catfish (*Clarias gariepinus*) is one of the the three main tropical fish species groups targeted by fishermen in Lke Tana next to Nile tilapia and the third by volume/or number next to large *Labeobarbus speciosus* and Nile tilapia.

A number of different methods are commonly used to obtain age of fish. The three majour methods are analysis of tag and recapture data; analysis of the hard parts of the fish like otoliths; and analysis of cohort progressions in length frequency distributions (Hallier and Gaertner, 2006; Sparre and Venema,1998).

Aging of individual fish in temperate zones based predominantly on annuly of scales, otolises and other bony structures of fish, which is difficult to apply in tropics (Pauly and Morgan, 1987; Sparre and Venema, 1998). Temperate zone fish, subject to yearly seasonality water temperature and thus growth, can often be aged this way. Most fishery models these days in this zone are age based, meaning that the model fish population is broken down by the numbers of fish in each age group.

Temperate zone stock assessment is, therefore, done by ageing them directly. Ageing is most often done by counting rings in hard parts of



the fish body, such as otoliths or scales. The so-called year-rings are formed through a daily addition (daily ring) to the size of the scale or otolith. The difference in deposits made in the winter and in the summer can be detected and one year ring, composed of a summer and a winter part, can be distinguished from the next. Moreover, temperate fish species usually spawn once per year in a relatively short time span, which makes it easy to distinguish year classes or cohorts (Sparre and Venema, 1998).

As far as tropical fish is concerned, fish material is added daily to hard parts, which can be distinguished as daily growth rings. However, the lack of a strong seasonality makes the distinction of seasonal rings and therefore also of year rings problematic for many tropical species. Aging of fish using tag and recapture data methods are rarely used in fishery research.

Length-based models are primarily used for invertebrates, where no otolith or other hard body parts are available to age individual animals. Sometimes, the quality of fishery model estimates, even where age samples are available, can be improved by incorporating length as an additional independent variable (Sparre and Venema, 1998). In tropical fisheries, there is often a heavy reliance on size frequency data only, which will incur a significant penalty in accuracy (Quin II and Deriso, 1999)

Recently there has been a great uprising in interest in length-based methods of assessing fish populations. This is due to an increasing problems of applying the better known age based methods, this is especially true in tropical areas where aging of fish is less precise on their scales or otoliths; the development of improved methods of analysing length data; and the increased availability of computers that put within the reach of all the computational power needed to take advantage of some of the new methods (Gulland and Rosenberg, 1992)



In many application of fish stock assessment, it is necessary to find a substitute for age dependent data. Collecting age specific data can a problem because of the inherent technical difficulty in determining the age of tropical fish and because, even when possible, it is expensive. Thus, the proxy measurement of length or size has become popular (Gallucci, 1996).

Population size may be analyzed for indicators of age grouping if individuals of fish cannot be aged totally or reliably. This age determination initiated with the anticipation that peak size frequency represent the mode of year classes or cohort. Fish hatched in the same year tend to be in the same size range, with most fish being close to an average size. Therefore, there trends to be a statistically normal distribution of size around a normal (most frequent distribution).

In addition, length is the most common information collected in fisheries research, perhaps due to its ease of collection. A histogram of frequencies of length often shows distinct modes that hypothetically represent distinct age classes. Length frequency analysis (LFA) has been used since 1892 to decompose a length frequency histogram into component age classes (Ricker 1975). The oldest method, simple inspection of the histogram, is the least reliable. Other graphical methods and curve fitting techniques are also subjective (Quin II and Deriso, 1999)

In recent years, there are techniques that have been developed to read daily rings in the otoliths of many fish species. This has enabled the development of age reading on tropical species, in particular of fish with short life spans, or young fish. These techniques are still very time consuming and will be difficult to apply on a routine basis. They may however, serve to validate the results obtained from the analyses of length-frequencies.



A further complication of tropical fish stock assessment as compared to temperate waters is that the number of species caught is very high. This does not only affect sampling and data collection procedures, it also makes it more difficult to apply the models (Quin II and Deriso, 1999).

The above mentioned differences can easily explain the slow rate of development of fish stock assessment in the tropics compared to that in temperate areas. However, it is important for the construction of assessment models and for fishery management decisions. In order to address this question, the ideal source of information would be reliable, high precision catch at age data, such as those provided in some cases by daily ring studies of otoliths which allow assessing the stock precisely. However, such precise catch at age data are not available for African Catfish in Lake Tana. So, we investigate the issue by applying a LFA to length frequency distributions of research survey data.

Besides, LFA has been useful tool in stock assessment with the help of software packages developed primarily to estimate growth parameters and age composition from length frequency data using ELEFAN (Pauly and David, 1981) and MULTIFAN-CL (Fournier et al., 1998). In most of these procedures, LFA is used to estimate growth parameters to support the stock assessment without any test of statistical robustness. However, in this paper we extended LFA to back to rough estimate the average age of distinct age classes and to test the robustness of the estimated parameters.

Therefore, the objectives of this study are:

- To slice age compositions of African catfish stock from length frequency analysis using likelihood estimator;
- Estimate the growth parameter and asymptotic length of the African catfish stock



Data and Method of Analysis

Data on the African cat fish are available from a historic data that was collected from Bahirdar Fisheries and Other Aquatic Life Research Center's annual progressive report. The center has collected a research survey data for more than more than 13 years. It has a total of six sampling sites both from the southern and northern part of Lake Tana. Data were sampled starting from year 2000 only from three sampling sites every month. Then the program has been expand it sampling to six and collect every other month from November 2009 till now. The gillnets used had mesh sizes of 60, 80, 100, 120 and 140 mm stretched mesh. The size of a single mesh panel was 3 m by 50 m. The nets were set at 6:00 p.m. and collected at 6:00 a.m. Representative sampling sites/habitats were selected. They are Abbay, Zegie, and Gerima in the southern part, and Dirma, Sekela, and Gedamat in the northern part of the Lake. The sites selected reflect the different habitat types present in the lake such as river mouths, deep water, muddy or rocky bottoms, and dense stands of aquatic macrophytes (Dereje, 2014).

Therefore, a total of 1451 fish length frequency data were collected from January 2000 to September 2012. We assume them to be representative of all African Catfish caught in the lake. We established a length frequency of 1cm (10 mm) interval with a total of 68 classes.

To derive the maximum likelihood function for LFA, following the approaches of Andrade and Kinas, (2004); and Quin II and Deriso, (1999), we assume that the probability density function of length l for a given age class i to be normal:

$$f_i(l) = \frac{1}{\sqrt{2\pi\sigma_i^2}} \exp\left[-\frac{(l - \mu_i)^2}{2\sigma_i^2}\right] \quad (1)$$

The derivation of the maximum likelihood method assumes that the



length frequency distribution is multinomial; the probability density function (PDF) of length $f_a(l)$ for each age group a is described by unknown parameter vector; the number of age groups A is known, and each length measurement falls into one and only one interval. (Quin II and Deriso, 1999).

where $i = 1, \dots, A$ refers to the index for the age class with mean age a_i , μ_i the mean length predicted for age class i , and σ_i the corresponding standard deviation (s.d.). We assume that μ_i is related to a_i by a von Bertalanffy growth equation and that σ_i is proportional to the square root of a_i :

$$\sigma_i = \sigma \sqrt{a_i} \tag{2}$$

where a_i we use the more general mean age a_i ,

In all, k length intervals $((l^{j-1}, l^j))$, indexed by j ($j=1, \dots, k$), are defined. The probability that a length measurement for a fish in age class i is in length interval j is

$$F_{ji} = \int_{l^{j-1}}^{l^j} f_i(l) dl \tag{3}$$

If N is the number of fish measured and g_i the true proportion of fish in age class i , then the expected number of fish of size class j is

$$L_j = N \sum_{i=1}^A F_{ji} g_i \tag{4}$$

The proportion of fish in size class j is then

$$P_j = \frac{L_j}{N} = \sum_{i=1}^A F_{ji} g_i \tag{5}$$



Finally, if the k-dimensional vector of observed length frequency $L^{Obs} = \{L_j^{Obs}\}$ is assumed to follow the multinomial distribution

$$f(L^{Obs}) = \binom{N}{L_1^{Obs}, \dots, L_k^{Obs}} \prod_{j=1}^k P_j^{L_j^{Obs}} \quad (6)$$

then the negative log-likelihood function to be minimized is

$$\ell(L^{Obs} | \{\mu_i\}, \{g_i\}, \sigma) = - \sum L_j^{Obs} \log \left(\sum_{j=1}^A F_{ji} g_i \right) \quad (7)$$

We used the von Bertalanffy parameters to describe the growth process.

$$l_t = l_\infty [1 - \exp^{-k(t-t_0)}]$$

Where t_0 - theoretical age at which the length of the fish (L) is zero,

l_∞ - Asymptotic length or length where age is infinity or the age at which growth of

length becomes zero

k -growth parameter

l_t - length at age t

It gives the start of the curve, i.e. where the theoretical length is zero. It is calculated by inserting l_∞ and K in the equation for a known length at age t .

Following Kolding and Giordano, (2002) and Sparre and Venema S.C (1998), l_∞ , t_0 , and k was computed as follows: since l_∞ is interpreted as the average length of very old fish, we can estimate it as a starting value using either the length of the largest fish for small sample size or the average of the last 10 fishes for the large sample size. Since our



sample is large we used the later approach, the length of the largest fish.

So, $l_{\infty} = 81.5$ cm

$$k = \frac{1}{t_2 - t_1} \times \ln \left(\frac{l_{\infty} - l(t_1)}{l_{\infty} - l(t_2)} \right)$$

(8a)

For the number of age class equals to 1, we can apply the growth parameter k as follows

$$k = \frac{\ln(l_{\max}) - \ln(l_{\min})}{t_2 - t_1} = \frac{\ln(85.4) - \ln(18.3)}{1 - 0} = 1.54$$

Where $l_{\max} = 85.4$, the largest length in our data set and

$l_{\min} = 18.3$ cm, the smallest length in our data.

Then, the computed $k = 1.54$ is applied to equation number (8b), we can find $l(t_1) = 64.036$

$$k = \frac{1}{t_1 - t_0} \times \ln \left(\frac{l_{\infty} - l(t_0)}{l_{\infty} - l(t_1)} \right)$$

(8b)

Applying $k = 1.54$ and $l(t_1) = 64.036$ to equation (8b), results $t_0 = -0.54$

$$t_0 = t_1 + \frac{1}{k} \times \ln \left(1 - \frac{l(t_1)}{l_{\infty}} \right) \tag{9}$$

$k = 1.54$ is applied only if the stock has only one cohort. $k = 1.54/2, 1.54/3, 1.54/4, \dots, 1.54/j$ for a stock having 2, 3, 4, . . . , j cohorts, respectively. So, will have different k values for different model. Here,



the model is the number of age classes. The computed values of k were taken as initial values for model specification in General Algebraic Modeling System (GAMS)

Hence, the model used to predict mean length μ_a for a given mean age a was

$$\begin{aligned} \mu_a &= 81.5 \left[1 - \exp^{-1.54(a+0.041)} \right] \text{ for a model having one age group} \\ \mu_a &= 81.5 \left[1 - \exp^{-0.77(a+0.041)} \right] \text{ for a model having two age groups} \\ \mu_a &= 81.5 \left[1 - \exp^{-0.513(a+0.041)} \right] \text{ for a model having three age groups} \\ \mu_a &= 81.5 \left[1 - \exp^{-0.385(a+0.041)} \right] \text{ for a model having four age groups} \\ \mu_a &= 81.5 \left[1 - \exp^{-0.308(a+0.041)} \right] \text{ for a model having five age groups} \end{aligned}$$

Note that the term age group connotes that more than one age class may be represented in an age group. Following equation (2), standard deviation of for the different age/cohort groups are calculated using the following functions

$$\sigma_i = 12.096 \sqrt{a_i} \quad \text{where } a_i \text{ is the mean age group}$$

To fit an LFA to data, A , the number of age classes, needs to be specified in advance. In order to deal with this unknown number, we fitted a set of models from $A = 1$ to a maximum as large as necessary to represent all discernible age classes, and used an index Akaike Information Criterion, AIC to choose the best fit (Michael and Taylor, 2014). For this purpose General using Newton Methods of Algorithm was used to estimate the population parameters. These are the proportion of age class/ or cohort, mean length of each cohort and their standard deviation.

For A age classes, there are $2 \times A$ parameters to be estimated. Andrade and Kinan, (2004) state that in the applications of the LFA, the solutions appeared to be highly dependent upon the starting values of



the parameters, because the shape of the negative log likelihood function is not informative or has several local minima. Therefore, they suggest that each optimization procedure would be tried with $10 \times A$ random starting parameter sets (Andrade and Kinas, (2004). However, in our case the selected model was run based on the estimated proportion of the algorithm's output and the observed frequencies using statistical/Econometrics software. The statistical/Econometrics output was used to remodel the algorithm. Besides the results of statistical/Econometrics output is used to test the robustness of the model and can generate data for simulation purpose. The growth parameter and asymptotic length were also estimated from linear regression models and Gulland and Holt Plot was plotted from model.

Result and Discussion

The estimation of catch age composition from length composition assumes, among other things that age class/cohort exhibits Von Bertalanffy growth. We use parameterization such that growth is specified by three parameters, k -the growth coefficient, t_0 - theoretical age at which the length of the fish (L_0) is zero, and l_∞ - asymptotic length or the age at which growth of length becomes zero. These parameters can be transformed to provide the usual Von Bertalanffy growth parameter $l(t)$.

There is a good correspondence between estimated mean length at age and noticeable model in the length frequency samples for African Catfish. We tested by comparing the indexed of Akaike Information Criteria (AIC). As it is depicted in the annex (Figure 1), slicing of age composition also support the theoretical basis of age composition using LFA.

$$AIC = -2 \log L(\hat{\theta} | y) + 2K \quad (10)$$



where K is the number of estimable parameters and $-2 \log L(\hat{\theta} | y) = \ell(L^{Obs} | \{\mu_i\}, \{g_i\}, \sigma)$, in our case is the log-likelihood at its maximum point of the model estimated. This can be further refined this estimate to correct for small data samples: $AICc = AIC + \frac{2k(k+1)}{n-k-1}$; where n is the sample size and K and AIC are defined above. If n is large with respect to K , this correction is negligible and AIC is sufficient. $AICc$ is more general, however, and is generally used in place of AIC .

The best model is then the model with the lowest $AICc$ (or AIC) score. It is important to note that the AIC and $AICc$ scores are ordinal and mean nothing on their own. They are simply away of ranking the models. So it can be used for comparison for a given data set. That is calculating AIC or $AICc$ value for each model with the same data set, and the best model is the one with minimum AIC value.

Table 1: Summary of AIC and $AICc$ result for models relating the Number of Age classes for age composition.

Model	log likelihood	K	AIC	AICc	Rank
1	-5,715.893	2	11,435.786	11,435.971	5 th
2	-5,615.771	4	11,239.542	11,239.570	4 th
3	-5,578.672	6	11,169.345	11,169.403	3 rd
4	-5,571.549	8	11,159.097	11,159.197	1 st
5	-5,572.591	10	11,165.182	11,165.335	2 nd

Number of age class equals to 4 (model 4) received the lowest AIC as well as $AICc$ score ($AIC = 11,159.097$ and $AICc = 11,159.197$), indicating that this model is the most parsimonious model for the given length frequency data. There is decisive evidence in favor of model 4 relative to the other models (Number of age class equals to 1, 2 3 and



5). So the number of age class /or cohort in of African Catfish in Lake Tana equals to 4

Table 2: Summary of proportion, Mean Length and standard deviation of the selected model,

Cohort /Age Class	proportion	Mean length (cm)	Standard error
One	0.106	28.834	1.985
Two	0.131	38.916	2.224
three	0.464	41.993	8.93
four	0.299	55.107	12.567

Table 2 provides the algorithm results of model 4. The proportion of age is distributed to 0.106, 0.131, 0.464 and 0.299 for 1st, 2nd, 3rd and 4th cohorts, respectively. As far as the mean length of the cohorts is concerned, it equals to 28.834 with a standard deviation of 1.985, 38.916 with a standard deviation of 2.224, 41.993 with a standard deviation of 8.93 and 55.107 with a standard deviation of 12.567 for 1st, 2nd, 3rd and 4th cohort, respectively.

Table 3: Results of the Multinomial Logit Model

Dependent variable	log likelihood			
Log likelihood function	-335.03632			
Restricted log likelihood	-382.61724			
Chi squared [3 d.f.]	95.16185***			
McFadden Pseudo R-squared	.1243565			
Estimation based on N = 276, K = 6				
Inf.Cr.AIC = 682.1 AIC/N = 2.471				
	1 st Cohort	2 nd Cohort	3 rd Cohort	4 th Cohort
Proportion	-4.25542*** (0.96349)	-5.928*** (1.257)	0	0.605* (0.364)
Frequency	.02631*** (0.00823)	.0311*** (.008)	0	-0.007 ^{NS} (0.008)



*Note: The parentheses are the standard error of the estimate and ***Significant at 1percent level, **significant at 5 % level, *significant at 10 % level NS-Non-Significant*

Once the best model is established, one can use the traditional null-hypothesis testing for the given best model in order to establish the scale of the relationship between the variables. This is the same as what is normally presented in regression analysis. Table 3 provides the regression results for model 4. The statistically highly significant chi Squared value (χ^2) is the test for the overall goodness of fit of the model. .

As depicted in Table 3, there is a significant positive and negative relationship among the three cohorts and the reference group on the two variables. In comparison to 3rd cohort, which is normalized and has higher proportion, the true probability is associated with lower likelihood to 1st cohort and 2nd cohort and higher likelihood to 4th cohort. As far as the observed frequency is concerned in comparison to 3rd cohort, observed frequency is associated with higher likelihood to 1st cohort and 2nd cohort and lower likelihood to 4th cohort.

Table 5: Estimation of growth parameter and asymptotic length from linear regression

	Coefficients	95.0% Confidence Interval for coefficients	
		Lower bound	Upper bound
(Constant)	31.085*** (.070)	30.191	31.979
Mean length	-.383*** (.001)	-.401	-.365

*Note: The parentheses are the standard error of the estimate and ***Significant at 1percent level, **significant at 5 % level*

So from the Table 4, we can directly estimate the growth parameter and asymptotic length. The growth parameter from linear regression



analysis is simply the negative of coefficient of mean length which equals to 0.383 cm per year. As far as the asymptotic fish length is concerned it is the negative of ratio of constant coefficient to mean length coefficient, which equals to 81.162 cm. This result is also depicted in annex of this paper (Table 2). The 95% confidence interval for the growth parameters ranges from 0.365 to 0.401 cm/ year.

Summary, Conclusion and Recommendation

Length-based models are primarily used when no otolith is available to age individual animals. Sometimes, the quality of fishery model estimates, even where age samples are available, can be improved by incorporating length as an additional independent variable. Through the advancement of computer, slicing of age composition using length frequency analysis can be done using ELFAN, MULTIFAN and others software. So the objective of this study is to slice of age composition in to cohorts using maximum likelihood and to test statistical robustness of slicing and to estimate growth parameter and asymptotic length of African catfish stock. A research survey data of African catfish of Lake Tana was used for this purpose.

Using maximum likelihood a possible number of age groups were tested and using AIC, the fish stock in the lake is represented by 4 age cohorts. The proportions of the cohorts are 0.106, 0.131, 0.464 and 0.299, respectively. AIC was used to select the best model based on this criterion it is found that model 4 (four age cohorts) is the true number of age cohort of the stock. A Highly statistical significant of χ^2 is an indication of the best fit of the model. Each of the independent variables are also statistically and independently significant in the specification of the model, 3rd cohort is normalized zero.

Slicing of age composition was also used to estimate the growth parameter of the stock and asymptotic fish length. The growth parameter measured in the change in average length per year was



0.383cm/year and highly significant; and the asymptotic fish length was 81.162 cm.

Slicing of age composition and parameter estimation require robustness statistical test. Slicing of age composition in to cohorts using FLA of maximum likelihood can be used to test statistical robustness of the estimation of parameters. So slicing of age in to age composition in addition to aging, it can be used to test statistical robustness of the estimation of parameters.

References

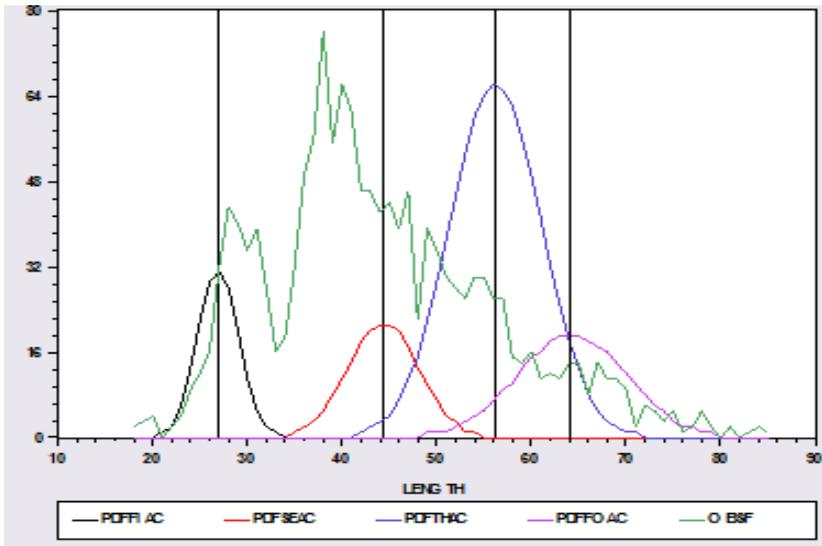
1. Andrade, H. A., and, Kinan, P. G. (2004). Estimation of birthdates and catch-at-age using length frequency analysis (LFA), with application for skipjack tuna (*Katsuwonus pelamis*) caught in the Southwest Atlantic. *ICES Journal of Marine Science*, 61: 798-811.
2. Dereje T. K., (2014). Spatial and temporal distributions and some biological aspects of commercially important fish species of Lake Tana, Ethiopia. *Journal of Coastal Life Medicine*; 2(8): 589-595.
3. Fournier, D. A., Hampton, J., and Sibert, J. R.(1998). MULTIFAN-CL: a length-based, age-structured model for fisheries stock assessment, with application to South Pacific albacore, *Thunnus alalunga*. *Canadian Journal of Fisheries and Aquatic Sciences*, 55: 2105-2116.
4. Gulland, J.A and, Rosenberg, A.A ,(1992). A review of length-based approaches to assessing fish stocks. *FAO Fisheries Technical Paper*. No. 323. Rome, FAO. 100.
5. Hallier J. P. and, Gaertner, D, (2006). Estimated Growth Rate of The Skipjack Tuna (*Katsuwonus Pelamis*) from Tagging Surveys Conducted in The Senegalese Area (1996-1999) Within a Meta-Analysis Framework, Col. Vol. *Sci. Pap. ICCAT*, 59(2): 411-420.



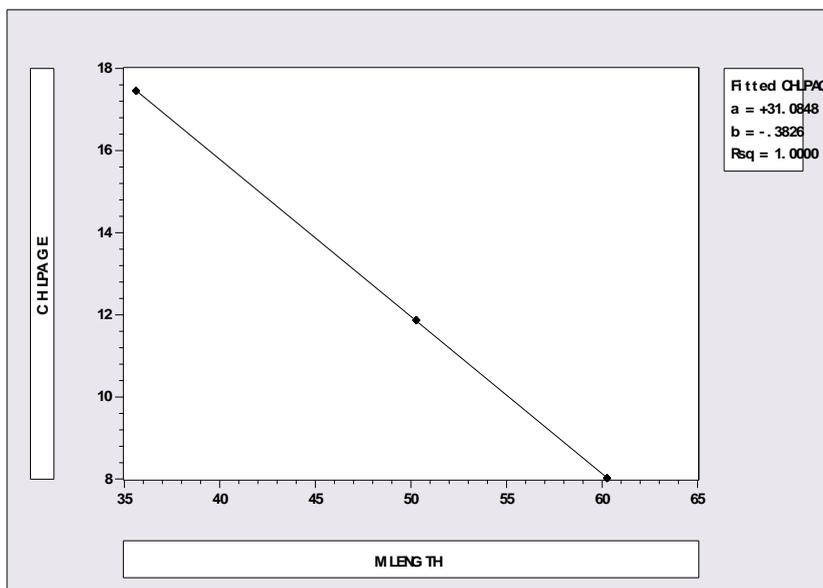
6. Hilborn, R.; Walters, C. J.(1992). Quantitative fisheries stock assessment: choice, dynamics and uncertainty. Chapman & Hall, New York.
7. Kolding J., and, Giordano, U.W. (2002). Lectures notes AdriaMed Training Course on Fish Population Dynamics and Stock Assessment, from 10-29 September 2001, AdriaMed Technical Documents No.8 GCP/RER/010/ITA/TD-08, Termoli (Italy).
8. Michael S., and, Taylor D.C. (2014). Model selection and Akaike Information Criteria: An example from wine ratings and prices, Elsevier <http://dx.doi.org/10.1016/j.wep.2014.03.001>
9. Pauly D and, Morgan (editors), G.R. (1987). Length Based Methods in Fishery research. Proceedings of the International Conference on the theory and application of Length Based Methods for stock Assessment, 11-16 February 1985, Mazzara del Vallo, Sicily, Italy. 468p
10. Pauly, D., and David, N. (1981). ELEFAN I, a BASIC program for the objective extraction of growth parameters from length frequency data. Meeresforschung, 28: 205- 211.
11. Quinn II, T.J., and, Deriso, R. (1999). Quantitative Fish Dynamics, Biological resource management series Oxford University Press, New York.
12. Ricker, W.E. (1975). Computation and interpretation of biological statistics of fish populations.
13. Bulletin of the Fisheries Research Board of Canada, Bulltin 191, Ottawa.
14. Sparre, P; and Venema S.C ,(1998). Introduction to tropical fish stock assessment. Part 1. Manual. FAO Fisheries Technical Paper. No. 306.1, Rev. 2. Rome, FAO.
15. Vincent F., Saul G., Saila, B, Gustafson D. J., and. Rothschild, B. J (1996). Stock Assessment: Quantitative methods and applications for small scale fisheries. CRC press, Inc. USA, pp 529

ANNEXES

Figure 1: Age Composition from LFA of African Catfish



Annex Figure 2: Gulland and Holt Plot





A NEW APPROACH TO UNDERSTAND ADHD

Sameena Moushtaq Shah
Ph.D Research Scholar
Department of Education
Central University of Kashmir
Kashmir

"It is not a simple behaviour disorder, but rather a complex syndrome of impairment in the management system of the brain."

---Thomas E. Brown

Introduction:

Dr. George F. Still, a physician, is credited with being one of the first authorities to bring the condition we now call ADHD to the attention of the medical profession. Because IDEA does not define ADHD, we use the definition put forth by American Psychiatric Association, (2000) which describes this condition as a neurological syndrome gradually characterised by impulsivity, distractibility, and hyperactivity that is inconsistent with the age of a person. This description derived from the Diagnostic and Statistical Manual-Text Revision, commonly referred as DSM-IV-TR. The American Psychiatric Association (2000) definition recognizes three type of ADHD based on the individual's unique profile of systems. (1) ADHD is predominantly inattentive type (2) ADHD predominantly hyperactive-impulsive type, (3) Combined type. The vast majority of individuals with ADHD exhibits Combined type (Berklet, 2006). Some research shows persons with ADHD exhibits deficits in several areas such as in selective attention, sustained attention, and orientation of attention (Tsal, Shalv and Meurach, 2005). Over the years a variety of labels- minimal brain dysfunction, hyperkinetic/impulsive disorder, hyperkinesis, hyperactivity, and attention deficit disorder with or without hyperactivity. Now, most experts are using the term attention deficit hyperactivity disorder (ADHD) as a diagnosis for children whose behaviour tends to be characteristically impulsive, inattentive, or a combination of both. Since all children have these traits some of the time, the diagnosis usually requires that the symptoms be present for



at least six months by age seven, be evident in various situations, and be more intense than usually seen in other children of the same age and gender. Students with ADHD are easily distracted, and have trouble in concentrating. They are full of energy and prone to act without sufficient planning, touching objects that are off limits or running into the street to chase a ball without apparent regards for their own safety. At school, teachers have noted that the progress reports that these “fail to listen to directions” “are underachieving” “are bright enough” but will not listen to directions or “are lazy”. They frequently experience other academic, social, and behavioural problems. This overlap is called comorbidity. They may be fidgety and brimming with energy, finding it difficult to sit still, jumping out of their seat constantly, as if unable to control their perpetual motion. Because of their behaviour they may be rejected by other children and disliked by teachers in the process their report card may be disappointing and their self esteem may suffer, despite the fact that they are often as bright as their peers.

Few researchers still think of ADD as a simple behaviour disorder. Increasingly, specialists are recognizing that it is a complex syndrome of impairments in development of the brain’s cognitive management system, or executive functions. The disorder affects once ability to

- Organize and get started on tasks.
- Attend to details and avoid excessive distractibility.
- Regulate alertness and processing speed.
- Sustain and, when necessary, shift focus.
- Use short-term working memory and access recall.
- Sustain motivation to work.
- Manage emotions appropriately

The research literature generally suggests that ADHD is more readily identified in Boys than girls. This condition is diagnosed four to nine times more often in boys than in girls (U.S. Department of Education, 2006). This statistics suggests the possibility of a gender bias in identification and diagnosis. Boys may be over identified and girls under identified. We believe that this situation exist because ADHD manifests itself differently in males and females. Boys are more likely to exhibit disruptive, hyperactive behaviour, thus being more



noticeable to teachers. Girls, on the other hand, are more likely to be withdrawn and exhibit inattention; consequently, they are less likely to be identified.

What causes ADHD

Research suggests that neurological dysfunction plays a key role in individuals with ADHD. Anatomical differences and imbalance in brain chemistry are being closely examined as etiological possibilities. In recent years, neuroscientists advance our understanding of several regions of the brain, specially frontal lobes, parts of the basal ganglia, and the cerebellum, appear to exhibit abnormalities in person with ADHD. Disorganization and inattention, frequently implicated with ADHD, are believed to be associated with impairment in the prefrontal and frontal cortex whereas hyperactive behaviour is thought to be due to abnormalities in the cerebellum and or basal ganglia. Research have found that the total brain volume was 5 percent less in a sample of boys with ADHD than in a sample of boys without ADHD.

Chemical abnormalities in the brain are a reason for ADHD. Neurotransmitters are the chemicals that transport electrical impulses from one brain cell or neuron to another across tiny gaps known as synaptic cleft. Current thinking suggests that ADHD results from the abnormal levels of two neurotransmitter- dopamine and norepinephrine in the regions of the brain that control activity and attention.

Attention deficit-hyperactive disorder includes difficulty with mental focus. People describe it as daydreaming or mind-wandering instead of concentrating on the task at hand. Now researchers think they have identified a gene that is responsible for this specific characteristic of the disorder. People who inherit two copies of a particular form of the gene called DAT1 10 are thought to be at greater risk for developing ADHD than people who inherit another form, called DAT1 9. Researchers found that among people with two copies of DAT1 10 (which the scientists term 10/10 carriers) are suffering from ADHD.

Facing a world full of potential dangers for the babies they carry, pregnant women hear regularly that acetaminophen can be trusted to reduce fevers and relieve aches and pains without causing



harm to a developing fetus. But a new study reports that the children of women who took the drug during pregnancy were about 40% more likely to be diagnosed with attention deficit hyperactivity disorder than children of mothers who took none. Acetaminophen is the active ingredient in Tylenol and Panadol and is also a component of Excedrin, among other common pain relievers.

Most authorities agree that there is a hereditary basis to ADHD. Studies indicate that if a child has ADHD, the chance of his or her sibling having ADHD is about 32 percent. Children of adults with ADHD run a 57 percent risk of having ADHD. In addition, several studies demonstrate that parents of children with ADHD are two to eight times more likely to also be ADHD than are parents of non-ADHD children.

More and more child-rearing involves lots of TV and video games, especially among parents who are so busy working to make working to make ends meet. Latchkey kids have become more common with increasing single-parent homes, but coming home from school to an empty apartment or house also occurs with both parents working. According to Jenny Deam of Parents magazine, 1 in 25 grade school kids is a latchkey kid. The continued suppression of outdoor child play or unsupervised physical activity of any sort has also been cited as a problem that contributes to ADHD.

What can be done for ADHD

There are multimodal approaches which are usually effective for students with ADHD.

A massive body of evidence indicate that 8 of 10 individual with the disorder experience significant improvement in their functioning when treated with appropriately fine tuned medications. Many professionals believe that medication, particularly psycho stimulants, can play an important role in the treatment of ADHD. The most popular stimulant medication is Ritalin, with Cylert, Dexedrine, and Adderall also commonly prescribed and have been 70 to 80 percent effective in reducing hyperactivity/ impulsivity behaviour. Medication will often increase the student's ability to attend and will help control



interfering behaviour. This makes the person more available to instruction, increase their attention span. These treatments can compensate for inefficient release and reloading of essential neurotransmitters at countless Synaptic connections in the brain. However, ADD is not like a strep infection, where you can take a course of antibiotics and knock out the infection. It's more like a vision problem: Appropriately prescribed eyeglasses can improve impaired vision, but not cure it. Similarly, medications for ADD may help alleviate symptoms, but only for those hours of the day when the medication is active in the brain.

William Cruickshank established a systematic educational program for children who today would meet the criteria for ADHD. Two hallmarks of program were reduction of stimuli that are irrelevant to learning and enhancement of materials that are important for learning, and a structured program with a strong emphasis on teacher direction.

Behavioural strategies are an effective intervention technique for students with ADHD. One example of this approach is Functional Behavioural Assessment. FAB involves determining the consequences, antecedents, and setting events that maintain inappropriate behaviour.

Contingency based Self- management approaches usually involves having people keep track of their own behaviour and then receive consequences, usually in the form of rewards, based on their behaviour. A combination of FBA and contingency based self management techniques has proven successful in increasing appropriate behaviour of elementary and secondary students with ADHD. Authorities have pointed to the crucial role that contingency plays in contingency-based self management. In other words, they point out that reinforcement of some kind, such as social praise or points that can be traded for privileges, is essentially important for self-management techniques to be effective. For example, an extensive review of research found that contingency-based management strategies were more effective than self- management strategies without contingencies in leading to positive behavioural changes in students with ADHD.

Home school collaboration is essential for all pupils, but especially for those with ADHD, when parents and teachers communicate about monitoring medication effects, completing homework assignments, establishing goals and rewards, assessing intervention effectiveness, and developing behaviour management plans. It is important ingredient for promoting their success at school. This partnership must be “ongoing, reciprocal, mutually respectful, and student centred”.

To start the process of early identification, school staff should systematically gather relevant information from teachers and the school psychologist about specific impairments observed in the student's academic work, classroom performance, or social interactions. They should present this information to parents with suggestions about how the parents can arrange for an appropriate evaluation to identify causes of the student's chronic difficulties and possible options for intervention. Before school staff can adequately assist parents in identifying students for a possible ADD/ADHD evaluation, however, teachers, school psychologists, and administrators need to develop a solid understanding of the new model for attention deficit disorder Centres for Disease Control. Early identification of students with ADD is important because appropriate interventions can prevent a student from becoming demoralized by repeated _ experiences of frustration and failure. With appropriate intervention, most students with ADD/ADHD can achieve at the level of their abilities.

Misconceptions about Learners with Attention Deficit Hyperactivity Disorder

1. MYTH: All children with ADHD are hyperactive.

FACT: Psychiatric classification of ADHD includes (1) ADHD, predominantly Inattentive Type, (2) ADHD, Predominantly Hyperactive-Impulsive Type, or (3) ADHD, Combined Type. Some children with ADHD exhibit no hyperactivity and are classified as ADHD, Predominantly Inattentive.

2. MYTH: The primary symptom of ADHD is inattention.

FACT: Although the psychiatric classification includes an Inattentive Type, recent conceptualizations of ADHD place problems with



behavioural inhibition, executive function, time awareness and management, and goal-directed behaviour as the primary behavioural problems of ADHD.

3. MYTH; ADHD is primarily the result of minimal brain injury.

FACT: In most cases of ADHD there is no evidence of actual damage to the brain. Most authorities believe that ADHD is the result of neurological dysfunction, which is often linked to hereditary factors.

4. MYTH: The social problems of students with ADHD are due to their not knowing how to interact socially.

FACT: Most people with ADHD know how to interact, but their problems with behavioural inhibition make it difficult for them to implement socially appropriate behaviours.

5. MYTH: Because students with ADHD react strongly to stimulation, their learning environments should be highly unstructured in order to take advantage of their natural learning style.

FACT: Most authorities recommend a highly structured classroom for students with ADHD, especially in the early stages of instruction.

References

1. Brown, T. E. (2005). Attention Deficit Disorder: The unfocused mind in children and adults.
2. Hallahan, Daniel.P and Kauffman, James.M (2004) Exceptional Learners-An Introduction to Special Education.
3. Gargiulo, Richard.M (2008). Special Education in Contemporary Society. An Introduction to Exceptionality.
4. Werts M.G, Culatta R.A and Tompkins J.R (2011). Fundamentals of Special Education.



COUNTER TERRORISM APPROACHES OF INDIA AND RUSSIA

Dr. Sanjukta Maharana

Guest Lecturer
Keshav Mahavidyalaya
University of Delhi
Pitam Pura, Delhi

Introduction

According to John Deutch (1997) "Terrorism is best defined as acts of violence committed against innocent persons or noncombatants that are intended to achieve political ends through fear and intimidation" (Deutch 1997:12). Terrorism is the worst form of threat to the whole mankind. "Terrorism is a global destructive phenomenon affecting all states and societies and morally dangerous to all people of the world" (Vart 2007: 90). Therefore, there is need of collective efforts of international community for the eradication of terrorism so as to ensure, peace, stability and security in the world.

Both India and Russia have been victim of terrorism. India has faced the bad effect of destabilizing forces like "international terrorism, religious extremism, separatism and secessionism, trans border organized crime and illicit traffic in arms and drugs" coming from Afghanistan and Pakistan occupied Kashmir (PoK) (Ganguli 2009: 156). India has been facing severe terrorist activities such as 2001 parliament attack, 2005 Delhi Bombings, 2008 Mumbai attack, High court bombing in 2011 and several incident of terrorism which is taking place in the country day by day. Furthermore, India is facing terrorism from neighboring countries and also facing terrorism from Maoist and Naxalite. In the same manner, Russia has been facing serious militant activities from Chechnya, North Caucasus. It was also victim of 1999 Russian apartment bombings, terrorist attack in Sochi and so on.

Consequently, India and Russia unite for fighting against both national as well as international terrorism. "India and Russia strongly feel that



there can be no double standards in the fight against terrorism otherwise this struggle will become meaningless" (Vart 2007: 90).

Strategies of India and Russia for Combating Terrorism

Both India and Russia are victims of national terrorism. Jammu and Kashmir issue of India and Chechnya issue of Russia unites both countries in their fight against terrorism (Mansingh 2007:30). "Russia is perhaps the only country to have upheld the Indian position on cross-border terrorism, whereas India has maintained that Chechnya is an internal matter of Russia". They are rigorously involved in their fight against religious extremism and terrorism in the international sphere (Joshi 2007: 38).

During the visit of Russian President to India on 3rd October 2000, India Russia signed declaration of Strategic Partnership and pleaded for "Cooperating in the fight against international terrorism, separatism, organized crime and illegal trafficking in narcotics" (Patnaik 2007:41). India and Russia are working for combating international terrorism by organizing India-Russia Joint Working Group (JWG). During "the seventh meeting of the India-Russia Joint Working Group (JWG), India and Russia gave importance for strengthening their cooperation for countering new challenges and threats. They have established "a partnership dialogue within the Financial Action Task Force (FATF) and modeled on it the Eurasian Group (EAG) on Combating Money-Laundering and the Financing of Terrorism". About the issue related to drug trafficking which threatens peace and stability, both actively cooperates to prevents this threat by signing "Intergovernmental Agreement on Cooperation in Combating Illicit Traffic in Narcotic Drugs, Psychotropic Substances and their Precursors" in 2007".¹

Various inter-departmental documents together with Memorandum on Mutual Understanding and cooperation for combating terrorism was



signed by India and Russia. The document clarifies that India and Russia are sufferer of the evil effect of terrorism and alleged that, "Being democratic and open nations they are susceptible to threats posed by terror globalization, including newly appeared connections between terrorism and weapon of mass destruction. The document further said, no circumstances can justify terror, it must be unanimously condemned everywhere". Both severely criticize "those who support terrorism, finance, train, harbor terrorists or provide them with assistance".²

After the Al-Quaeda attack of 9/11 in US, both countries activated the existing machinery of consultations which have already existed and worked for security of the region. In May 2002, they established regular and emergency consultation mechanism (Gopal 2008: 86). In November 6, 2001 during the Prime Minister Atal Behari Vajpayee's visit to Russia, a joint statement was signed. In this India and Russia expressed their "satisfaction with the level of cooperation on countering terrorism and other transnational organized crimes". Both urged to strengthen the international legal basis for eradication of terrorism. They have established various institutional mechanisms for the eradication of terrorism. They agreed to form more action oriented counter terrorism committee under UNSC (Prabha 2008: 346).

Suppress financing to the international terrorist is major step to control the terrorism. So India and Russia worked to control financing of international terrorist (Prabha 2008: 347).

On 30th June 1994, Moscow Declaration was signed by India and Russia. According to Moscow Declaration "In particular, there is a growing threat from the forces of aggressive nationalism, religious and political extremism, terrorism and separatism, which strike at the unity of pluralistic states" (Ganguli 2009: 121).



Due to the Kargil crisis of 1999, India and Russia came to nearer and Russia criticized strongly the Kargil infiltrators and termed them as “fundamentalists, extremists and separatist” (Ganguli 2009:135). Furthermore, in April 2000, India and Russia signed a protocol “to establish a direct apex link between bilateral security establishments, with sub-groups on international terrorism and drug trafficking” (Ganguli 2009: 140).

In 1994 by a declaration on Further Development and intensification of cooperation, both the countries noted their concern with “Aggressive Nationalism, religious and political extremism, terrorism and separatism present a special threat to territorial integrity and unity of sovereign states and international peace and stability” (Ganguli 2009: 155).

“The Russian Foreign Ministry Communique on the conversation between the two Foreign Ministers of Russia and India stated, “Russia and India, have reaffirmed to closely coordinate, in the spirit of strategic partnership, joint efforts aimed at curbing the threat of terrorism and religious extremism. Indian security advisor to the Prime Minister, Brajesh Mishra discussed, during his mid-September 2001 Moscow visit, current security situation with his Russian counterpart General Vladimir Rusilailo, Defence Minister Sergei Ivanov and Foreign Minister Igor Ivanov and stated, “we are for combating terrorism in a global framework which would include Chechnya and Kashmir. We have an eye on the effect of US military action against the Taliban on India and Russia” (Ganguli 2009:159).

Russia has clearly supported India’s position on Pakistan and “said any compromise on terrorism while normalizing bilateral ties would be ‘inadmissible’ and asked Islamabad to stop infiltration to neighbouring countries”. “Lavrov said Russia, along with the international community, would back Pakistan in its efforts to eradicate hotbeds of



terrorism on its soil, to eradicate terrorism in the neighbouring countries and to stop infiltration of terrorism from Pakistan to neighbouring countries".³

Both India and Russia held the view that, terrorism is a severe threat to the security and stability in Afghanistan which not only threatens the peace and stability in the region but also the entire world. Furthermore, both work for combating terrorism on SCO and RIC.

India and Russia "condemned terrorism in all its forms and manifestations and agreed that there should be no tolerance for sheltering, arming, training or financing of terrorists".⁴

India and Russia undertake joint military training in order to prepare their troops to face any emergency caused by any terrorist activities. The troops of both the countries were participated in a joint military drill at the Mahajan Field Firing Range near India-Pakistan border in Thar desert of Rajasthan. The aim of this drill is to improve capabilities for conducting anti-terrorist operations. The key objective of the joint military drill is to continue anti-terrorist operation such as the destruction of illegal armed formations.⁵

In yet another incident both India and Russia conducted their annual joint counter-terrorism and counter-insurgency army war game in Buryatia in southeast Russia. The exercise is called Indra-2012. In this exercise, about 250 troops from India and Russia "matching their skills and understanding each other's standard operating procedures" for the elimination of terrorists and insurgents. One such Indra exercise was conducted in October 2010 in India's Uttarakhand. "Indian Army troops will get acquainted with Russian military equipment during exercise in the first stage, after which they will get to participate in joint tasks to get trained in standard operating procedures. Later, the two sides will carry out a synchronised counter-terrorism operations".⁶



India Russia cooperation for fighting against terrorism in Afghanistan

The disintegration of Soviet Union lead to the end of Cold war and this created new security challenges for India. Afghanistan became the central theme of super power rivalry from 1979-89. The withdrawal of Soviet Union from Afghanistan in 1989 and disintegration of USSR lead to the emergence of various Central Asian state redefined the nature and scope of battle ground in Afghanistan. The political vacuum which was created after the pull-out of Soviet Union from Afghanistan , the inter ethnic war, the failure of Mujahedeen to establish political stability, drug trafficking, proliferation of small arms and a devastated economy created a suitable atmosphere for militant religious extremism to spread in the unstable country that is Afghanistan (Ganguli 2009:156).

“Afghanistan under the Taliban rule had emerged as a hub of international terrorism”. India and Russia offered their support to the opposition forces that is the Northern Alliance (Joshi 2007: 37) which fought against the Taliban rule in Afghanistan.

Taliban problem and drug trafficking in Afghanistan have become a strong headache for both India and Russia. In 2003, India and Russia joint declaration expressed “concern at the continuing threat to security, especially in the South and South-east provinces and also over the continued increase in the cultivation, production and trafficking of narcotics drugs in Afghanistan and underlined the need for effective steps to counteract the drugs and terrorist threats”. The 2007 Joint Statement between India and Russia took into account the resurgence of Taliban in Afghanistan and wish to “participate in the post-war recovery in Afghanistan and in the re-emergence of the country as a peaceful, democratic, independent and prosperous state” (Sarma 2008: 549). India has also been participating actively in combating terrorism



in Afghanistan since the Taliban rule. Both have same ideology against the threat to security from international terrorism (Patnaik 2008: 152-153).

India and Russia agreed to enhance their cooperation in fighting against extremism and drug trafficking in Afghanistan after the withdrawal US forces from Afghanistan.⁷

India Russia cooperation for fighting against terrorism in Central Asia

Threat to the peace and stability of Central Asian countries in turns poses a threat to the security of both India and Russia. International terrorism and religious extremism have negative impact on India and Russia. The stability of Central Asian region is affected by drug trafficking and religious extremism. India and Russia are of the view that, "regional cooperation can play an important role in the stabilization of the situation in the Central Asia region". The situation of Central Asia is taken into consideration by General Assemblies. "The Comprehensive Convention on international terrorism and the international convention for the suppression of Acts of Nuclear Terrorism". According to this, stability of Central Asia is closely related to stability of India and Russia (Sarma 2008: 548).

Russian Defence Minister, Sergei Ivanov said that cooperation of India and Russia is necessary to fight against terrorism in Central Asia. "Russia wants India to play an active role in Central Asia and suggested that the two countries can set up strategic asserts in the region to fight terrorism and bring stability". Furthermore, the 2007 Joint statement which was signed between India and Russia said "strengthening bilateral and multilateral interaction in Central Asia , would contribute to enhance stability and security in the region, including trough close and mutually beneficial cooperation with



individual countries in the region based on shared interests and mutual respect” (Sarma 2008: 549).

India-Russia counter terror approach in United Nation

India and Russia are actively participated in fight against terrorism in international field on the periphery of United Nation. They desire for increasing role of international legal framework within UN for fighting against international terrorism. A “draft comprehensive Indian convention on and a draft Russian convention” signed for combating terrorism (Lavrov 2007:25).

Giving importance to the role of international community for fighting against terrorism both the countries pleaded for the implementation of UN global counter terrorism strategy for eradication of terrorism on the periphery of UNSC. Drug trafficking is a serious issue in the present world responsible for threatening the peace and security of world. So both countries wanted to begin their negotiation for combating this threat by signing “Intergovernmental Agreement on cooperation in combating illicit traffic in narcotic drugs, psychotropic substances and their precursors” on November 8, 2007.⁸

“Both India and Russia are of the opinion that since terrorism and organized crime happen to be global in nature, these issues need to be dealt at a suitable forum like UN” (Prabha 2008: 347).

“The India-Russia Joint-Statement of 4 December 2002, following President Putin’s New Delhi visit in December 3-5, 2002, firmly rejected and condemned “all types of terrorism, based on any ground-political, religious or ideological- and wherever it may exist”. It recommended that countermeasures against this menace “should be directed also against those states, entities and individuals who support, fund or abet terrorist or provide them shelter or asylum to engage in cross-border terrorism. There should be no double-standards in the fight against terrorism”. Both sides reaffirmed the relevance of the



Moscow Declaration on International Terrorism of 6 November 2001, of UN Security Council Resolution 1373 on the fight against terrorism, the need to intensify efforts to finalize in the UN, the draft International Convention for the Suppression of Acts of Nuclear Terrorism and the draft Comprehensive Convention against International Terrorism. Their resolve to fight terrorism was reaffirmed by the signing of the Memorandum of Understanding on Combating International Terrorism during the Summit (Ganguli 2009: 160).

They condemned each and every aspect of terrorism and held the same view against sheltering, arming, training and financing to terrorist. They urged for speedy signing of draft UN Comprehensive Convention on International Terrorism and agreed to continue approach against terrorism through joint working group on countering terrorism. They also condemned "use of information and communication technologies for criminal and terrorist purposes, as well as other purposes that are inconsistent with the UN Charter". They agreed for sanction against Taliban in UN Security Council which is an important component of combating terrorism.⁹

During the seventh meeting of the India-Russia Joint Working Group (JWG) on Combating International Terrorism "The parties emphasized that their cooperation in countering new challenges and threats is an integral part of the Indian-Russian special and privileged strategic partnership, expressed mutual concern about the continuous threat of cross-border terrorism, and reaffirmed their commitment to consolidate bilateral interaction in the fight against this global scourge. The parties also underlined the role of international efforts in preventing and suppressing terrorism including the consistent implementation of the UN Global Counterterrorism Strategy and the relevant resolutions of the UN Security Council. They noted the importance of the early conclusion of the negotiation process aimed at agreeing within the



framework of the UN General Assembly on the draft Comprehensive Convention on International Terrorism (CCIT) that was put forward by India".¹⁰

Conclusion

Terrorism is considered as worse threat for the whole mankind. India and Russia counter terror approach would be helpful for eradication of terrorism from their respective countries, from Afghanistan, Central Asia and form the entire world as a whole. India Russia counter terror approach on the periphery of UN will lead to a stable and peaceful international order.

Endnotes

¹ (2012), "India-Russia hold talks on combating terrorism", Press Trust of India, April 12, 2012, [Online Web] Accessed 28 November 2013, URL: <http://ibnlive.in.com/news/indiarussia-hold-talks-on-combating-terrorism/247905-3.html>.

² (2007), "Indo-Russian relations events and Landmarks" India and Russia 60 years of fruitful cooperation, Page-100, A unity international publications.

³ (2010), "Russia backs India's stand, asks Pak to stop infiltration", November 30, 2010, [Online Web] Accessed 30 October 2013, URL: <http://www.rediff.com/news/interview/russia-backs-india-asks-pak-to-stop-cross-border-infiltration/20101130.htm>.

⁴ (2013) "Indian PM Manmohan Singh ends Russia visit", October 22, 2013, [Online Web] Accessed 31 October 2013, URL: http://www.upi.com/Top_News/World-News/2013/10/22/Indian-PM-Manmohan-Singh-ends-Russia-visit/UPI-54711382439681/.

⁵ (2013), "India, Russia join hands to thwart terrorism on terrain resembling Sudan" ANI October 24, 2013, [Online Web] Accessed 31 October 2013, URL: <http://news.yahoo.com/india-russia-join-hands-thwart-terrorism-terrain-resembling-160132459.html>.

⁶ (2012). "India, Russia counter-terrorism exercise INDRA 2012 in August" India News, By IANS, Jun 19, 2012, [Online Web] Accessed 31 October 13, URL: <http://defence.pk/threads/india-russia-counter-terrorism-exercise-indra-2012-in-august.188560/>.

⁷(2012), Pravda.Ru, "Russia's dreams come true in India with Putin's help" 25 December 2012, [Online Web] Accessed 12 August 2013, URL: http://english.pravda.ru/russia/economics/25-12-2012/123302-russia_putin-0/.

⁸ India-Russia Joint Working Group on Combating International Terrorism Posted by Editorial, [Online Web] Accessed 22 November 2013, URL: <http://voiceof.india.com/features/india-russia-joint-working-group-on-combating-international-terrorism/1507>.

⁹ (2013), "India, Russia to enhance military-technical cooperation", 22 October 2013, [Online Web] Accessed 31 October 2013, URL: http://www.domainb.com/defence/general/20131022_brahmos_missile.html.



¹⁰ India-Russia Joint Working Group on Combating International Terrorism Posted by Editorial, [Online Web] Accessed 25 October 2013, URL: <http://voiceof.india.com/features/india-russia-joint-working-group-on-combating-international-terrorism/1507>.

References

1. Deutch, John (1997) "Terrorism" Foreign Policy, No. 108 (Autumn, 1997), pp. 10-22, Reviewed work(s), Washingtonpost; Newsweek Interactive, LLC, accessed on 19/03/2012, URL: <http://www.jstor.org/stable/1149086>.
2. Ganguli, Sreemati (2009) Indo-Russian Relations, The Making of A Relationship: 1992-2002, Kolkata: Shipra Publications.
3. Gopal, Krishna (2008), "India and Russia: The Ambit of Strategic Partnership", in P. L. Dash and Andrei M. Nazarkin (eds.) Indo- Russian Diplomatic Relations: Sixty Years of Enduring Legacy, New Delhi: Academic Excellence.
4. Joshi, Nirmala (2007), "Evolution of Indo-Russian Relations" India and Russia 60 years of fruitful cooperation, A unity international publications.
5. Lavrov, Sergei (2007), "Russia and India: Strategic Partnership for the Future", India and Russia 60 years of fruitful cooperation, A unity international publications.
6. Mansingh, Lalit (2007) "India and Russia: Enduring Ties", India and Russia 60 years of fruitful cooperation, A unity international publications.
7. Patnaik, Ajay(2008), "Central Asia in Indo-Russian Strategic Calculations" in P. L. Dash and Andrei M. Nazarkin (eds.) Indo- Russian Diplomatic Relations: Sixty Years of Enduring Legacy, New Delhi: Academic Excellence.
8. Prabha, Kshitij (2008), "Terrorism and Organised Crime: An Indo- Russian Perspective" in P. L. Dash and Andrei M. Nazarkin (eds.) Indo- Russian Diplomatic Relations: Sixty Years of Enduring Legacy, New Delhi: Academic Excellence.
9. Sarma, Angira Sen (2008), " Indo-Russian Amity Mirrors on Central Asia's Advantage" in P. L. Dash and Andrei M. Nazarkin (eds.) Indo- Russian Diplomatic Relations: Sixty Years of Enduring Legacy, New Delhi: Academic Excellence.
10. Vart, Dev (2007), "Putin on Terrorism and other International Issues", India and Russia 60 years of fruitful cooperation, A unity international publications.



MANOHAR MALGONKAR'S – A BEND IN THE GANGES: A CLASSIC IN MODERN INDO-ANGLIAN FICTION

S V Rama Rao

Lecturer in English
Govt. Degree College
Cheepurupalli, Andhra Pradesh

Manohar Malgonkar is one of the India's most prolific writers in English, was born on July 12, 1913 in a royal family. He graduated from Bombay University in English and Sanskrit. Before becoming a professional writer in his forties, he worked as a big-game hunting guide, an army officer, an executive at a tea plantation, and in politics. His fast-paced, action- filled fiction is known for its visually and aurally rich language. He conveys the sound of trumpeting elephants and galloping horses in his historical novels, and vividly renders the details of his characters' clothing and gestures.

Malgonkar always had a good grip on the plot. He was no run-of-the mill writer. His language is crisp and easy and he creates a vivid picture for the reader, yet his works were popular with a large number of modern readers and not only discerning type. He was a man from an aristocratic background, favourably disposed to the Raj and to cap this Lieutenant Colonel in the Indian Army, who took up the pen to write a string of novels. In fact, he wrote 13 of them and each of them is filled with adventure, dare devilry and romance that can keep the reader glued to the book.

Malgonkar was a man of many distinct, impressive and splendid parts. He wrote interesting history, presenting a worms-eye view of episodes, people and events from a perspective that academics often ignore. He wrote several fine novels that captured the spirits of the times that they were set in. Historical accuracy, rather than history as a metaphor, is his forte.



He dealt with the freedom struggle and Partition in *A Bend in the Ganges*. Compared with contemporaries such as Khushwant Singh, Kamala Markandaya and MulkRaj Anand, he wrote on the conflict between the imperial power and Indians differently, and was often criticized for his positive characterization of the British. The Socio-historical milieu of those times forms the backdrop of his novels, which are usually of action and adventure, probably reflecting in some way, his own life. He has also written non-fiction including biography and history. Apart from history, the army and communal politics during partition, Malgonkar wrote of human relationships.

He wrote five English novels: *Distant Drum* (1960) *Combat of Shadows* (1962), *The Princes* (1963), *A Bend in the Ganges* (1964), and *The Devil's Wind* (1972). His works of history are *Kanhoji Angrey* (1959), *Puars of Dewas Senior* (1962), and *Chhatrapatis of Kolhapur* (1971).

Manohar Malgonkar's fourth novel *A Bend in the Ganges* is one of the most powerful novels focusing on the background of Indian Independence and the communal riots in the Punjab. The novelist depicts before us a powerful story against the background of the troublesome times of India. The novel is especially well known for its thematic complexity. The theme is presented against the background of India's struggle for Independence and the tragedy of partition riots. It is a profound study of the human context of non-violence, violence, disintegration and communal disharmony on a vast scale. A major aspect which contributes to continuous external action and adventure in his fiction is the theme of revenge.

It is a multi-dimensional novel with multiple view points. It may be called a partitional novel for the sake of descriptive convenience. There are however, other equally interesting elements of it that deserve critical appreciation. As a matter of fact the novel explores the theme of



revenge and violence in the inter-related lives of such characters such as Gian Talwar, Debi Dayal, Sundari and Shafi Usman. However, the theme of Partition is brought into sharp focus in the last part of the novel. The action of the novel extends from domestic feud to national bloodshed. It begins with non-violence, gathers tempo through family feud and the extremist's movement and develops through the communalism and revenge. It rightly concludes with the partition tragedy and massacre of thousands of innocent lives in 1947. It suggests the great human drama of countless homes uprooted and millions of people driven from one country to another, in the aftermath of Partition.

A Bend in the Ganges depicts one of the most violent periods in recent Indian history, the revolt against the British rule. During India's struggle for independence, the two forces of Gandhiji and Subhash Chandra Bose working for the same goal pulled in contrary directions, with the result that the ideals of their different ideologies came into conflict and the young men who matured during the years of the war and the Japanese invasion of Burma doubted their own conviction of the earlier years. The issues were thus complicated and created confusion and chaos. Malgonkar takes an objective view of the turbulent years of struggle and independence and resolutely stands outside the subject to examine these conflicting ideologies and non violence. Malgonkar seems to have taken up the two philosophies only to explore them and to place the characters against these backgrounds, which forms a part of their very being. The Gandhian philosophy is here contrasted with the methods of those who believed in violent means.

In *A Bend in the Ganges*, Malgonkar turns once again to the turbulent years of the pre independence phase of Indian History, but this time his intention is not merely to get down an objective record or to celebrate a set of passing values but to probe the ideology of Ahimsa-



non-violence and truth-which the Mahatma offered to the world, not only as a political expedient but as a philosophy and a way of life.

A Bend in the Ganges may be called an epic of the Gandhian era for depiction in a very comprehensive manner the various aspects of life- political, social and moral. The novel gives the feeling that its creator is only thoroughly read in the history of freedom movement but also has been a keen observer of the feverish happenings of the Gandhian era.

Although *A Bend in the Ganges* like *A Train to Pakistan* affirms the value of love as transcending all barriers against the background of horrid communal riots, Malgonkar's novel examines more thoroughly the steady though subtle corruption of the idealistic freedom fighters in the context of communal loyalties. Malgonkar portrays different patterns of conflict-Psychological conflict, ideological conflict, cultural conflict, social conflict, and above all national conflict *in A Bend in the Ganges*.

A Bend in the Ganges is a multifaceted, ambitious and epic novel like *War and Peace*. His ability to methodize history and depict most impressively, the basic emotions of man distinguish him as a capable writer of fiction. As a creator of effective scenes, outdoor situations and living characters and as a capable manipulation of the history of India and contemporary meanings, he remains unbeatable among the Indo-Anglican fiction writers.

The powerful characterization, subtle nuances in style, the evocative descriptions and recreations of the milieu and the moment, mark this out as a classic of modern Indo-Anglican fiction.



References:

1. Malgonkar, Manohar, A Bend in the Ganges. NewDelhi: Orient Paperbacks, 1964.
2. Amur, G.S.Manohar Malgonkar. New Delhi: Arnold-Heinemann, 1973.
3. Bhatnagar, Manmohan K. Indian Writings in English: Vol.IV.New Delhi: Atlantic Publishers and Distributors, 1999.
4. Iyengar, Srinivas K.R.Indian Writing in English. New Delhi: Sterling Publishers, Pvt, Ltd, 1994. Pri Joshi, Chandra B.V.S.Naipaul: The Voice of Exile. New Delhi: Sterling Publishers Pvt., Ltd., 1994.
5. Mukherjee, Meenakshi. The Twice Born Fiction: Themes and Techniques of the Indian novel in English. New Delhi: Heinemann Educational Books, 1971.



REEXAMINING FALSIFICATION

Dr. Soumya R.V.

Department of Philosophy
Pondicherry University
R.V. Nagar, Kalapet, Puducherry

This paper is an attempt to make a discussion on some of the challenges faced by Popper's account of scientific method. Criticisms against this method can be traced in the writings of some influential thinkers of Philosophy of Science including Kuhn and Feyerabend. These criticisms, in a way demand some kinds of modifications in Popper's theory of scientific method. The question is: whether or not Popper's theory of scientific method is successful in solving the problem of demarcation? The intention behind this paper is not to undermine the relevance of Popper's theory of scientific method. Rather it is an attempt to analyze and find out those portions if strengthened could make appropriate changes in the ways to approach the problem of demarcation.

Popperian methodology can be well expressed as a combination of both deductive and experimental reasoning. The starting point is nothing but conjectures that possess a high amount of empirical content and explanatory power. Certain empirical consequences will be deduced from the conjectures which will be subjected to empirical testing. If these empirical consequences are actually obtained, then the test has to be continued. If they are not obtained, then the theory and initial conditions will be falsified by using *Modus Tollens*. In Popper's view, a sound theory is always one which possesses a high amount of empirical content. Moreover it will be the one which is fit to overcome several attempts to falsify it.

For Popper, science is nothing but the consequence of its own aims. Methodological rules advanced by Popper were aimed at the



realization of proposed aims of science. The very first rule is the rule of demarcation which will be complete with the application of the principle of falsification. As a methodological supplement to the above mentioned rule, Popper advanced what he calls a supreme meta-rule which says that "the other rules of scientific procedure must be designed in such a way that they do not protect any statement in science against falsification."¹ It is this rule that assures the application of rule of demarcation. The application of this supreme meta-rule leads to a number of rules that ensures the protection of the criterion of demarcation.

Three other rules which can be labeled 'anti-conventionalist' were introduced by Popper among which the first one is named 'No *ad hoc* hypothesis' rule. While the second among the anti-conventionalist rules has its application on the definitions in science. In Popper's words alterations in explicit definitions "are permissible if useful; but they must be regarded as modifications of the system, which thereafter has to be re-examined as if it were new."²

It is to be noted that the acceptance of alterations on explicit definitions depends on the higher degree of falsifiability possessed by the new theoretical system. If this is the case with explicit definitions, Popper holds that the application of undefined concepts in implicit definitions will definitely destroy the empirical character of theoretical systems. Popper opines that "This difficulty, I believe, can only be overcome by means of a methodological decision. I shall, accordingly, adopt a rule not to use undefined concepts as if they were implicitly defined."³ The third rule says: "Inter-subjectively testable experiments are either to be accepted, or to be rejected in the light of counter-experiments."⁴ One of the main criticisms that Popper raises against

¹ Karl Popper, *The Logic of Scientific Discovery*, London: Routledge, 2005, p.5.

² *Ibid*, p.63.

³ *Ibid*, p.54.

⁴ *Ibid*, p.63.



the conventionalists is that they make continuous attempts to save the theories even in the presence of counter instances. In Popper's view, the conventionalists hold a kind of skeptical attitude towards the counter instances and even reject them completely.

One of the important methodological rules explained by Popper is nothing but 'No-stopping rule.' It says that "The game of science is, in principle, without end. He who decides one day that scientific statements do not call for any further test, and that they can be regarded as finally verified, retires from the game."⁵ This particular rule is nothing but a warning against stopping further testing of theories. Popper writes: "...theories which we decide not to submit to any further test would no longer be falsifiable."⁶

One point that has to be noted is that Popper never claims that scientific theories can be falsified with an absolute certainty. In order to falsify a theory, first, we must establish the truth of that falsifying hypothesis and it is not possible, according to Popper. This leaves a certain amount of hope in the truth of falsified theory also. Though this situation goes against the methodology advanced by Popper. Still we can identify the role that can be played by this methodology to detect the errors existing in our theories.

One of the criticisms that can be posed against Popperian methodology is that it is hardly practiced in the actual practice of science. But it is not surprising that, sometimes, methodologists may adopt incorrect methodologies. Inconsistencies with the actual scientific practice are not sufficient enough to prove that Popperian methodology is something that deserves complete refutation. From these inconsistencies, what one can infer is the assumption that something is wrong with the proposed methodology. In the literature of philosophy of science, we can trace the criticism of Popper's theory in the writings

⁵ Ibid, p. 32.

⁶ Ibid, p.33.



of noted thinkers including Kuhn, Feyerabend and Lakatos. The common line among their criticisms of Popperian methodology is that the rules advanced by Popper are not successful in attaining the proposed aims of science as they are mentioned in his writings.

One among his methodological rules states that a new theory which is accepted in the place of an older theory should have a greater empirical content than its predecessors. Though this condition can be satisfied in certain cases, there are also some situations in which a new theory extends a promise to achieve a greater empirical content in future through development. In such conditions, adopting the theory with hope will be the better decision than rejecting it on the basis of a weak reason that it possesses less empirical content as compared to the old theory.

Another methodological rule of Popperian methodology says that the new theory should explain each and every past success of its predecessors. This demand seems to be so severe. There may be situations in which a new theory may solve a number of outstanding problems. In such situations a possibility of moving towards to a theory which is potentially capable of explaining the past achievements in the end cannot be ruled out.

There is yet another methodological rule that demands severe testing of a theory. The message it conveys is that the intention behind the testing of a theory is nothing but its falsification. This does not seem to be a healthy scientific attitude. The exclusive intention to falsify a theory can undermine the possibility of developing and extending the width of its successful applications. If we take the observations of Kuhn into consideration, it is fair enough to ignore the refuting instances for a while since continuous refutation will harm the very essence of scientific growth. For Kuhn, refuting instances are very rare instances during scientific growth. They are part of revolutionary science and not of normal science.



The next rule of Popperian methodology is related to the action that has to be taken after the refutation of a theory. Precisely, it says that an experimentally falsified theory should be rejected. Just like many other rules that have been proposed by Popper, this is also too severe to practice. Though a particular theory is shown to be empirically refuted, it will be having a history of a number of empirical successes. In Popper's account, revival of a refuted theory is not acceptable. Here, the question is: What if the refutation is due to a number of false auxiliary hypotheses? Here, one is forced to reject the Popperian rule.

The next methodological rule advanced by Popper demands the rejection of an inconsistent theory. Here, we cannot rule out the possibility of scientists holding an inconsistent theory in the hope that a future theoretical work will definitely eliminate the inconsistencies existing in the theory. The main question is: whether or not Popper is successful in solving the problem of demarcation? It can be more clearly asked: whether or not Popper could provide a rationale for all methodological rules advanced by him? What makes Popperian methodology more promising as compared to many other sets of methodological rules? This is the matter of discussion in this paper from here onwards.

As an answer to both problems of induction and demarcation, Popper introduced falsifiability as the criterion which distinguishes scientific theories from non-scientific theories. Popper firmly believed that it is only through the application of falsifiability that we can detect errors in science and adopt steps to rectify them systematically. He completely rejected the view that scientific theories can be conclusively verified. At the same time he rejected the view that scientific theories can be probable.

Now the question is: what is so special about the solution Popper has given to the problem of demarcation? In order to answer



this, a clear analysis of aims of science as it is mentioned in Poppers writings is needed. Among the proposed aims of science the very first one is nothing but the formation and rejection of theories according to the relevant methodological rules. Second aim can be described as the introduction and falsification of theories which have ever increasing empirical content and which are capable of explaining all the success of its predecessors. Introduction of theories which are capable of predicting new phenomena before their refutation and theories of ever increasing verisimilitude are the two other aims of Popperian scheme.

From the above discussion, we reach to the assumption that a slight modification is needed to assume that Popperian methodical rules possess a strong rationale behind it. It can be done if we replace the aim of science as search for truth with the search for explanations. The aim of science can be defined as explanatory truth rather than truth. In Popper's view, timely detection and elimination is the basic aim of science. If this is taken to be the basic aim of science, one has to make the assumption that theories are always vulnerable to refutation and this will consequently equate the degree of falsifiability, with degree of empirical content.

Popper opines that theories of ever increasing degree of empirical content are to be considered and taken serious in order to achieve this basic aim. Here, the search for explanations is made limited and reduced to a search for high amount of empirical content. Further the search for empirical content is reduced to detection of error and progression towards truth. The point that has to be noted is that high explanatory content cannot be equated with high amount of empirical content. Popper's attempt to prove that a high amount of empirical content is a necessary condition for high explanatory power.

The problem of finding out the rationale for methodological rules in attaining truth must be replaced by the problem of finding out the rationale behind the methodological rule for attaining increasing



explanatory power. The reason for such an assumption can be well traced in examples from Physics. Physics always extends a prestigious position to those theories which are less complex with a high explanatory power. From this it is to be understood that instead of searching for the rationale behind the methodological rules we should also ask the question: whether or not the proposed aim of science is rational? There are no sufficient reasons to suppose that simple theories are closer to truth as compared to complex theories. Thus there is no way to establish that it is simple theories which are falsifiable. From this, it can be concluded that a theory which is complex in nature is also falsifiable as a theory which is simple in nature and that of equal empirical content.

References

1. Popper, K.R. (2005) *The Logic of Scientific Discovery*. Edition published Taylor and Francis e-Library, London: Routledge.
2. ----- (1962) *Conjectures and Refutations: The Growth of Scientific Knowledge*. London: Routledge and Kegan Paul.
3. ----- (1981) *Objective Knowledge: An Evolutionary Approach*. Oxford: Clarendon.
4. ----- (1983) *Realism and the Aim of Science*. W.W. Bartley (ed.), III. London:Hutchinson Publication.
5. ----- (1994) *The Myth of the Framework: In Defence of Science and Rationality*. M.A. Notturmo (ed.) London: Routledge.
6. Kuhn, T.S. (1970) "Reflections on My Critics", *Criticism and the Growth of Knowledge*, Imre Lakatos and Alan Musgrave (eds.) Cambridge: Cambridge University Press, 231-78.
7. ----- (1970) "Logic of Discovery or Psychology of Research?" *Criticism and the Growth of Knowledge*, Imre



- Lakatos and Alan Musgrave (eds.) Cambridge: Cambridge University Press.1-22.
8. Popper, K.R (1974) "Ayer on Empiricism and Against Verisimilitude" The Philosophy of Karl Popper P.A. Schlipp (ed.) LaSalle, Illinois: Open Court, 1100-14.
 9. ----- (1970) "Normal Science and its Dangers," in Criticism and the Growth of Knowledge Lakatos and Musgrave (eds.) Cambridge: Cambridge University Press, pp.51-8.
 10. ----- (1985) "The Rationality Principle" in Popper Selections, David Miller (ed.)Princeton: Princeton University Press, pp. 357-65.
 11. ----- (1985) "The Aim of Science" in Popper Selections, Popper Selections, David Miller (ed.) Princeton: Princeton University Press, pp.162-70.
 12. ----- (1985) "The Growth of Scientific Knowledge" in Popper Selections, David Miller (ed.) Princeton: Princeton University Press. pp.171-80.
 13. ----- (1985) "Truth and Approximation to Truth" in Popper Selections. David Miller (ed.) Princeton: Princeton University Press, pp. 181-98.
 14. Corvi, R. (ed.) (1997) An Introduction to the Thought of Karl Popper. Patrick Camiller(trans.) London: Routledge.
 15. Gattei, S. (2009) Karl Popper's Philosophy of Science: Rationality Without Foundations New York, Oxon: Routledge.
 16. Giere, R.N. (1988) Explaining Science. Chicago and London: University of Chicago Press.



17. Jarvie, I., Milford, K., and Miller, D. (eds.) (2006) Karl Popper: A Centenary Assessment. Vol.III, Burlington and Aldershot: Ashgate.
18. Ladyman, J. (2002) Understanding Philosophy of Science. London, New York: Routledge.
19. Lakatos, and Musgrave, A. (eds.) (1970) Criticism and the Growth of Knowledge. Proceedings of the International Colloquium in the Philosophy of Science, London, 1965. Volume 4. Cambridge: Cambridge University Press.
20. Marcum, J. (2005) Thomas Kuhn's Revolutions: An Historical Philosophy of Science. London and New York: Continuum.
21. Rowbottom, D.P. (2011) Popper's Critical Rationalism: A Philosophical Investigation. New York, London: Routledge.
22. Sceski, J. H. (2007) Popper, Objectivity and the Growth of Knowledge, New York: Continuum.
23. Stenmark, M. (1995) Rationality in Science, Religion, and Everyday Life: A Critical Evaluation of Four Models of Rationality. Notre Dame: University of Notre Dame Press.
24. Toraldo Di Francia, G. (1981) The Investigation of the Physical World. Cambridge: Cambridge University Press.
25. Krige, John. (1978 August) "Popper's Epistemology and the Autonomy of Science," *Social Studies of Science*, Vol.8, No.3, Sage Publications Ltd. pp. 287-307.
26. Maxwell, N. (1972 January) A Critique of Popper's Views on Scientific Method *Philosophy of Science*, Vol. 39. No.2 University of Chicago Press, pp.131-52.



ECOLOGICAL CRISIS: AN EXAMINATION

Akram Ali Bhutto

Assistant Professor
Department of Political Science
Indira Gandhi College, Boitamari
Bongaigaon, Assam

1. Introduction

Before going to discuss different causes of ecological degradation and harmful consequences of ecological crisis it is essential for us to know what environment is. Environment is a harmony of physical, biological and cultural elements. Physical components include land, soil, and water and so on, biological element means plants, animals and human beings etc. and cultural component indicates man's activities on environment. Even there is a delicate state of environmental balance in between the living communities and non-living things or materials. The state of ecological balance based on the life style of living communities in general and man in particular. When the state of ecological system is disturbed by its elements, especially by man-made features, the ecosystem lost its balance. This makes the sense to say that ecological imbalance is the outcome of misdeeds with nature. In other words, when human interfere with nature with his endless requirements or needs greatly upset the environment which results severe ecological crisis. In short, any attempt to harm nature which results environmental degradation.

2. Causes of Ecological Crisis

The world at present is identified by science and technological development on the one hand and diseased by natural problem on the other hand. There are so many reasons behind this catastrophe. Alarming rate of population growth, modernization of agriculture, rapid industrialization, urbanization, transportation, deforestation etc. are the basic reason behind the environmental catastrophe. In short,



the unprecedented rate of scientific as well as technological development is primarily responsible for the present environmental degradation. The major reason behind the environmental degradation is the alarming increase rate of population growth. The alarming increase of population and so food demand that will be needed to feed an estimated population of 6-9 billion by 2050(Chen H and Yada R, 2011, 585). In India nos. of vehicles is increasing at a rate of more than 7% per annum, which creates a serious threat of noise pollution. (D.P.,2009, 11,45). In 1960 world population was 3 billion. In the last 57 years we have added more than four billion more people to our planet. Moreover arable, land has only grown four percent, compared to a population growth of 85 percent over the same time frame (FAOSTAT,) More people demand more water. Although our planet is comprised of 70% of water, only 3% is fresh water, again 2% is in the formation of ice in Polar Regions and mountain tops. Approximately 1.1 billion people do not have access to clean potable water, another 2.7 billion people live with scarce water at least 1 month out of the year(."Water Scarcity"World Wild Live). The rapid rate of ecological crisis is due to "interference of man with nature"(Das,2013,3). R. F. Dassman says, "...the human race is like an ape with a hand grenade. Nobody can say when he will pull the pin of the grenade and the whole world will be destroyed" (Dassman,1976,20).

2. A. Industrialization, Urbanization and Ecological Crisis

One of the most important factors of ecological crisis is rapid rate of industrialization. Rapid industrialization has led various ecological problems which have ruined delicate relationship between human and environment. Production of industrial wastes or poisonous gases, i.e. carbon dioxide and other chemicals brings global warming as well as unseen diseases. Products of chemical industries such as fertilizers, insecticides, pesticides etc. considers as the cause of fatal disease and death of living beings. Discharge of sulphur dioxide by



industries is the cause of acid rain which is harmful for all forms of life. Equally, various toxic gases pollute air to a great extent. Likewise, noise pollution affects brain and it is the cause of hyper-tension. Apart from these, releases of gases by industries badly affect the *ozone layer*. *Ozone layer*, as we all know, saved us from the dangerous ultraviolet rays of the Sun. The ultraviolet ray is the cause of skin cancer. The use of CFC in various applications in large scale is a serious matter, because it is one of the main cause of ozone depletion.

In the same vein of industrialization, numerous environmental crises, such as, water pollution, air pollution etc. arising from urbanization. "Shortage of housing, mushroom growth of slums with the substandard and insanitary living condition, large scale unemployment and poverty are the adverse consequences of overcrowding of population in the urban centres" (Das, 2013, 10). Modern life style in urban areas causes another serious problem, which is more use of motor vehicles. Motor vehicles affect the environment in various ways such as causing air, water and dust pollution. Huge amount of poisonous aerosol emitted from the chimneys of 'human volcanoes' results in the concurrence of pollution domes' over the industrial cities. The air quality thus deteriorates, bringing about serious health hazards. The deadly 'urban smog' formed due to mixing of smoke and sulphur-di-oxide spreads over the industrial city centres imperilling human life (ibid.). Thus, the twin process of urbanization-industrialization wastes crushed environment.

2. B. Atmospheric pollution

(I) Burning fossil fuels

The valuable mineral resources of each country are mainly coal, oil, natural gas which are fossil fuels and used as fuel for human activities. We used it in cars and power stations and burning these fuels we releases mostly carbon dioxide which adds to the greenhouse effect.



In addition such fuels also release sulphur dioxide and oxides of nitrogen, which causes acid rain.

(II) Chlorofluorocarbons (CFC's)

CFC's are used in aerosols, fridges, air conditioning units and polystyrene foam. The release of CFC's in the atmosphere damage our ozone layer of the earth, and as a result the earth is getting warmer due to incoming ultra violet rays of the Sun through the wider and wider hole of the ozone layer. Again hotter the weather we use more air conditioning units and as a consequence release more CFC's in the atmosphere and more hole in the ozone layer which allows harmful UV rays to reach to the earth surface and causes skin cancer in human.

(III) Lead used in petrol

Lead is one of the most poisonous chemicals which pollute the air badly affects to people's health, especially nervous system. Old – fashioned leader (4 star) petrol contained lead and burning of such fuel on various vehicle produces air as well as noise pollution.

2. C. Population Growth, Deforestation and Illegal wild life trade

There are many reason of deforestation, but population growth is one of them. Deforestation is also one of the reasons behind the global warming. Certainly, the rampant feeling of plants or trees accelerates the rate of soil erosion, over load the river because of siltation thereby increasing floods and flood risk. For example, the recent flash floods in Assam. "Intermitted rainfall was reported from the parts of Kamrup (Rural) district where the water level had been subsiding in Boko, Chayagaon and Palashbari, though in Goroimari, Chamaria, Sontoli, Kalatoli and Nagarbera, vast tracts of land continued to be under water"(AssamTribune,Sept.,27,2014,1). "...widespread deforestation causing siltation....added to the



destructive dimension of the floods" (Assam Tribune, Sept., 25, 2014, 6). A report published in the Assamese daily *Asomya Pratidin* states that according to Brahmaputra Board, the water carrying capacity Pandu Ghat near Guawhati is now only 400 to 100 Cubic Centimetre in winter, earlier which was 40000 to 42000 Cubic Centimetre (*Asomya Pratidin*, 6 February, 2015). Another report published in the same daily is that the water containing area of the Brahmaputra is decreasing at the rate of 1.5 feet per year (*Asomya Pratidin*, 6 February, 2015). The major reason behind the environmental crisis is population through decades. Alarming rate of population growth degrades environment to a great extent. No doubt, with the growth of population, food and other needful production increases via the advent of science and technology. Equally the amount of waste is increases and thereby affects ecology in a number of ways. As human population increases and food production also increases via chemical fertilizers which inviting severe environmental problems. Not only this, population growth increases deforestation in rural areas too. Illegal wildlife trade and environmental crime involve a wide range of flora and fauna across all continents, estimated to be worth USD 70-213 billion annually. This compares to a global official developmental assistance envelope of about 135 billion USD per annum (UNEP 2011)

Moreover, agriculture practice has led to environmental degradation to a greatest magnitude. Since mass clearing of forest areas for agriculture purposes and massive use of scientific techniques of various chemicals such as fertilizers, pesticides increased food production on the one hand and increased the magnitude of serious ecological crisis on the other hand. For example, toxic chemical used as fertilizers in the field of agriculture is the cause of cancer and massive deforestation is the cause of flash floods, namely, the flood situation of Assam and Kashmir as we have already mentioned above.



3. Some Creative solution of Ecological crisis.

3.1 Population control

Population has grown larger than the carrying capacity of the earth. Overshoot population uses resources faster than they are regenerated by the environment and produces waste faster than the environment can absorb it without being degraded.

3.2. Alternative source of energy

Use of renewable sources of energy such as wind power wave power, solar power

3.3 Environmentally-friendly forms of transport

Use of public transport like buses and trains instead of a car individually. Buses and trains are environment-friendly as it can carry large numbers of people at a same time whereas cars often carry only one person. Developing new engine technology so that cars can run cleaner fuel, like hydrogen instead of petrol. Use of bicycle for shorter journey is more effective way of saving environment.

3.4 Green products

Green products also help the environment, e.g. organic food that is produced without using of pesticides. Every household can make their own small garden for growing organic vegetables which is especially good for health and environment.

3.5 Reforestation

Instead of deforestation, reforestation helped us in a number of ways such as it reduces flood, infiltration of water, binds soil via network of roots, builds up soil rich in organic matter, provides natural habitats for all forms of lives and provides firewood etc. One of the most important functions of forestation is that it provides *oxygen* which is a must for living and takes *carbon dioxide* which is harmful for lives.



Forestation, therefore, provides *fresh air* for us on the one hand and absorbs carbon dioxide on the other hand. Thus, forestation saved us from global warming and CFC and thereby minimizes environmental degradation. Nobody can deny the value of tree because without tree human life is impossible as tree provides oxygen which is necessary for human. This is the reason why forestation is necessary.

4. Conclusion

From the above discussion it becomes clear that there are a number of causes of environmental degradation. Of many causes, this paper highlights some of the causes of environmental degradation. Environmental degradation is a threatening for the very existence of our life as well as others. So, we should take necessary measure to protect our environment, otherwise it will be harmful for all forms of life on the earth. All these measures will be successful via environmental awareness, otherwise not. Because the crisis of the nature is brought by the human beings and so its solution also lies in the hand of people, i.e., the damage of ecology and restore of ecological balance all depends on human's behaviour towards the environment. Our earth in which we live is fading away and our environment is destroying. We are facing with seriously consequences of environmental crisis caused by ourselves. Let's save our planet earth! and leave healthy environment for our next generation.

References:

1. Chen, H. and Yada, R. (2011), Trends food Sci, Techsol, 22 (585)
2. D,P. (2009), Is their evidence that environmental noise is immunotoxic? Noise and health 11 (45)
3. Food and Agriculture Organization, FAOSTAT.
4. World Wild Live website (<http://worldwildlive.org/threads/water-scarcity>)"Water Scarcity"
5. Ibid
6. Das, A. D. (2013), *Modern Environmental Ethics, A Critical Survey*, Kunal books, New Delhi, 7. Dassman, R. F. (1976), Environmental



- Conservation*, Wiley, New York 8Flood situation remains grim (2014, 27 September). *Assam Tribune*, P.1
9. 13 bodies recovered in Boko (2014, 25 September). *Assam Tribune*, P-1
 10. Nellemann C, R.H.,P.R., N.A. and E.M. The environmental Crime Crisis.
 11. Murubhumit porinat hobo Brahmaputra (2015,6th February) *Asomiya protidin*, P-1