Volume 5, Issue 2 (I)
April - June 2018

ISSN 2394 - 7780

International Journal of
Advance and Innovative Research
(Conference Special)

Indian Academicians and Researchers Association
www.iaraedu.com

JHARKHAND
Rai University
RANCHI

INTERNATIONAL CONFERENCE ON EMERGING TECHNOLOGIES, SYSTEMS AND APPLICATIONS (ICETSA – 2018)

Organized by
Jharkhand Rai University, Ranchi

Publication Partner
Indian Academicians and Researcher's Association

JHARKHAND Rai University

RANCHI

ABOUT JHARKHAND RAI UNIVERSITY (JRU)

Jharkhand Rai University (JRU) has been established under "Jharkhand Rai University Act, 2011" by Jharkhand State Legislature as per section 2 (f) of UGC Act 1956. JRU is also a member of Association of Indian Universities (AIU), Association of Commonwealth Universities (ACU London) and an ISO certified University (ISO 9001:2015). Our aim is to create a knowledge pool for the State of Jharkhand by serving the needs of diverse communities. JRU continuously strives to provide quality education to its students through dynamic research, rigorous training and efficient mentorship. The University offers Diplomas, Degrees, Postgraduate Degrees and Doctoral programs in different disciplines.

Research and Innovation forms a significant part of our envisaged goals. Our aim is to integrate research & development with academics and encourage our faculty and students to carry on research in their respective areas of interest. The University is focused on interdisciplinary, collaborative and community based research which will help to generate excellent technologies responding to the needs of local, national and global interests.

Creation of an agriculturally literate society is not only essential but is the need of the hour and our team from the Department of Agriculture strives to help the students in the learning process. Our Agricultural Education Program aims at raising awareness for food and farming. We inspire young people to think more deeply about sustainable agriculture, food supply and the role of science in this context. We also help students and the rural community specially farmers to learn entrepreneurship to become change makers.

We aspire to be a vibrant community with a focus on teaching, learning and community based research. Our faculty members are experts in their fields and professionals in their own right who bring creativity, ingenuity and resourcefulness in the mind of students. We believe in fostering pioneering minds and nurturing intellectuality in individuals. We endeavor to create the best possible environment for our students and are committed to the cause of making higher education accessible to all irrespective of caste, color and creed.

ABOUT IARA

Indian Academicians and Researchers Association (IARA) is an educational and scientific research organization of Academicians, Research Scholars and practitioners responsible for sharing information about research activities, projects, conferences to its members. IARA offers an excellent opportunity for networking with other members and exchange knowledge. It also takes immense pride in its services offerings to undergraduate and graduate students. Students are provided opportunities to develop and clarify their research interests and skills as part of their preparation to become faculty members and researcher.

ABOUT THE CONFERENCE

ICETSA will be held on 21st - 22nd April, 2018 wherein we would be inviting Academician from different Institutes/ Colleges/ Universities, Industry Professionals, Research Scholars, Student, Entrepreneurs, Government Experts and Bureaucrats to participate in Invited Talks and Paper Presentation. Selected abstracts will be published in the souvenir of the conference and accepted papers will be published in UGC approved journals. All submissions will be reviewed by group of peers for assurance of technical merit and quality content. It is anticipated that a broad range of emerging technologies, systems and applications will be covered during the conference. The conference aspires to exhibit the technical excellence of budding technocrats, research scholars, representatives from all over the world. This conference is sponsored by Govt. bodies, Institutes of technical and international repute & industries.

PREFACE

This Special issue of the UGC Approved International Journal of Advance & Innovative Research (IJAIR) contains peer-reviewed manuscripts presented at the "International Conference on Emerging Technologies, Systems and Applications (ICETSA-2018)" held during 21st -22nd April, 2018. The journal is published by the Indian Academicians and Researchers Association (IARA). Jharkhand Rai University organized this conference with an aim to achieve the goal of sharing and enhancing scientific and technological knowledge especially in the emerging areas. It is expected that the useful discussions and research outcomes presented during this Conference would help in using technological and scientific developments to ameliorate basic problems faced by poorer sections of the society. The Conference provided a good opportunity both to those who have a thirst for knowing about present technological developments as well as those who needed a platform to share their original research ideas.

More than 100 papers were presented in ICETSA-2018 and 20 of them after peer-review have been selected for publication in this special issue of IJAIR. The topics bring together ideas from contrasting fields like information technology, agriculture, management, mathematics and physical sciences. The aim however, of both the Conference as well as the choice of papers for this special issue, has been to highlight the application of modern research for solving problems of the poor masses living in developing and under-developed countries. One of the papers discusses the possible use of data mining for prediction of heart diseases. It can be a very useful research specially considering the increasing number of deaths occurring due to heart ailments in our cities these days. Two other papers review the role of information technology in financial inclusion and the use of personal digital assistants. They highlight aspects of our changing society which is slowly making a transition towards a technological society, where a lot of our basic needs are going to be effectively fulfilled through use of modern technology. One of the papers from agricultural research shows how grass extracts can be used for antioxidative synergistic purposes. The work can help in curing and preventing critical diseases, at effectively minimal price. Another research discusses the possible use of catalytic waste water for agricultural irrigation, while another paper suggests a solar desalination system for water purification in disaster affected areas. One paper focuses particularly on Ranchi (the host city of this Conference) and discusses the ground water recharge potential of the city. These three papers aim to provide technological solutions for the huge problem of water scarcity on whose edge the whole world is standing at the present moment. Another refreshing paper studies the role of tribal women of Jharkhand (the host state of the Conference) in guarding agricultural biodiversity. A bio-technological research study highlights how Gamma radiations can be used to increase the agricultural yield, while another paper discusses antibacterial screening of edible crabs. One more study focuses on evaluation of genotypes against maize stem borer, while another one discusses the possible emulsification use of bacteria extracted from soil contaminated by crude oil. One more study in this field that needs mention is one that brings out various aspects of green marketing in India. These studies can go a long way in solving our agricultural problems and specially provide alternative and efficient methods to farmers, who in the present day are getting caught in debt-traps often leading to suicides. Two engineering studies deal with the effect of carbon doping and the simulation of friction stir welding. Some of the other interesting papers deal with the impact of human resource audit on value creation and delivery, anthropometric features of the children of Siliguri town, teaching practices in business schools of Jharkhand, use of mathematical models and inventory control in automobile retail sector, and construction of newer norms for combined motor fitness tests.

The conference proved to be a good small step in bridging the gap between researchers working in academia and other professionals working in industry and service sector. As the convener of the Conference, I hope that this Special Issue will also prove to be successful in furthering our overall aim of converging technological developments with societal problems. Such a large conference was the

culmination of the untiring effort of many individuals, including the faculty members, management, non- teaching staff and students of Jharkhand Rai University. I take this opportunity to once again thank the conference committee for extending their valuable time in organizing this conference, all the authors, participants, reviewers, sponsors, and the publication team at IARA for their sparkling efforts and their belief in the excellence of ICETSA-2018.

Dr. Neha Keshri
Jharkhand Rai University
Ranchi, Jharkhand

Dr. Neha Keshri
Guest Editor, Special Issue

International Journal of Advance and Innovative Research

Volume 5, Issue 2 (I): April - June 2018

Journal - 63571

UGC Journal Details

Name of the Journal :	International Journal of Advance & Innovative Research
ISSN Number :	
e-ISSN Number :	23947780
Source:	UNIV
Subject:	Multidisciplinary
Publisher:	Indian Academicians and Researchers Association
Country of Publication:	India
Broad Subject Category:	Multidisciplinary

International Journal of Advance and Innovative Research

Volume 5, Issue 2 (I): April – June 2018

CONTENTS

Research Papers

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

ANTIOXIDATIVE SYNERGISTIC EFFECT OF EXTRACT MIXTURE OF SOME GRASS SPECIES

Aloke Sarkar[1], Debjoy Bhattacharya[2] and D De Sarker[3]
[1]Department of Botany, Jharkhand Rai University, Ranchi
[2]Department of Sericulture and Department of Botany[3], Raiganj University, Raiganj

ABSTRACT
It has been reported that combination of different antioxidants or bioactive compounds may increase the effectiveness (Mahmoud Rafieian-Kopaei, 2013,June)[1]. Smet and others (2008) found that dietary synthetic antioxidants combined with α-tocopherol were more effective than rosemary green tea, grape seeds, or tomato interacts alone or in combination. In this paper we have tried to find-out whether there is synergism in the mixture of interacts three different grass species with respect of antioxidative reactions. Three grass species tried were, kyllinga nemoralis, Kyllinga brevifolia, and Elusine indica. These grasses grow commonly in the northern plains of west Bengal, India. The RSA values of Antioxidants were measured for each species along with their combination. Results show that there is obviously a correlation of synergistic effect of antioxidative reaction.

Keywords: bioactive compounds, synergism, kyllinga nemoralis, Kyllinga brevifolia, Elusine indica

I. INTRODUCTION

Among all the naturally growing vascular plants, grasses are very common, particularly in alluvial plain of North Bengal,India.Their mode of reproduction susceptibility to withstand in variety of Season makes them dominant species in certain area. Leaves of grass species constitute the principle foods for herbivores. The herbivores are in turn the main source of meat for human food. It has been found that the health of herbivore animals in turns the quality of meat is higher when domesticated animal consume variety of mixture grass species. Herbivores food when sourced from a single species of species grass, the quality of meat is far inferior to consumed mixed type of food. It has also been a matter of experimentation that the mixture of various medicinal plants for a particular medicine as practiced in *Āyurveda* always performed better that single non-mixture plant source. There are several reports from synergistic effects in mixture with respect to antioxidant activity both in-vitro and in-vivo.

There are few works on using grass species and their mixtures to assess the antioxidant activity. Individual works have been done but the mixtures of grasses have not been done so far. The three common grasses Kyllinga *brevifolia* Rottb. *Kyllinga nemoralis* (Hutch & Dalz) and *Eleusine indica* (L.) Gaertn.((Indian goosegrass)) are easily available throughout the North Bengal plains in cultivated lands as well as open fallow lands.RSA activity (using DPPH)of individual as well as the mixture of combination were studied in the present paper.

The objective of this work was to study the antioxidant activity and the synergistic interaction between the fresh plant water soluble extracts of each species along with their combination

II. MATERIALS AND METHOD

2.1 Plants

Kyllinga brevifolia Rottb. (Family- Cyperaceae)The plant is commonly known as 'kyllinga weed'and is perennial, stoloniferous, flowering heads are green in colour, leaves shorter than stem. This grass is so common and abundant in North Indian plains along the water courses of crop and paddy fields.The leaves contains essential oils(sesquiterpenols eg. α-cadinol,δ-cadinene , α-muurolol,germacrene D 4-ol) [2]**.** *Kyllinga nemoralis* (Hutch & Dalz) (Family- Cyperaceae)The plant is commonly known as Whitehead spike sedge or poverty grass and is also perennial and rhizomes are stoloniferous,flowering heads are white in colour, leaves are as long as or longer than stem. This grass is very common and abundant in North Indian plains along the road side of damp places, crop field throughout the year.The plant leaves contain many biologically active chemicals like terpenoids, saponins phenolic compounds[3] and essential oils (terpenes α-cyperone, β-selinene, and α- humulene),[4]The rhizomes possess flavonoids, triterpenoids and glycosides[5]. The most representative compounds are α-cadinol, caryophyllene oxide, α- muurolol, α-humulene, and α-atlantone[6]. *Elusine indica(L.)*Gaertn the plant is perennial and commonly known as cow foot grass, crab grass and found almost everywhere in fallow land, play ground, road side in west Bengal as well as Northern India.

2.2 Chemicals and Spectrometry

The chemicals and reagents {2,2 diphenyl -1-phcrylhydrazyl(DPPH),Methanol,Ethanol,etc} used in all experiments were of analytical and HPLC grade and purchased from Bengal Chemicals and Hi-media Lab,

ISSN 2394 - 7780

Mumbai. Absorbance measurements to determine the free radical scavenging activity were performed by the Spectrophotometer 166 of SYSTRONICS. The Software used for statistical analysis was PAST.

2.3. Preparation of the aqueous plant extracts

The fresh green leaves, stolons and tubers of individual three plants, *kyllinga nemoralis*,*Kyllinga brevifolia*, and *Elusine indica*, were collected from the local crop fields, road side of Uttar/ Dakshin Dinajpur districts of West Bengal, India in a quantity of sufficient amount and the plant materials were identified and authenticated by the Botany Department of Raiganj University. The leaves, stolons and tubers were washed under running distilled water and soaked through blotting paper, then dried and finally cut into small pieces for the preparation of fresh plant extracts. The appropriate amount of plant pieces were pasted in a grinder to get crude fresh plant extracts of individual and mixtures (1:1). The crude preparation was then centrifuged for few minutes and finally filtered for DPPH test.

2.4 Determination of the DPPH radical scavenging activity]

The hydrogen atom or electron donating ability of the plant extract was determined from bleaching of purple colored ethanol solution of DPPH; Gallic acid was used as standard. This spectrophotometric assay uses the stable radical DPPH as a reagent. The procedure involves measurement of decrease in absorbance of DPPH at its absorption maxima of 517 nm. DPPH was prepared at a concentration of 0.002%. The stock solutions of the extracts were prepared in water (200 mg/ml). Different volume (1.0, 0.5, 0.25, 0.125 ml etc) of extracts was taken in separate test tube and volume was made up to 1.5 ml with ethanol/methanol. Now 1.5ml of DPPH solution was added in each test tube and kept in dark for 30 minutes.. Later optical absorbance was recorded at 517 nm using UV- Visible spectrophotometer. Methanol/ethanol with DPPH was used as a control. All the samples were tested in triplicate. The formula used for the calculation[7] is:

$$\% \text{ of RSA Values} = \frac{A_{control} - A_{sample}}{A_{control}} \times 100$$

Whereas $A_{control}$ and A_{sample} are the absorbance values of the control and test sample, respectively.

III. RESULTS

3.1. Statistical analysis

The synergistic effect of two or more antioxidants is an idea of recent origin. Met and Others(2008) showed that dietary synthetic antioxidant combined with α-tocopherol were more effective than rosemary, green tea, grape seeds or tomato extracts (100-200 ppm) alone or in combination. It has been proposed that mixed free radical acceptors involves two antioxidants, one that reacts with the peroxi radical (and is consumed) and second that regenerates the first . It has been reported that addition of anthocyanin can prevent the oxidation of ascorbic acid by metal ions i.e Copper (Sharma and Others 1987).

Lee and Others (2005) found that combination of Chilators (Sodium-tri-phosphate or Sodium Citrate) with reductants (e.g Erythorbate) and /or free radical scavengers were effective antioxidants.

Pinelo and Others have shown that mixtures of three mono-phenols increase in antioxidative activity followed by subsequent of all solution combination.

In our present study we have used crude plant extract mixtures between three herbs. It has been found that there are uniform increases in RSA activity over its component plant interacts,when ,compared at equal fresh weight (in mg) . the observed data were tabulated in the different forms as shown bellows-

Table 1: % of RSA of 3 grasses and their respective mixtures

Kb = *Kyllinga brevifolia*, Kn = *Kyllinga nemoralis* , E = *Elucine indica* , Kb+E = mixture of Kb and E(1:1), Kn+E = mixture of Kn and E(1:1) , Kb+Kn = mixture of Kb and Kn(1:1)

Crude extracts	Kb	Kn	E	Kb+E	Kn+E	Kb+Kn
5 mg	35.97±1.20	21.48±1.70	12.92±1.40	23.89±1.14	55.4±1.25	66.03±1.13
10mg	46.49±0.88	30.66±1.52	26.5±0.68	38.84±2.25	63.86±0.77	71.16±1.07
20 mg	67.16±1.12	50.79±0.46	42.87±1.97	59.51±0.64	88.72±1.01	78.94±0.70
30 mg	70.51±1.71	60.03±1.41	55.68±1.50	78.67±1.18	87.48±1.44	77.53±1.08
40 mg	72.9±1.62	66.56±1.59	68.01±0.40	85.29±0.54	86.84±1.20	78.48±1.06
60 mg	70.96±0.54	64.85±2.68	67.9±1.12	89.80±1.28	84.75±1.33	76.64±1.18
80 mg	73.01±0.99	65.14±1.13	68.79±1.76	94.07±1.73	88.35±1.93	76.94±1.77

ISSN 2394 - 7780

Table 2: Changes in RSA values (% of inhibition in DPPH) of the mixture over its components plants (Calibrated to equal weight in *mg*)

(+) = increase, (-) = decrease

Plants / Concent.	Kb+E to Kb	Kb+E to E	Kn+E to E	Kn+E to Kn	Kb+Kn to Kb	Kb+Kn to Kn
5 mg	-38.81±3.27	+87.40±11.90	+337.09±39.49	+165.15±15.96	+83.75±2.99	+210.23±18.32
10mg	-18.54±5.16	+46.48±5.29	+141.16±3.86	+109.43±8.02	+53.07±0.90	+133.33±8.73
20 mg	-13.5±0.66	+39.27±4.94	+107.58±6.93	+74.65±0.44	+14.73±1.03	+55.41±0.75
30 mg	+11.62±1.08	+41.41±3.36	+57.19±1.65	+45.77±1.10	+10.01±1.39	+29.19±1.27
40 mg	+17.10±1.90	+25.40±0.23	+27.67±1.07	+30.54±1.51	+7.69±1.06	+17.96±1.38
60 mg	+26.54±1.15	+32.28±1.39	+24.82±1.04	+30.94±3.30	+7.98±0.85	+18.45±3.39
80 mg	+27.81±1.72	+36.77±2.77	+28.45±1.30	+35.61±1.49	+5.35±0.97	+18.09±0.65

Table 3: Graphical representation of RSA Values of the three individual crude plant extracts and their mixtures

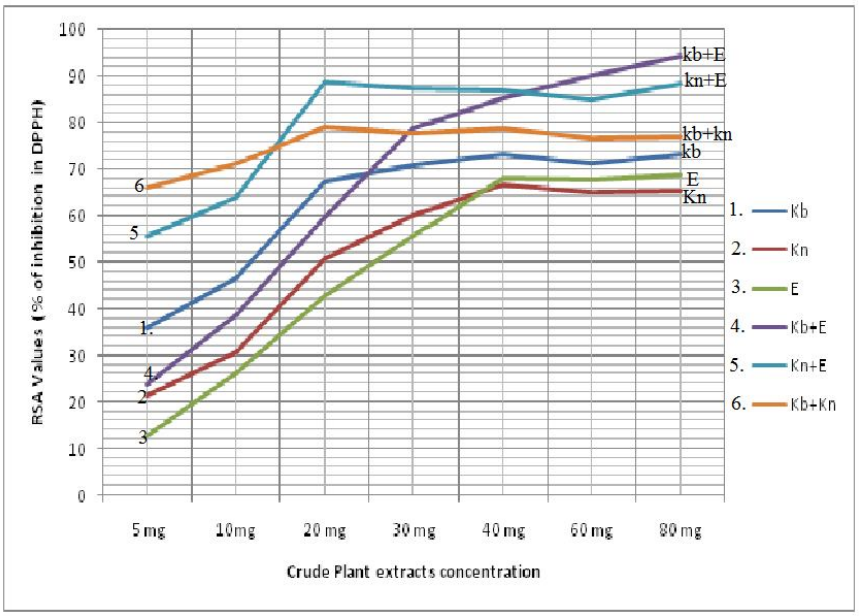


Table 4: Increase % of activity in Mixture from single extract

Extract concentration	kb--KbE	E--KbE	E--KnE	Kn--KnE	Kb--KnKb	Kn--KnKb
5 mg			**358%**	**161%**	**94%**	**209%**
10 mg		**46%**	**142%**	**110%**	**36%**	**133%**
20 mg		**40%**	**109%**	**76%**	**29%**	**56%**
30 mg	**11%**	**41%**	**60%**	**49%**	**10%**	**30%**
40 mg	**18%**	**25%**	**17%**	**21%**	**5%**	**15%**
60 mg	**25%**	**32%**	**26%**	**32%**		**4%**
80 mg	**30%**	**39%**	**23%**	**29%**		

IV. DISCUSSION

4.1. From the above data charts following impressions have been analyzed

1. It is clear that when the concentration of individual plant extracts increases, the RSA values of all 3 species are also increased. (The RSA values of all six extracts are gradually increases in respect of their extracts concentrations. The % of RSA activities and the concentration of different crude extracts are directly proportional to each other up to certain level)
2. *Elucine indica* has less RSA activities where as it is highest for *Kyllinga brevifolia* .e.g. ***Kb+E > Kn+E > Kb+Kn > Kb > Kn > E***
3. Though the *Kyllinga brevifolia* and the *Kyllinga nemoralis* are same genus but their antioxidative activities are different may be due to the varied different bioactive components.
4. The % of increase RSA activities are more prone in low concentration rather high.

ISSN 2394 - 7780

4.2. T-Test

The table value of (t) as at **(t) 0.05, 6 = 1.943** the calculated value of **(t)** =3.23>,3.06>,2.14>,3.33> tabulated value **(t) 0.05** = 1.943, the Null hypothesis is rejected in above cases, this is significant difference in the mean RSA activity in the mixture of(Kn+Ei to Kn),(Kn+Ei to Ei),(Kb+Kn to Kb) and (Kb+Kn. To Kn) but the calculated value [t] is less than the tabulated value Null hypothesis is accepted and hence no Significant difference between the mixtures of (Kb+Ei to Kb) and (Kb+Ei to Ei) **.**Student t test was applied for all the combination results. Baring two combination i.e. combination between *Kyllinga brevifolia and Elucine indicaover (KE and EI),* all other combination shown the calculated value of "t" above the critical valueof "t" at 0.05, 6 = 1.943.this confirm the statistical significant difference between the means of combination and non-combinations

Table 5: t - test between the mixture and individual plant extracts

combinations	calculated value of t	comments
Kb+Ei to Kb	0.4031	difference is not significant at 0.05%
Kb+Ei to Ei	1.3683	difference is not significant at 0.05%
Kn+Ei to Kn	3.2399	difference is significant at 0.05%
Kn+Ei to Ei	3.0631	difference is significant at 0.05%
Kb+Kn to Kb	2.1412	difference is significant at 0.05%
Kb+Kn to Kn	3.3301	difference is significant at 0.05%

V. CONCLUSION

In this paper we studied the synergistic effect of antioxidants found in mixture of combination of three common grasses of West Bengal,India.It gave us the confirmation on antioxidative synergistic effects present on naturally growing plants like grasses. . The fact is that the materials included in the experiment are natural and shown better antioxidative activity than the single individual plants makes them attractive for commercial food processor.

VI. ACKNOWLEDGEMENT

We are thankfull to Department of Botany,sericulture of Raiganj University for providing lab facilities.Authers wish to express special thanks to Dr. Manas Ranajan Saha ,Department of Botany,UNB, West Bengal, India, for analysis.

REFERENCES

1. Mahmound Rafienian-Kopaei,A.B. (2013,June). Combination of metformin with other antioxidants may increase its renoprotective efficacy. *Journal of Renal Injury Prevention*, Volume 2.Number 2 ,35-36.
2. Journal of Essential Oil Bearing Plants ,Jeobp 15 (5) 2012 pp 854-857 Leaf Essential Oil Composition of Kyllinga brevifolia Rottb. from Nepal Prajwal Paudel,Probodh Satyal,Ganesh Ghadka and William N. Setzer.
3. Arumugam S, Ramadoss K, Vadivel V, Balasubramanian D and Muthu R. Evaluation of hepatoprotective activity of Kyllinga nemoralis (Hutch & Dalz) rhizomes, Journal of Ethnopharmacology; 127:555-557.(2010).
4. Komai K, Tang CH. Chemical constituents and inhibitory activities of essential oils from Cyperus brevifolius and C. kyllingia, Journal Chemical Ecology; 15:2171- 2176.;(1989).
5. Jusal P. Quanico, Evangeline C. Amor1, and Grace G. Perez. Analgesic and Hypoglycemic Activities of Bixa orellana, Kyllinga monocephala and Luffa acutangula, Philippine Journal of Science; 137 (1):69-76;(2008).
6. Sorachai Khamsan, Boonsom Liawruangrath, Saisunee Liawruangrath, Aphiwat Teerawutkulrag, Stephen G. Pyne and Mary J. Garson. Antimalarial, Anticancer, Antimicrobial Activities and Chemical Constituents of Essential Oil from the Aerial Parts of Cyperus kyllingia Endl, Records of Natural Products; 5(4):324-27;(2011).
7. Yen GC, Duh PD (1994). Scavenging effect of methanolic extracts of peanut hulls on free-radical and active oxygen species. J. Agric.Food Chem. 42: 629-632.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018

ISSN 2394 - 7780

PERSONAL DIGITAL ASSISTANT

Aneesh Veeresh Angadi and Yash Khairnar
Computer Science and Engineering, SRM Institute of Science and Technology, Ramapuram Part – Vadapalani Campus, Chennai

ABSTRACT

When search engines were introduced to the world, they were made for everyone so that everyone can find anything they need among the billions of things in the world. With that came the modern technological revolution, where the growth rate of information skyrocketed to new heights. Then the world was introduced to Personal Digital Assistant. The objective of Personal Digital Assistant in short was to make things simpler and convenient for users. As the world is moving towards Artificial Intelligence because of its unknown capabilities and possibilities, the world is already investing billions of dollars on it.

The Personal Digital Assistant is a metalayer of insight that sits on the highest point of different administrations and applications and performs activities utilizing these administrations and applications to satisfy the client's goal. These days, Personal Digital Assistant makes utilization of some of center arrangement of advances, for example, Machine Learning, Speech Recognition, Language Understanding, Question-Answering, Dialog Management, Language Generation, Text to Speech Synthesis, Data Mining, Analytics, Inference and Personalisation.

Personal Digital Assistants are built to help user get things done like setting up an alarm, reminder, meetings, taking notes or creating list and provide easy access to personal/external structured data, web service and application like finding the user's documents, locating a place, making reservations or playing a music. They also assist the user in his/her daily schedule and routine by serving notifications and alerts based on contextual information, such as time, user's location and feeds or information produced by various web services, given the user's interest like commute alerts to/from work, meeting reminders or concert suggestions. Collectively these functionalities are expected to make the users more productive in managing his/her work and personal life.

Keyword : Machine Learning, Speech Recognition, Language Understanding, Question-Answering, Dialog Management, Language Generation, Text to Speech Synthesis, Data Mining, Analytics, Inference and Personalisation.

I. INTRODUCTION

we have since quite a while ago imagined that one day PCs will comprehend normal dialect and expect what we require, when and where we require it, and proactively total undertakings for our benefit. As PCs get littler and more inescapable, how people interface with them is turning into a significant issue. Notwithstanding various endeavors in the course of recent years to make dialect understanding (LU) a compelling and strong characteristic UI for PC collaboration, achievement has been constrained and perused to applications that were not especially integral to regular utilize. In any case, discourse acknowledgment and machine learning have kept on being refined, and organized information served by applications and substance suppliers has developed. These advances, alongside expanded computational power, have widened the utilization of common LU to a wide range of ordinary errands that are integral to a client's efficiency. We trust that as PCs end up littler and more pervasive [e.g., wearables and Internet of Things (IoT)], and the quantity of uses increments, both framework started and client started assignment fulfillment crosswise over different applications and web administrations will end up crucial for individual life administration and work efficiency. In this article, we give a review of individual computerized aides (PDAs); portray the framework design, key segments, and innovation behind them; and talk about their future potential to completely rethink human– PC association.

We are living in the portable Internet processing cycle. Amid the previous decade, cell phones have encountered phenomenal development. As indicated by Statista, there are right now in excess of 4.6 billion cell phone clients on the planet, and the number is required to become much all the more advancing. With this wonderful increment in volume came specialized refinement and enhanced capacities of cell phones (both on the equipment and programming sides), especially around applications and web administrations where clients can finish a wide cluster of undertakings. As the need and desire to accomplish more developed, in spite of upgrades, a constrained normal UI has stayed as one of the real bottlenecks in cooperating with these gadgets. PDAs (otherwise called virtual colleagues) definitely focus on this issue and have the guarantee of upgrading a client's profitability by either proactively giving the data the client needs in the correct setting (i.e., time and

ISSN 2394 - 7780

put) or responsively noting a client's inquiries and finishing errands through characteristic dialect. Assignments can be identified with gadget usefulness, applications, or web administrations.

Research on PDA innovation, in any case, began significantly sooner than the development of cell phones. Throughout the most recent 20 years, scientists have researched customized virtual colleague operators focusing on particular spaces, including tourism, senior care, gadget control, and home and office applications. In any case, endeavors at offering them for sale to the public prior have fizzled in view of their restricted utility.

In the course of recent years, there has been huge interest in PDA innovation by both little and enormous innovation organizations. Siri, Google Now, Cortana, and Alexa are the real individual collaborators in the market today, and they give proactive or potentially receptive help to the client. Proactive help alludes to the specialist making a move to help the client without the client's express demand. Receptive help alludes to the operator reacting to the client's voice or composed order to help him or her. The quantity of cell phone clients utilizing PDAs expanded from 30% out of 2013 to 65% out of 2015, showing expanded selection. PDAs have turned into a key capacity in many cell phones. They are currently additionally sent in tablets, PCs, work area PCs, and headless gadgets (e.g., Amazon Echo), and some are likewise even incorporated into working frameworks. These operators are intended to be close to home; they know their client's profile, whereabouts, timetables, et cetera. They can proactively begin cooperations with their client through warnings and framework started inquiries or re-effectively react to client demands. User– PDA cooperations normally happen by means of regular dialect, where the client addresses the operator as though he or she were addressing a genuine human right hand.

II. SYSTEM ARCHIECTURE

The situations that the PDAs support can be isolated into two fundamental classes: 1) proactive and 2) receptive help. The reasonable operator engineering intended to help these two methods of help. The framework engineering delineates proactive and responsive client encounters, information, and administration end focuses. Responsive help, where the client issues an unequivocal normal dialect order (e.g., "book me a taxi") to the specialist. The client ask for is dealt with through an arrangement of receptive help parts, for example, discourse acknowledgment, LU, and DM. The information returning from different closures, and applications are served to the client as indicated by the limitations determined in the common dialect inquiry.

The experience (receptive or potentially proactive) can be served in at least one of the distinctive gadget or administration end focuses. Proactive help includes expectant processing, where the individual advanced specialist gets things done in a relevant way (i.e., at the opportune time and place) that it anticipates that is significant will the client without an express client ask. Proactive help makes utilization of derivation, client displaying, and positioning to control encounters. Backend information, gadget, applications, and web administrations signals are utilized for proactive induction and activating. Despite the fact that proactive and responsive parts of the present PDA designs are worked in separation, on a fundamental level they can utilize a solitary engineering to empower the two kinds of encounters. Truth be told, most proactive situations have responsive augmentations and the other way around. For instance, if the client makes an eatery reservation (responsively), the specialist may (proactively) recommend a motion picture after the supper or may offer to book a taxicab to take the client to the eatery. Information and setting are shared between the two help modes. Next, we center around the proactive framework design and the segments that power proactive situations.

At the point when a client enters an inquiry, the client's program first plays out a space name framework (DNS) query to a specific IP address. To give sufficient ability to deal with question traffic, our administration comprises of various groups dispersed around the world. Each group has around a couple of thousand machines, and the topographically appropriated setup secures us against calamitous server farm disappointments (like those emerging from tremors and vast scale control disappointments). A DNS-based load-adjusting framework chooses a group by representing the client's geographic nearness to each physical bunch. The heap adjusting framework limits round-trip time for the client's demand, while likewise thinking about the accessible limit at the different groups.

The pursuit procedure is testing a direct result of the huge measure of information: The crude records contain a few several terabytes of uncompressed information, and the modified list coming about because of this crude information is itself numerous terabytes of information. Luckily, the hunt is very parallelizable by separating the list into pieces (list shards), each having a haphazardly picked subset of archives from the full file. A pool of machines serves demands for every shard, and the general file group contains one pool for every shard. Each ask for picks a machine inside a pool utilizing a middle of the road stack balancer—at the end of the day, each question goes to one machine (or a subset of machines) appointed to every shard. In the event that a shard's

ISSN 2394 - 7780

copy goes down, the heap balancer will abstain from utilizing it for inquiries, and different segments of our group administration framework will attempt to restore it or in the end supplant it with another machine. Amid the downtime, the framework limit is decreased in extent to the aggregate portion of limit that this machine spoke to. Be that as it may, benefit stays continuous, and all parts of the record stay accessible

III. APPLICATION CHARACTERISTICS

A PDA is a metalayer of knowledge that sits over different administrations and applications and performs activities utilizing these administrations and applications to satisfy the client's aim. A client's goal could be express, where the client charges the framework to play out an activity, or it could be construed, where the operator advises or makes endless supply of at least one activating conditions it has been following. PDAs make utilization of some center arrangement of innovations, for example, machine learning, discourse acknowledgment, LU, question replying, content to-discourse combination, information mining, examination, derivation, and personalization.

PDAs are worked to enable the client to complete things (e.g., setting up an alert/update/meeting, taking notes, making records) and give simple access to individual/outside organized information, web administrations, and applications (e.g., finding the client's reports, finding a place, reserving a spot, playing music). They likewise help the client in his or her day by day calendar and routine by serving notices and alarms in view of relevant data, for example, time, client area, and sustains/data created by different web administrations, given the client's advantages (e.g., drive cautions to/from work, meeting updates, show recommendations). By and large, these functionalities are relied upon to make the client more gainful in dealing with his or her work and individual life. For instance, carrier travel is a normally upheld situation by generally PDAs.

On the off chance that the client has booked a flight and got an affirmation email alongside an agenda, the PDA filters the email, removes the flight data, and stores it on the administration. Upon the arrival of movement, the PDA figures the client's present area utilizing the worldwide situating framework (GPS) on the gadget, checks the activity conditions to the airplane terminal, and advises the client when to leave for the air terminal. It additionally checks the flight status and updates the client if there is a postponement, utilizing a flight card.

Also, it gives climate estimates to the goal and also cash transformation rates. Ordinarily, a client needs to utilize various applications to experience every one of these means to discover the required data that is recorded on the cards for the movement. None of these nuclear advances is noteworthy in segregation, yet sewing them together can conceivably check a leap forward in helpfulness to the client. This is the key guarantee of PDAs.

IV. OPERATOR, INTENTS AND ENTITIES

Operators are best depicted as NLU (Natural Language Understanding) modules. These can be incorporated into your application, item, or benefit and change common client demands into noteworthy information.

This change happens when a client input matches one of the plans inside your operator. Expectations are the predefined or designer characterized segments of specialists that procedure a client's demand.

Operators can likewise be intended to deal with a discussion stream particularly. This should be possible with the assistance of settings, goal needs, opening filling, obligations, and satisfaction through webhook.

V. PROACTIVE ASSISTANCE

As a general recommendation, counterfeit consciousness is for the most part any product which approximates some huge portion of some part of human knowledge. The catch is the extensive variety of level of many-sided quality and trouble moving that portion up to a nearby estimation of human knowledge. Solid AI alludes to a bigger part, Weak AI alludes to a littler portion.

Just to be clear, AI does not entirely or even normally infer Strong AI. A driverless auto uses AI regardless of whether it can't tackle the greater part of the non-driving issues that even a normal individual can do easily. What is most essential is that AI is used to give preferable answers for issues over if AI was not utilized. Machine insight is ordinarily utilized as an equivalent word for AI, yet can likewise allude to types of knowledge which are past or not quite the same as human insight, for example, discovering complex examples in a lot of information.

Machine Learning is basically the procedure by which machines gain information. It by and large spotlights on investigating information for examples and connections. Profound Learning goes significantly further and endeavors to break down the idea of the marvels that the information speaks to, including disclosure of guidelines of conduct, collaborations, and methodology.

ISSN 2394 - 7780

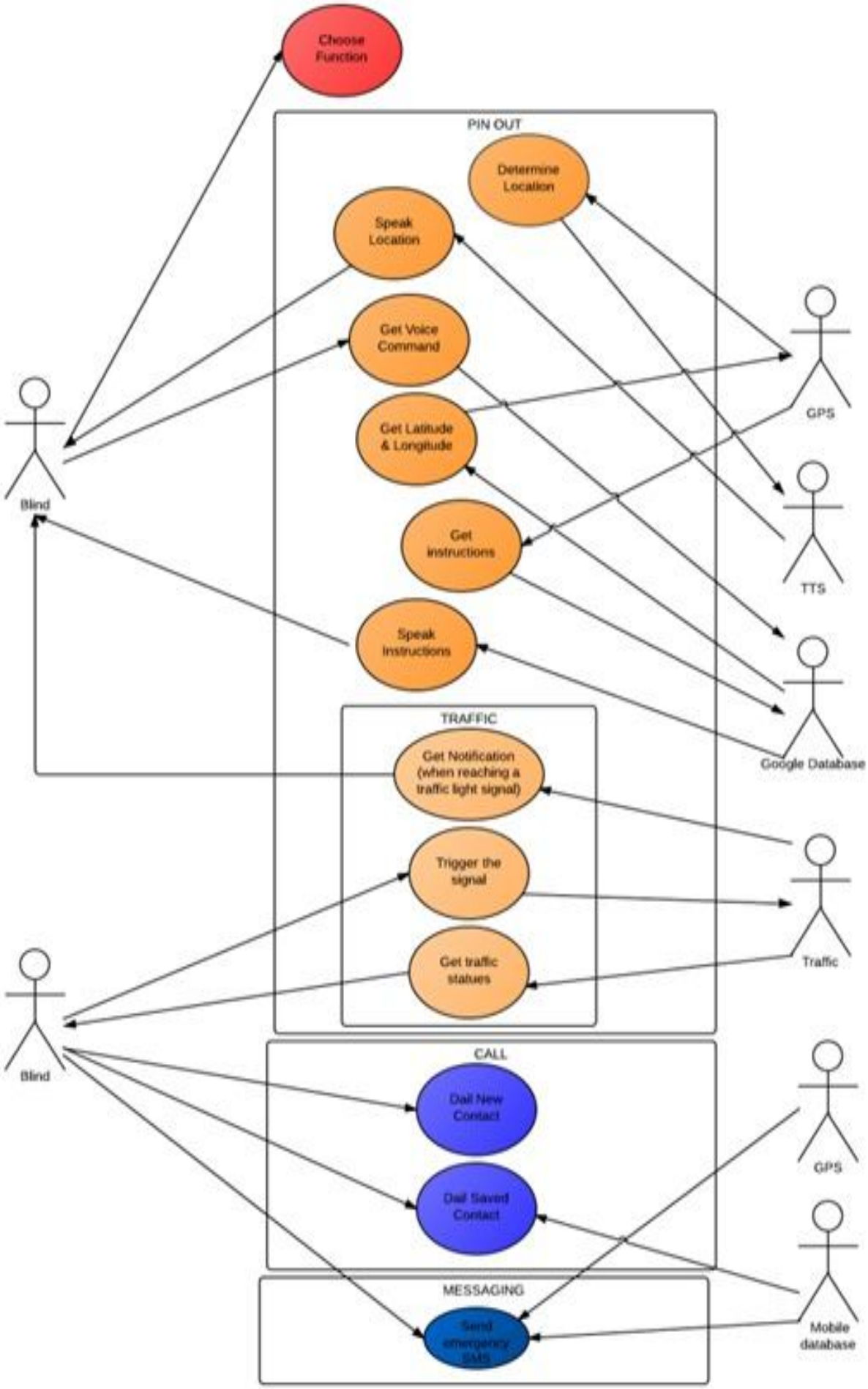


Figure-1: Use case diagram

ISSN 2394 - 7780

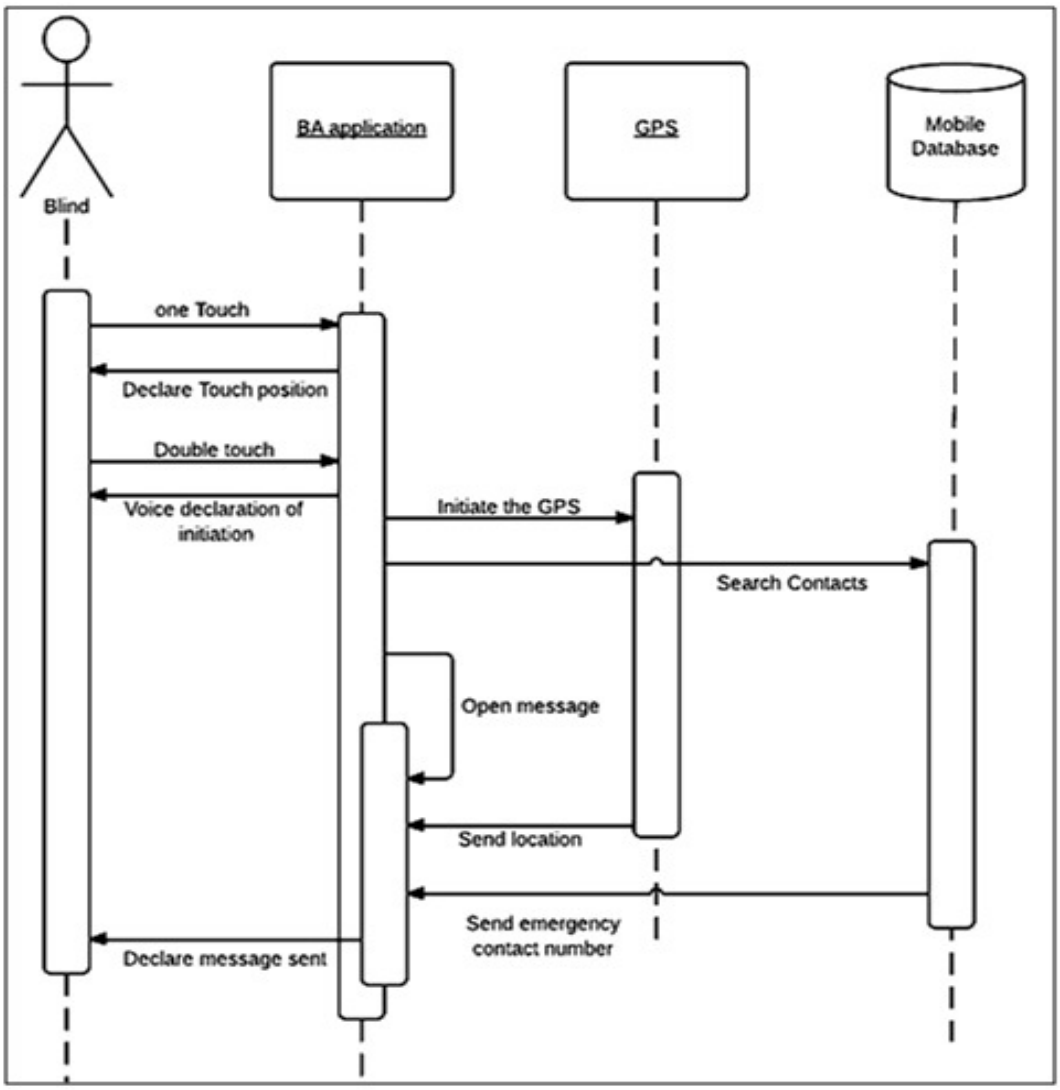


Figure-2: Sequencing diagram

Proactive help depends on the hypothesis of proactivity that portrays client wants and a model of accommodation. The objective is to give help to mechanize assignments or further the client's advantages for things he or she thinks about, all inside setting, without express client ask. To accomplish that, the specialist is intended to have an arrangement of qualities; it ought to be significant in that it progresses the client's advantages and errands, while not meddling with the client's own particular exercises or consideration unless it has the client's express endorsement. It ought to be unimposing. The specialist ought to be straightforward in what it thinks about the client. It ought to be expectant and know the future needs of the client and convey chances to the surface. The operator ought to likewise persistently take in and refine its choices from the input signals it gets in regards to the moves it makes. These standards put the client at the inside, and the specialist's activities are viewed as important just in the event that they at last include an incentive for the client. Proactive help works on the proactivity continuum, which ranges from zero to full robotization, taking into consideration the accompanying situations:

- do it without anyone's help (no assistance from the specialist)
- client advises the operator what to focus on (warnings/alarms)
- operator derives client's propensities/examples and makes recommendations (deduction/proposals)
- specialist settles on choices and takes activities (full self-sufficiency on undertaking choices/executions).

The vast majority of the at present upheld proactive situations are notices/alarms and proposals. Despite the fact that there is some preparatory work, none of the operators underway backings self-governing basic leadership and move making for the client without affirmation. The proactive specialist framework design is appeared in Figure 3. Signs originating from web administrations, gadget sensors, and the client's profile are prepared, where handling incorporates parsing, enhancing, and sifting to combine gadget and administration information.

ISSN 2394 - 7780

The following stage is conglomeration, which joins the handled information streams through time and space (i.e., area) about the client's whereabouts and activities/assignments done at particular circumstances and spots. This progression mixes the physical and advanced universes and takes into consideration effective deductions that catch tedious conduct and occasions in the two universes. The signs are utilized to influence deductions and prepare to machine learned models for demonstrating the client and his or her interests. A similar arrangement of signs is additionally used to set principles for notices and alarms the client needs the specialist to serve. The models and govern formulas are sent to a run time condition. Once proactive situations are conveyed underway, catching and nourishing back client conduct signals with respect to notices, alarms, and suggestions are essential for the proactive agent to learn and adapt to the user.

VI. PRODUCT PERSPECTIVE

5.1 Hardware Interface

The framework must interface with the standard yield gadget, console and mouse to cooperate with this product. The processor must have the capacity to help the running of the product with no intrusions. Hard plate: The database network requires an equipment arrangement that is on-line. This makes it important to have a quick database framework running on high rpm hard circle allowing complete information repetition and go down frameworks to help the essential objective of unwavering quality.

5.2 Front-End Description

Front-end consists of basic HTML, CSS and JavaScript mainly for displaying, getting user query, passing it to server, getting results and displaying it.

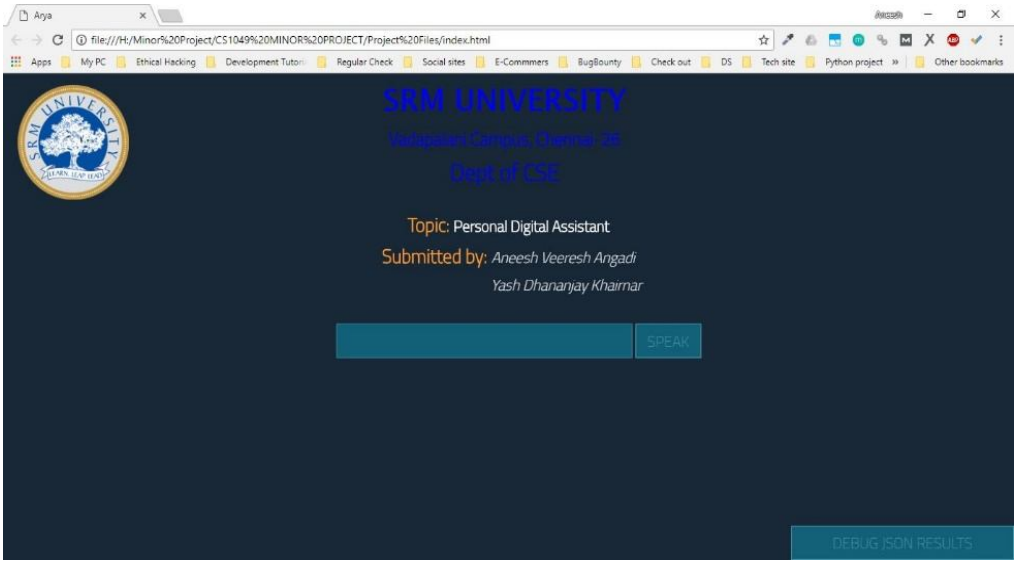


Figure-3: Output Screen

5.3 Backend Description

While Back-End consist of MongoDB (No SQL Database) and python script that does Speech Recognition, Searchable Content Optimization, Language Understanding, Question Answering, Dialog management and language generation.

VII. CONCLUSION AND FUTURE SCOPE

Research on human work propensities and undertaking administration demonstrates that individuals normally total all their essential errands yet may neglect to effectively total assignments with delicate due dates or may overlook less-basic points of interest. For the time being, PDAs can give extraordinary utility by turning into the computerized memory that clients can rely upon for help with fruition of ordinary errands. Truth be told, it is these situations that are utilized most by the clients (e.g., updates, gatherings, and some proactive notices and alarms).

Since time is a basic resource, enhancing customized time administration and utility through proactive and receptive errand assignment and finish is by all accounts a conceivable and alluring long haul objective for PDAs. Later on, it is the adaptable and consistent outsider coordination that can significantly build the situation and experience scope and decide if PDAs will satisfy the guarantee of a genuine individual collaborator that clients can rely on to deal with their own and work life, successfully making them more beneficial. The dividers between applications may begin to separate if PDAs accomplish application/benefit sythesis to finish new assignments scalably.

ISSN 2394 - 7780

PDAs will surface on various gadgets and conditions. This will make new flag handling challenges, for example, exact speaker partition and following in multi speaker situations (e.g., home, auto), vigor as for various gadget composes, and hearty discourse acknowledgment crosswise over age, sexual orientation, and highlight. Advances in calculations, flag handling, and machine learning would be expected to tackle these issues.

On the business front, the speculation and rivalry in PDA innovation will continue expanding throughout the following decade. It is seen by some that PDAs may set the adjust of energy in the following period of the Internet, on the off chance that it turns into the passage to applications and administrations with the multiplication of IoT gadgets. It is too soon to call it an enunciation point for PDA innovation. It is likely that genuine normal dialect human– PC cooperation with devices may take one more decade to be second nature.

REFERENCE

1. Ruhi Sarikaya, "The Technology Behind Personal Digital Assistants", IEEE Singal Processing Magazine, pp.67-73, January 2017
2. T. Winograd, "Understanding natural language," Cognitive Psych., vol. 3, no. 1, pp. 1–191, 1972.
3. SRI International. (2003–2009). CALO: Cognitive Assistant that Learns and Organizes. [Online]. Available: pal.sri.com
4. S. Schiaffino and A. Amandi, "User-interface agent interaction: Personalization issues," Int. J. Human-Computer Studies, vol. 60, no. 1, pp. 129–148, 2004.
5. J. Li, L. Deng, R. Haeb-Umbach, and Y. Gong, Robust Automatic Speech Recognition, a Bridge to Practical Applications. New York: Academic, 2015.
6. N. Gupta, G. Tür, D. Hakkani-Tür, S. Bangalore, G. Riccardi, and M. Gilbert, "The AT&T spoken language understanding system," IEEE Trans. Audio, Speech, Language Process., vol. 14, no. 1, pp. 213–222, Jan. 2006.
7. A. J. Hunt and A. W. Black. "Unit selection in a concatenative speech synthesis system using a large speech database," in Proc. Int. Conf. Acoustics, Speech, and Signal Processing, 1996, vol. 1, pp. 373–376.
8. I. H. Witten and F. Eibe, Data Mining: Practical Machine Learning Tools and Techniques. San Mateo, CA: Morgan Kaufmann, 2005.
9. S. Brin and L. Page, "The Anatomy of a Large-Scale Hypertextual Web Search Engine," Proc. Seventh World Wide Web Conf. (WWW7), International World Wide Web Conference Committee (IW3C2), 1998, pp. 107-117
10. M. Nickel, M, K. Murphy, v. Tresp, and E. Gabrilovich, "A review of relational machine learning for knowledge graphs," Proc. IEEE, vol. 104, no. 1, pp. 11–33, 2016.
11. P. A. Crook, A. Marin, v. Agarwal, K. Aggarwal, T. Anastasakos, R. Bikkula, D. Boies, A. Celikyilmaz, S. Chandramohan, Z. Feizollahi, R. Holenstein, M. Jeong, O. Z. Khan, Y. B. Kim, E. Krawczyk, X. Liu, D. Panic, v. Radostev, N. Ramesh, J. P. Robichaud, A. Rochette, L. Stromberg, and R. Sarikaya, "Task completion platform: A self-serve multi-domain goal oriented dialogue platform," in Proc. North American Chapter of the Association for Computational Linguistics: Human Language Technologies, San Diego, CA, 2016, pp. 47–51.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

CATALYTIC WASTE WATER FOR AGRICULTURAL IRRIGATION

Dr. Namrata Sinha
Department of Chemistry, Ranchi Women's College, Ranchi

ABSTRACT
Using waste water for agricultural purposes is a common practice and such practice is needed where the scarcity of water is increasing. Waste water reuse is the need of the hour and has merits in scientific manner as well as it helps in decreasing the pressure and pollution in water. This article presents a literature review of how catalytic water is a good option for irrigation purposes .Recycled waste water has more nutrients and organic matter than any commercially sold fertilizer in the market. This is possible as all major minerals like N, P, S and C are present and along with some micro nutrients they help in increasing the growth. Excess of any mineral can cause damage, excessive vegetative growth and hence it is important to understand the specific application of any mineral for efficient growth of crop.

Keywords: Catalyst, Waste Water, Treated, Untreated, Water Pollution, Agricultural Irrigation, Water Treatment, Sewage, Efficient Use of Water, Minerals, Fresh Water

I. INTRODUCTION
Catalyst treated waste water usage for irrigation purpose is considered an efficient tool for managing water resources and regulating water. It covers for all types of water scarcities caused by seasons or even due to irregular availability all through the hydro-calendar year. Using waste water is an ancient practice which never was properly managed or never met standards to use. However with coming of age of mankind, the knowledge about waste water has also evolved and has met quality standard, and it also improves every day.

With gaining popularity every day, waste water as a source of irrigation is being used vastly by countries all over the world. Especially in developing countries such as India, China and many other waste water has gained significance drastically over the years. However, the economic and strategic importance of this method is little known to the poor even though it has been used for many decades now. But, the use of treated waste water can pose significant risk to health for occupational people and public.

The market for waste water irrigation is wide open as it lacks any other alternative source of water and hence a viable market has been formed. The current usage of waste water in irrigation for developing countries is not an easy task at hand. The technologies are not well known to the world hence reliability is a question always. The rate of urbanization has decreased the volume of fresh water and as a result urban farmers use treated waste water directly from sewages or through any other polluted waste water.

Hence the agricultural irrigation use of untreated or polluted waste water has been associated to land application and production of crops for a country. Likely so, in India waste water irrigation is used extensively for crops such as vegetables, fruits, cereals, flowers and also fodders. By using domestic waste water both foo and cash crop are irrigated.

ISSN 2394 - 7780

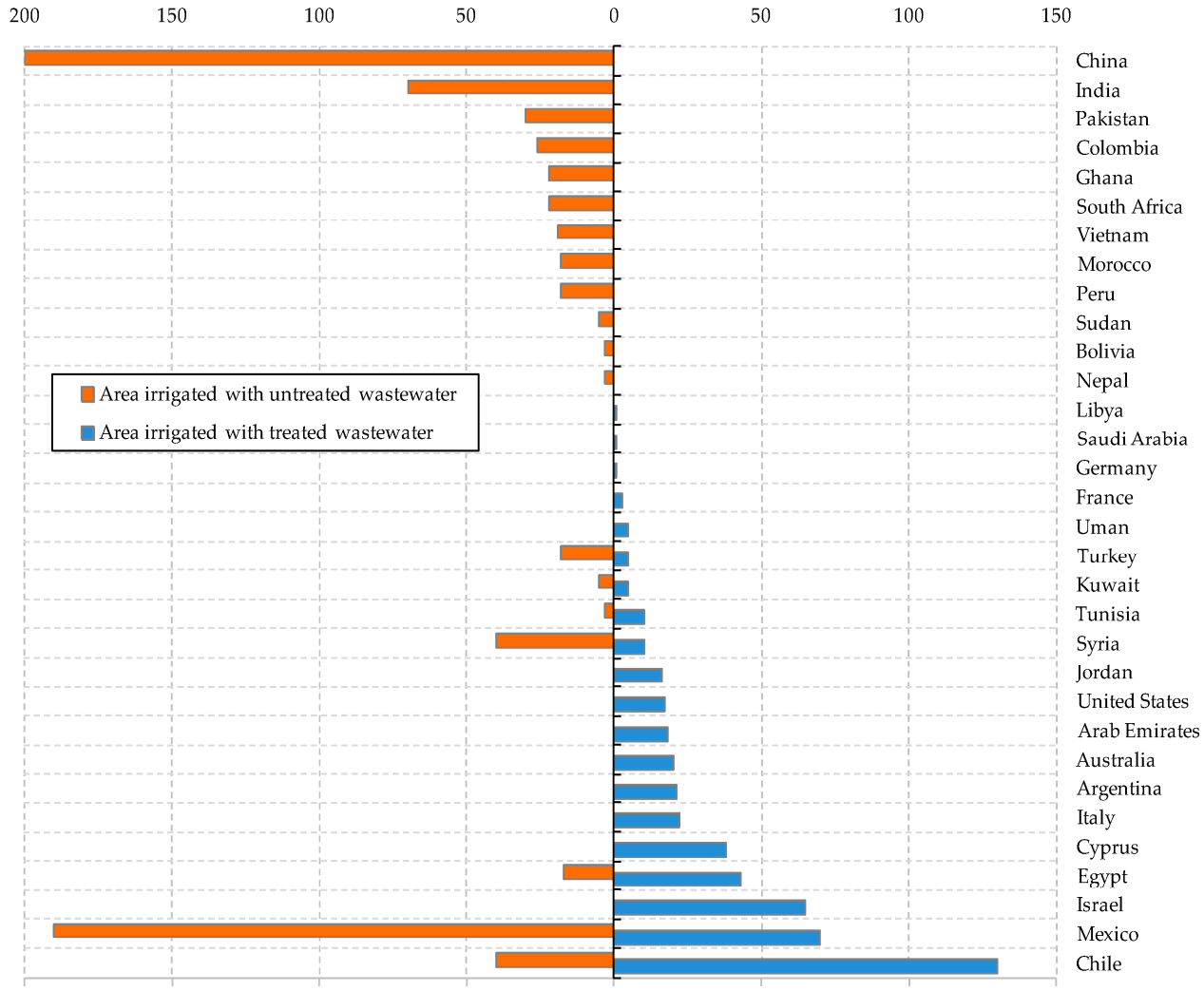


Image: Area irrigated with treated and untreated wastewater.

II. USE OF WASTEWATER IN IRRIGATION SYSTEM

The use of untreated waste water agricultural activities are mostly not common in and around urban areas. It can be witnessed in rural areas though, in communities located near streams where mostly waters discharge. Unless the streams are self-purifying the farmers use the polluted waters only. According to a survey it was found that four out of five cities use untreated water for agricultural irrigation. Waste water needs to be used so that the health of crop and public both are maintained. Treated waste water is economical as the by-products will be better than what untreated would produce. Recycled waste water has more nutrients and organic matter than any commercially sold fertilizer in the market. This is possible as all major minerals like N, P, S and C are present and along with some micro nutrients they help in increasing the growth.

III. BENEFITS OF AGRICULTURAL REUSE

Using catalyst treated waste water is good for agricultural crops, human health and also for the economy. Due to the declining ground water level caused due to growing population, climate changes and seasonal backlashes, using treated waste water is an alternate practice that has been adopted in all regions and especially those with shortage of water.

One of the major accepted and acknowledged benefit of using treated waste water is that it decreases the pressure on fresh water resources. Thus, slowing the rate of water level decline. If used in agriculture we can save up to 70% of water was being wasted as agriculture is the greatest user of water resources.

Now that water is being treated before discharge, this will ensure that the pollution in water bodies is reduced thereby improving the quality of water at the source resource of water bodies. Ultimately the quality and quantity of ground/surface water is increases. Talking commercially and economically, setting up of plants will generate work for more people as installations will be needed for optimization of treatment so that an effective result is procured. In challenging regions (climatic and geographically), low cost treatment system can be feasible option as there are so many technologies coming as options to fulfil the requirement.

ISSN 2394 - 7780

IV. EXPERIMENT AND RESULTS

Sewage water or untreated waste water gets polluted due to many solid waste such as human and animal excreta, bodily waste, garbage from households, non-decomposing wastes and hence the hardness and ionic concentration of waste water is much higher than what is in the ground water. The presence of effluent minerals such as N, P, S are so viable for growth and so the parameters such as shoot length, weight (fresh and dry) and leaf quality quantity was better with sewage waste water as compared to ground water which lack the minerals and also the micronutrients as proven by test. So, it would be an understatement if we say that treated waste water would not perform equally if not better as the untreated one.

V. COMPARISON OF PHYSICO-CHEMICAL CHARACTERISTICS OF SEWAGE WASTEWATER AND GROUND WATER

Determination	Sewage wastewater	Ground water
Ph	8.2	7.5
EC	1210dSm^{-1}	573dSm^{-1}
TDS	1421 mg/l	542mg/l
BOD	155.18 ,,	16.75,,
COD	366.0,,	38.5,,
Calcium	157.5m.mol/l	23.98 m.mol/l
Magnesium	132.0 ,,	26.0 ,,
Carbonate	94.85 ,,	19.32 ,,
Bicarbonate	219.2 mg/l	68.0 mg/l
Chloride	130.70 mg/g	74.66 mg/l

As it can be seen sewage water has more mineral content than ground water, it resulted in usage of waste water which has improved the parametrical results such as chlorophyll content and rate of photosynthesis as compared to ground water. Application of waste water decreases the requirement of fertilizers and reduces pressure on fresh water bodies.

VI. THE CHARACTERISTICS AND COMPOSITION OF LIQUID DISTILLERY EFFUENT PARAMETERS

COLOUR	Dark Brown
ODOUR	Unpleasant
PH	7.8
ELECTRICAL CONDUCTIVITY	2.8dSm^{1}
ORGANIC CARBON	.8 %
TDS	14635 mg/l
BOD	462 MG/L
TSP(Total suspended particle)	38 mg/l
COD	20000 mg/l
NITROGEN	.19 %
TOTAL Phosphorus	6 ppm
TOTAL Potassium	53356ppm
TOTAL Sulphite	4.2 m.mol/l
TOTAL Calcium	100 ,,
Total Magnesium	12 ,,
Chloride	14.4 ,,
Sodium	20.00 ppm
Zinc	6.00 ,,
Copper	3.00 ,,
Iron	38.0,,
Manganese	2.00,,
Boron	0.4 ,,
Carbonates	Nil
Bi Carbonate	150/l

ISSN 2394 - 7780

VII. EFFECT OF WASTEWATER ON PLANT GROWTH

Agriculture is amongst the biggest users of waste water and why wouldn't it be considering the high and never ending food demand. As it has been discussed already, waste water has so much more nutrients as compared to the regular ground water and the mineral content is also high therefore making the products stronger and healthier and healthier for consumer as well. Higher potential yields are observed with waste water. Economically on plants, the requirements of commercial fertilizer also decreases thereby making growth more natural and cost is also reduced.

VIII. LIMITATIONS ASSOCIATED WITH AGRICULTURAL WASTE WTER REUSE

However good treated waste water might be but as every other coin, it is no vary of adverse effects on environment and its resources especially land/soil. Alterations in physical and chemical parameters of soil has been noticed over the period for soil. Also recent works have shown variations with structural parameter and magnitude of microbial biomass for soil.

Alterations in physical and chemical parameter and soil micro biota have capabilities to affect fertility of the soil. And when soil fertility is affected that means the organic matter is reducing which would result in lesser capacity for soil to retain water as the stability is uncertain.s

IX. CONCLUSION

As the scarcity of water all over the globe is not an unknown fact and the situation is not getting any better, alternate ways need to be found which can solve the thirst of the biggest user of water which is agriculture and irrigation. There are so many areas across the globe with severe issue of fresh water shortage so reusing water is the solution. Moreover catalytic waste water has abilities to produce better crops than ground water. Reusing water will also reduce the pressure on fresh water bodies and fertilizers hence more sustainability is achieved with crops. Strategy to reuse treated water needs to be developed locally as a mandate for a better and sustainable environment in future.

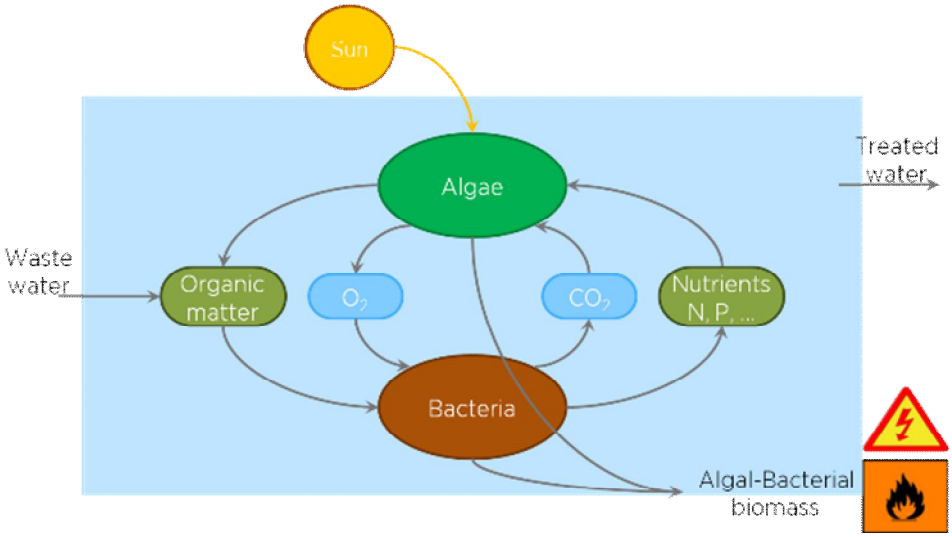


Image: waste water to treated water

REFERENCES

[1] María Fernanda Jaramillo ID and Inés Restrepo, Wastewater Reuse in Agriculture: A Review about Its Limitations and Benefits, Published: 11 October 2017 MDPI

[2] Editor-in-Chief Prof. S. S. Katiyar, EVERYMAN'S SCIENCE, Vol. XLVII No. 2 (June '12 – July '12)

[3] Blanca Jiménez, Pay Drechsel, Doulaye Koné, Akiça Bahri, Liqa Raschid-Sally and Manzoor Qadir, Wastewater, Sludge and Excreta Use in Developing Countries: An Overview

[4] ClaudeDescorme. Catalytic wastewater treatment: Oxidation and reduction processes. Recent studies on chlorophenols

[5] Isabel Castelo-Branco,Adrían Silva,Rosa. M. Quinta-Ferreira, Catalysts for Wastewater Treatment, (NAII, volume 69)

[6] Derrouiche S[1], Bourdin D, Roche P, Houssais B, Machinal C, Coste M, Restivo J, Orfão JJ, Pereira MF, Marco Y, Garcia-Bordeje E., Process design for wastewater treatment: catalytic ozonation of organic pollutants. Water Sci Water Sci Technol. 2013;68(6):1377-83 . doi: 10.2166/wst.2013.384

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

ROLE OF INFORMATION TECHNOLOGY IN FINANCIAL INCLUSION

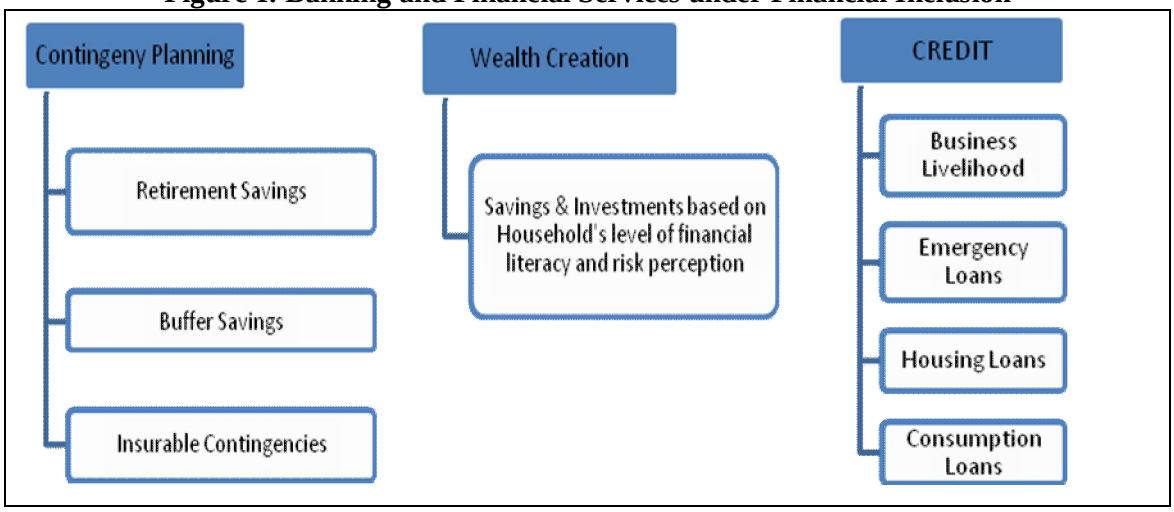
Dr. Neelu Kumari
Assistant Professor, Department of Economics, Doranda College, Ranchi

ABSTRACT
In India, financial inclusion has gained importance in recent years and policies are being designed to provide greater access to financial services and products to those who are still excluded from availing such benefits.With this regard, various initiatives have been undertaken by the RBI and the government to improve financial inclusion across the country. Although these initiatives have paid off to a certain extent in terms of augmented network of bank branches and priority sector lending, a sizeable portion of population (about 50%) particularly rural and economically vulnerable groups, continue to remain excluded from the basic financial services. In this context, it is essential that Government and RBI take some more concrete step and amplify usage of advanced technology to realize full prospect of financial inclusion. Technology like Automated teller machines, internet banking etc. have already made dramatic differences to consumer experience and played a major role in enabling a broader reach for various banking and financial services. Now, payment wallets, mobile banking and other advancements are going to revolutionize it further. 'Money on API (Application Program Interface)' seems to be the future of payments.

Keywords: Finanical Inclusion, Electronic Clearing Service (ECS), Electronic Funds Transfer (NEFT), Real Time Gross Settlement (RTGS), Mobile Banking,

INTRODUCTION
Financial inclusion may be defined as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups such as weaker sections and low income groups at an affordable cost in a fair and transparent manner by mainstream institutional players (The Committee on Financial Inclusion, Chairman: Dr. C. Rangarajan). These include banking as well as other financial services such as contingency planning, wealth creation, credit, equity and insurance products (Figure I). The process channelizes the savings of the large segment of the society and enlarges the resource base of the financial system. Further, it protects the financial wealth and other resources of low income groups in exigent conditions by bringing them within the arena of formal banking sector. Due to easy access to formal credit, the vulnerable sections and marginalized segment of the society are safeguarded from the exploitation by the money lenders

Figure-I: Banking and Financial Services under Financial Inclusion



Financial inclusion has increasingly occupied an important place in recent years. Policymakers all over the world are emphasizing on the need for greater inclusion of the financially excluded segments of the society. In India, the apex bank, Reserve Bank of India has undertaken various measures to augment financial inclusion across the country. In recent years, Government of India has launched two ambitious programmmes named Pradhan Mantri Jan Dhan Yojana (PMJDY) launched in August 2014 and the Jan Dhan Aadhaar Mobile (JAM) trinity articulated in the Government's Economic Survey 2014-15 , which aim to provide a big push towards financial inclusion in India. The rapid advancement of technology like Automated teller machines, payment wallets, mobile banking and other advancements have already made dramatic differences to consumer experience and broadened the reach of financial services.

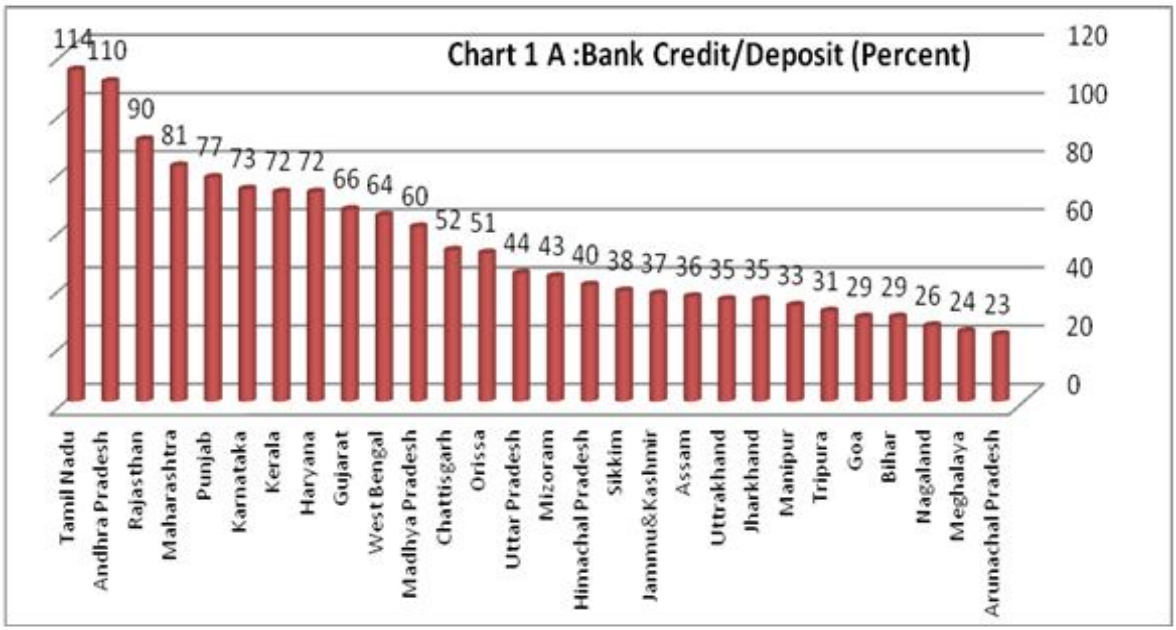
ISSN 2394 - 7780

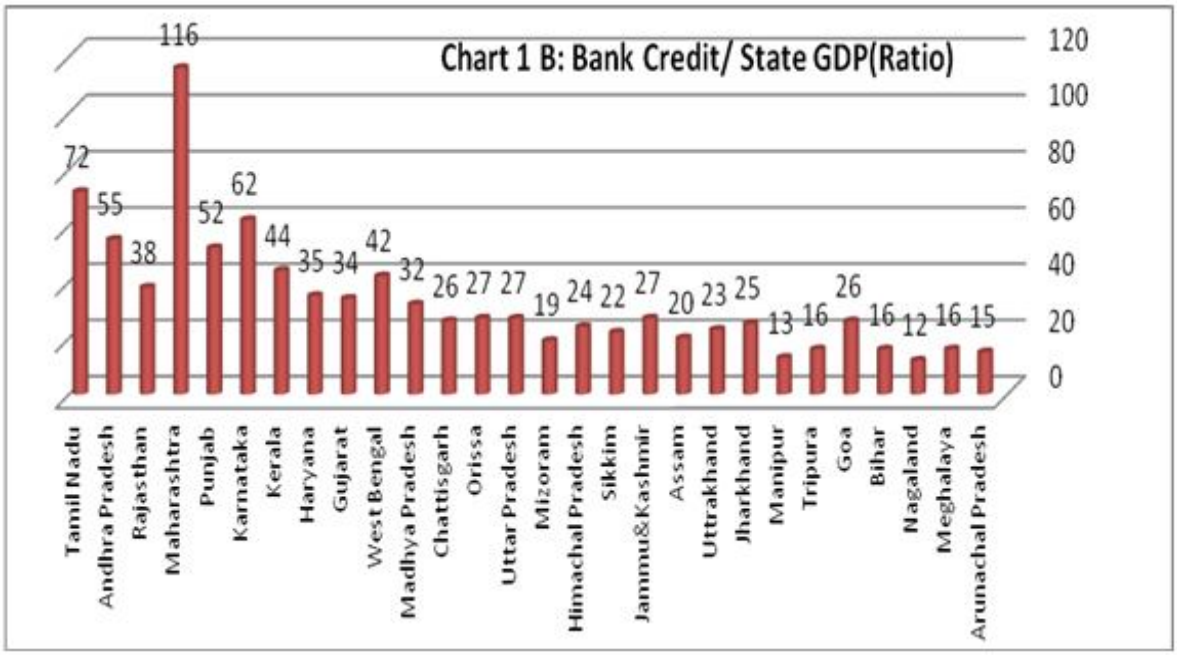
However, despite so many initiatives on part of RBI and the government, little has been achieved in terms of network of bank branches and access o financial services in rural areas and a sizeable portion of population (about 50%) continue to remain excluded from even the basic financial services. Moreover people having any kind of life insurance cover comprise just 10% of total population and those with non-life insurance is as low as 0.6%. Further, only 13% of population has debit cards while people having credit cards amounts to 2.0%. As a consequence, a large segment of the population has to depend on informal sources, who charge exorbitantly from them. Limited access to basic financial services is a major concern given the fact that around 81% of Indian households save a portion of their income.

EXTENT OF FINANCIAL INCLUSION IN INDIA

In India, the access of banking services seems to be geographically limited to few states of the country as evident State wise Banks Credit to deposit ratio amount of bank credit with the State Gross Domestic Product.

The chart depict that the credit to deposit ratios are significantly low in some states, which imply that due to poor status of financial inclusion the funds are not being utilized by the state due to multiplicity of reasons. The credit to deposit ratios of southern and northern states e.g. Tamil Nadu (114 percent), Maharashtra (81 percent), Punjab (77%),Karnatka (73%),Kerala and Haryana(72% each) are high, whereas it is much lower for north eastern states, particularly Arunachal Pradesh (44 percent).





Source: Reserve Bank of India, Annual report, 2014

ISSN 2394 - 7780

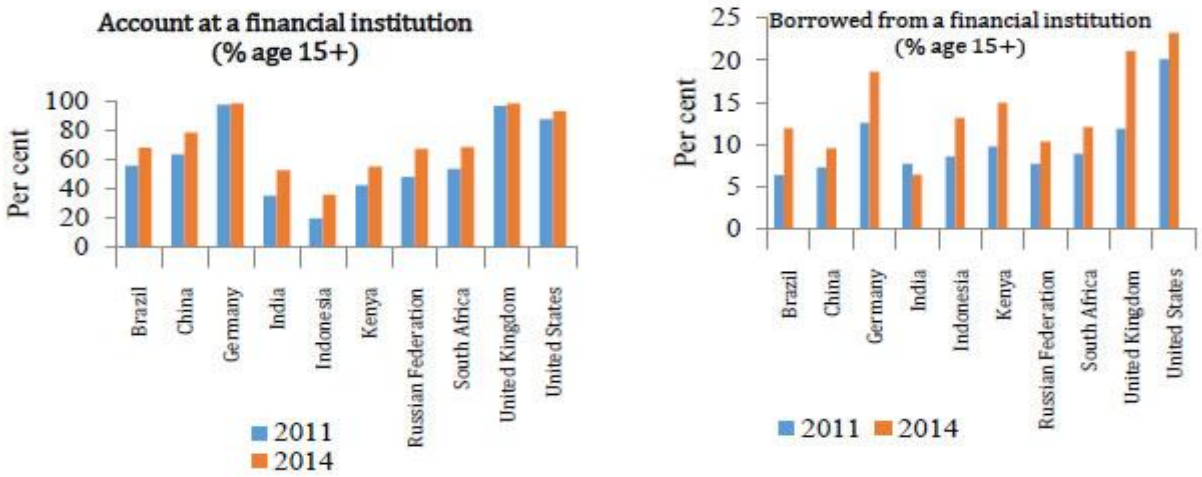
If we take into consideration the amount of bank credit in relation to state's Gross Domestic Product, the ratio should not vary between different states on the assumption that banks provide loans commensurate to the size of the respective state's GDP. But again, there seems to be considerable variations in the credit to state GDP ratio. Chart 1 B depicts that Bihar and North-Eastern states e.g. Arunachal Pradesh, Meghalaya, Nagaland ,Tripura and Manipur are at the bottom with credit to state GDP at less than 20 percent. On the other end, the ratio is much higher for states like Maharashtra at 116 percent, TamilNadu at 72% and Karnataka at 62%. Thus, it is clear from the analysis, that underdeveloped state such as Bihar, North-Eastern states, Uttar Pradesh, Jharkhand and Chhattisgarh are receiving far less bank credit compared to the size of their economy.

FINANCIAL INCLUSION: INDIA VIS A VIS OTHER NATIONS

Recent studies have shown that globally, 2 billion adults remain unbanked. Chart below shows the share of the world's unbanked by nations. The data reveal that the status of financial inclusion in India is poor compared to the peer emerging market economies.

In 2014,the number of adults having an account with financial institution amounted to nearly 50 per cent, lower than those in BRICS economies at around 70 per cent, and around 75 to 90 percentages of adults in the US and UK. Similarly, the share of Indian adults borrowing from a formal financial institution in the past one year period comprised only 6 percent, which is again too low compared with 10 per cent or more in other BRICS economies (Chart 2.1)

Chart 2.1: Account at a Financial Institution



ROLE OF TECHNOLOGICAL DEVELOPMENTS IN FINANCIAL INCLUSION

Technology has played a significant role in the expansion of financial and banking sector over the years. The revolution in Information Technology (IT) sector has strongly sustained the intensification and reach of the banking sector. Increased application of IT has improved the efficiency of the banks by amplifying back-end administrative procedures. The advancement in front-end operations has resulted in cheaper, easier and faster retail transactions for the customers. Technology has enabled the customers to manage their accounts and take advantage of banking services on Core Banking Solutions (CBS), irrespective of the branch where the account is maintained.

Automated Teller Machines have transform the delivery channel in the urban/metro areas . ATMs have registered considerable growth in recent years. Presently, 87000 ATMs are operational in the country . However, Tier III to VI unbanked/under banked areas in the country have not witnessed much ATM presence.

Another key technological improvement has taken place in payment system (Paper-based and Electronic Payments) in the country. Of the total non-cash transactions in the country, Paper-based mechanisms e.g. cheques, drafts etc. account for nearly 60 percent in terms of volume and around 11 % in terms of value. With a view to bring swiftness and effectiveness in processing of cheques, the apex bank has introduced Magnetic Ink Character Recognition (MICR) technology. Introduction of cheque truncation system (CTS) has helped in restricting physical movement of cheques and facilitated usage of images for payment dispensation. The main emphasis of RBI is to condense the use of paper for dealings and shift towards electronic payments mode which assists mass transmition of money from one account to many accounts and vice versa.. In this direction, Electronic Clearing Service (ECS)/National ECS (NECS is introduced for institutions that deal with bulk payment of amounts towards disbursements of salaries, pensions, dividends, interest etc., or for mass

ISSN 2394 - 7780

assortment of amount towards periodic savings in MFs, premiums towards insurance, payments for utilities e.g. electricity, telephone , water dues, tax collections, installment of loan repayments, etc.

National Electronic Funds Transfer (NEFT): NEFT is an interbank fund transfer system in which funds can be electronically transferred from any bank branch to other branch of the same bank or any other banks by an individual, firm or corporate.

In recent years, the government of India assisted in developing market infrastructure that can be controlled by private players. This move has resulted in an exceptional uptake in the use of payments services. However, despite innovative measures and increased penetration of technology into financial sector, 50% of population in the country is financially excluded. The reason is that the delivery mechanism and financial products are not commensurate with the income and satisfaction level of the low income families in the country. T can play a significant role in bringing down the transaction costs and make the services cheaper, efficient and affordable to common masses.

STATUS OF TECHNOLOGY USAGE IN FINANCIAL INCLUSION

The data reveals that there were only 18 ATMs per 100,000 adult population in India in 2014 considerably low compared to over 180 in Russia and over 65 in South Africa and. Similarly, 10 per cent of individuals (aged 15 years and above) had made payments through debit cards in India as against approximately 40 per cent in South Africa (chart 2.2).

Chart 2.2: Use of technology in financial inclusion

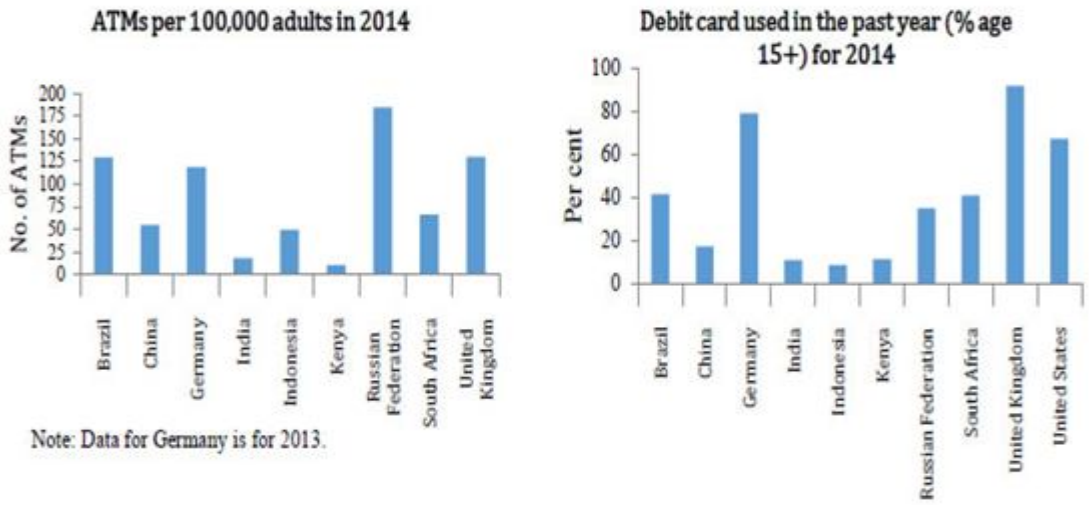
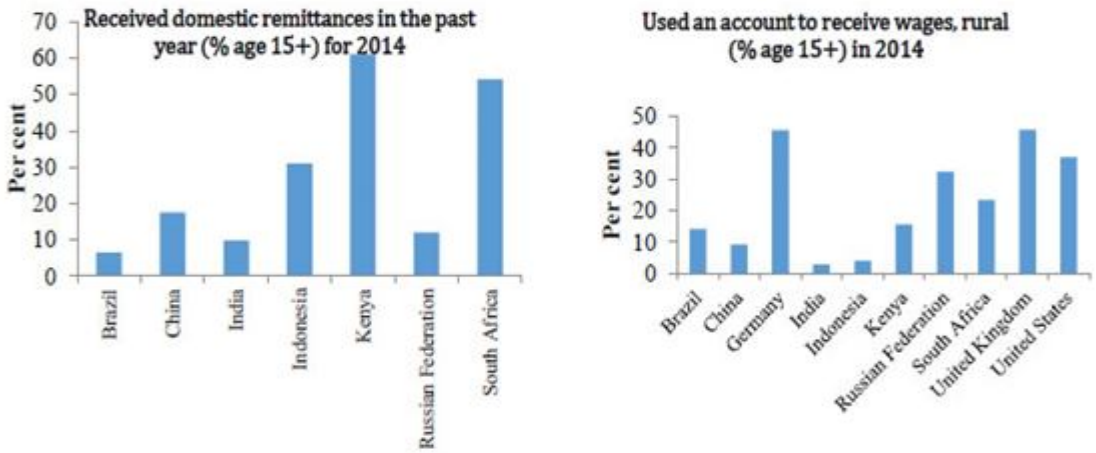


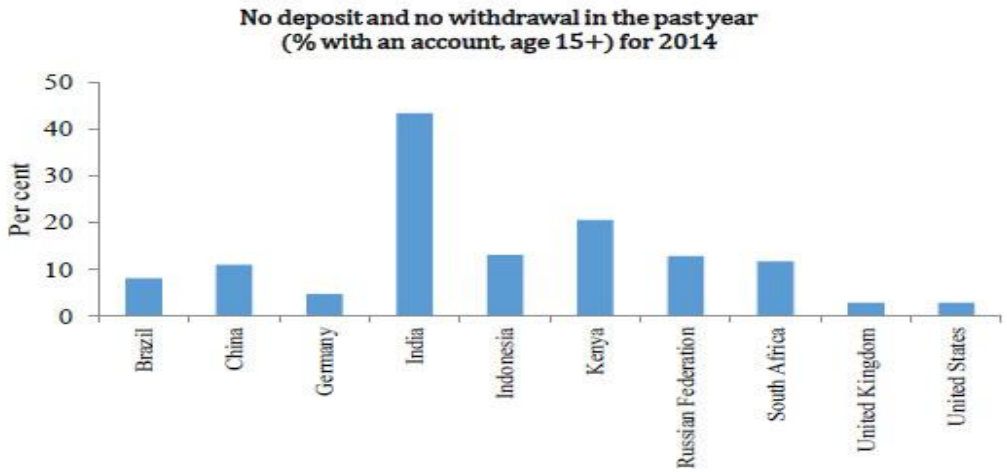
Chart depicts that in terms of remittances, Kenya holds a leading position in 2014 with over 60 per cent of its adult population receiving domestic remittances in their accounts as compared with less than 10 per cent in India. Similarly, only 3 per cent of the rural population in India had directly received wages into their accounts, as against 14 per cent in Brazil and 23 per cent in South Africa. The low usage of accounts in India is also evidenced from the fact that over 40 per cent of accounts did not witness any 'movement' in 2014 (chart 2.4).

Chart 2.3: Remittances and wage payment

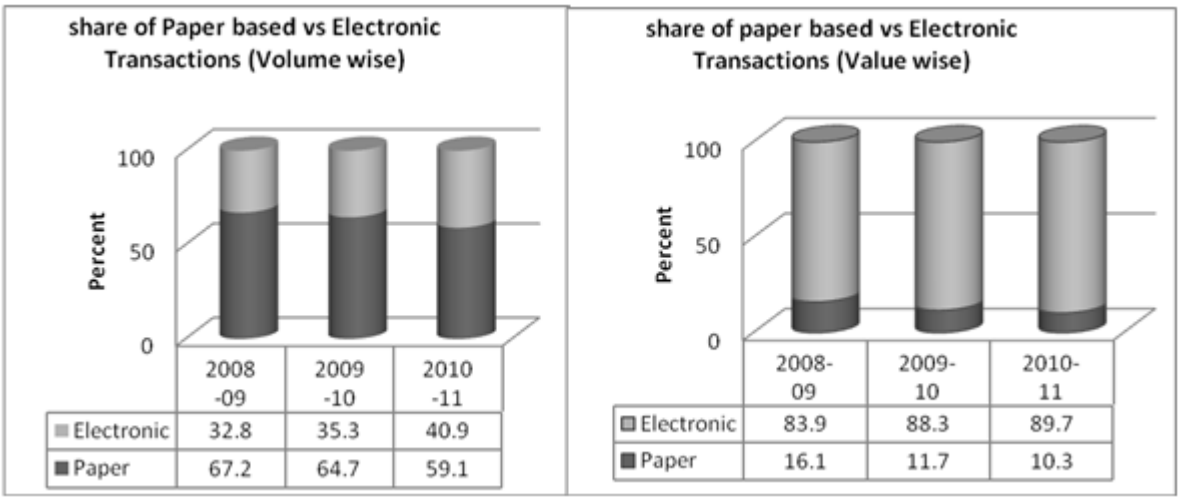


ISSN 2394 - 7780

Chart 2.4: Use of accounts



With regard to the efforts of apex bank towards encouragement of electronic and paper based systems , the data reveal that both the value and volumes of the two systems have recorded remarkable growth (Chart 2.5 A& 2.5 B)



Source: http/ rbi.org.in

The entire prominence of policy makers should be on increasing the access of financial and banking services to financially excluded segment of the society. In this direction, only account opening will not help promoting the process of financial inclusion. A lot needs to be done, like, the payment of subsidies or various social schemes to be done through account payment to plug the issue of money pilferage. Budgetary provision for the cost and reimbursement in bank accounts directlys should be ensured accordingly. doorstep services can be provided to those who are excluded from banking and financial services so that they can join the inclusion programme of banks.

REFERENCES

- Andrianaivo, M and Kpodar, K. 2011. ICT, Financial Inclusion, and Growth: Evidence from African Countries. *WP/11/73* Internationa Monetary Fund (IMF).
- Ford, J. and K. Rowlingson. 1966. "Low-income Households and credit: Exclusion, Preference and inclusion". Environment and Planning, 28: 1345-60.
- Rangarajan C (2008), "Report of the Committee on Financial Inclusion"
- Reserve Bank of India, Annual report, 2010,
- Reserve Bank of India, Report of the Working Group to Review the Business Correspondent Model, 2009.
- Subbarao, D. "Financial inclusion - challenges and opportunities." Speech published in RBI bulletin January 2010.

ISSN 2394 - 7780

- UIDAI, From Exclusion to inclusion with micro payments 2010. (http://uidai.gov.in/UID_PDF/Front_Page_Articles/Strategy/ Exclusion_to_Inclusion_with_Micropayments.pdf)
- UIDAI, Handbook for Aadhaar enrolment. http://uidai.gov.in/images/FrontPageUpdates/ trainning_mod6.pdf)
- World Bank, 2014, Global Financial Development Report 2014: Financial Inclusion, International Bank for Reconstruction and Development / The World Bank, Washington

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

IMPACT OF HR AUDIT IN VALUE CREATION AND DELIVERY

Dr. Nitesh Raj
Assistant Professor, Department of Economics, S.P. College, Dumka

ABSTRACT
HR audit is a comprehensive evaluation of the current HR strategies structure, systems styles and skills in the context of the short and long- term business plans and creation of value of a company. It provides inputs required to access all aspects of HR and assign the HR score for the company on a number of dimensions so it can add in value in consideration of future growth of the company. Its main objective is to align the HR function (structure, systems and style) in comprehensive towards value addition. It uses various methods including interview, observation, secondary data analysis and workshops by considering the interest of stakeholders – customers, investors, employees, line and top manager etc. Is has to business- driven and comprehensive. There are numerous reasons why companies go for HR audit, the main ones being growth and diversification, promoting professionalism, improving HR strategies and enhancing the direct contribution of HR audit to value addition and delivery. Experiences has shown HR audit to have tremendous impact on business in areas of strategic planning, role clarity, streamlining practices, better policies, top management styles, improvement HR systems, focus on competence and TQM interventions with better premise of value. However, proper implementation and top management support are both very crucial for its success.

Keywords: Human resource department; Value creation; HR audit; TQM intervention; Strategically planning; Professionalism; HR strategy; Business-driven; Streamlining.

In the last two decades a large number of corporations have established Human Resource departments, introduced new systems of HR, and made structural changes in terms of differentiating the HR function and integrating it with the HR function. A good number of CEOs saw a hope in HR for most of their problems, issues and challenge. It is estimated that on an average, establishing a new HR departments with a small size of about five professionally trained staff costs about two million rupees per annum in terms of salaries, another ten million in terms of budget (e.g. Training budget, travel etc.) and probably about five to ten times the amount in terms of managerial time costs and opportunity costs. This is because HR systems are people intensive and require a lot of managerial time. In spite of these investments in a number of corporations, there is a widespread feeling that HR has not lived up to the expectations of either the top management or the line managers. The skills and styles of the HR staff, line managers and top management should be in synergy with the HR goals and strategies. So there was a need of a strong HR audit to evaluate value creation and its effective delivery.

HR audit is a comprehensive evaluation of the current HR strategies, structure, systems, styles and skills in the context of the short and long term business plans of a company. It attempts to find out the future HR needs of the company after the assessing the current HR activities and inputs. The HR audit starts with the following questions:

a) Where does the company want to be ten years from now, three years from now and one year from now?

b) What is the current skill base of the employees in the company in relation to the various roles and role requirements?

c) What are the HR subsystem available today to help the organization build its competency base for the present, immediate future and long term goals?

d) What is the current level of effective of these systems in developing people and ensuring that human competencies are available in adequate level in the company?

e) Does the HR structure exist in the company adequate enough to manage the HR in the company?

f) Are the top management and senior manager styles of managing people in tune with the learning culture?

Twenty year ago it would have been unthinkable for almost everyone in HR to even consider spending time with external customer but it is now the HR audit that compels the HR professionals to build staffing, compensation training and other programmes and policies that focus on employees and customer and kept companies legally compliant. In the last decade HR professional have worked to become business partners and to align their work with business strategies. HR professional have been coached to spread line with general manager and with their counterparts and sales, marketing and manufacturing to ensure that HR work help to deliver results. But this may also suggested what is next for HR: beginning to convert with these outside the

ISSN 2394 - 7780

firm as well as those inside. To do so, HR professionals via HR audit must grasp and master the concept of value and its delivery. At a base level value reflects the standard within a firm.

VALUE ADDITION

Live and encourage moral principles believe that a HR value proposition goes beyond value. Value means that someone receives something of worth from a transaction. Value in this light is defined by the receiver than the giver. HR professional add value when their work help someone to reach their goals. HR value proposition means that HR practices, departments and professional produce positive outcome for key stakeholders – employees, line manager, customer and line manager. In presentations on HR audit creating value we often ask six random participants to complete the following statements as fast as they can

*our goal is to be……

*we will do this by leveraging……

*And we will ensure that we anticipate……..

*And we will invest in…….

*And we will be known for……..

*And we will work with unyielding……..

All above statements will show the nature of value creation and delivery. HR audit is really creating and delivering the value. The new world of HR comply the work in all the parts of the organization including corporate finance, marketing, customers, investors, stakeholders etc. At mid to large size sized entity risk experts suggests that HR audit should be independent in nature and be done in every 16^{th} to 18^{th} months in order to checking of proper implementation of value creation and its effective delivery. HR audit focus more on specific risk and value creation that are designed to ultimately deliberation for process improvement. Colorado based Mountain State Employees council offers following sample of HR audit for value creation.

1. Compliance Audits: cover central and state regulations that import recordkeeping and report HR programme administration for value creation.
2. Benefit Programme Audit: cover a review plan design, regulating compliance, benefits processing administration and reporting regarding creation of value.
3. Employee Programme/Function Audit: cover a review of any individual HR related function in creation and delivery of value.
4. Comprehensive HR Audit: cover a review and evaluation of areas noted above as well as an audit of all other functional areas; including staffing and recruitment, job analysis and description, compensation and benefit programme, performance management, training and development, employees relations and policies and HR matrices in creation of value.

HR audit is responsible towards the society. So it takes following steps that the society for HRM recommendation for value creation.

1. Determining the scope and type of Audit
2. Developing the Audit questionnaire
3. Collecting the data
4. Benchmarking the findings
5. Providing feedback about the result
6. Creating action plans and
7. Creating a climate of continuous improvement.

VALUE CREATION & HR AUDIT

1. HR audit succeeds when it creates value

a) So it recognizes external business realities and adopts its practice and allocates resources accordingly.

b) Creates market value for investors by increasing intangibles.

c) Increase customer share by connecting with target customers.

ISSN 2394 - 7780

d) Help the line managers.

e) Delivers strategy by building organizational capabilities.

f) Clarifies and establishes and employees value proposition and ensures that employees have ability to do their work.

g) Manage people's process in ways that add value.

h) Manage performance management process and practices in ways that add values.

i) Manage information process and practices in ways that add value.

j) Manage workflow process and practices in ways that add value.

k) Has a clear strategic planning process for aligning HR investment with business goal.

l) Align its organization to the strategy of the business.

m) Has staff that plays clear and appropriate roles.

n) Staff ability to demonstrate HR competencies.

o) Investment in HR professional through training and development experiences.

The universal value addition is defined by receiver more than by the giver HR audit requires that HR professional focuses less on what they do and more than what they deliver. The value focuses in HR audit we suggest shapes conversation between HR professionals and their constituents. Conversation with investors will focus on how investors given market value from HR service. Conversation with key customers will focus on how the customer receives unique products and services because of HR investment. Conversation with business leaders will focus on establishing accomplishing their business strategy through the categorization of organizational capabilities. Conversation with employees will focus on nothing sure that employees have the abilities the need to do what is expected of them. So here we can say the HR audit can add value for investors, customers, managers and employees. HR audit influence value creation and delivery may be grouped under four headings:

I. Technology

II. Economic and regulatory issues.

III. Work force demographics.

IV. Globalization.

I. Technology: - The application of knowledge to the transformation of things into other things - Derives almost every aspect of the changing business environment. The major trends in technology fall into four dimensions:

a) Speed- the growth of the company is consistent for a longer period of time.

b) Efficiency- per unit of costs is dropping as speed increases.

c) Connectivity- the world is rapidly reaching a point where any human being can be a nodal in a network that includes everyone.

d) Customization- technology allows company to identify customer requirement more quickly and more accurately and translate requirement into customized products and services.

New blocks of customers, suppliers, employees and owner can form overnight, called 'smart mobs'. These groups can mobilizes them to undercut pricing, raise product and service standard, communication satisfaction and dissatisfaction impose statistical proceeds on their target organization – example range from the companies sponsored to the upstart. People may or complaint about products and services, companies and politicians create websites that able to access a large scale audience thereby mobilizing collective action that otherwise would not have been possible. Based on their percentage people caste their vote with their time and energy for the espoused cause. Example: e-bay.com, twitter, face book, orkut, etc are really adding value through HR audit.

II. Economic and Regulatory Issues: - Economic regional environment provides the context for business operation. They are frequently the precursors to changes in the expectations of the customers, shareholders, managers, and employees. If HR professional are to contribute to business decision through HR auditing must

ISSN 2394 - 7780

have data about these factors; and they must be able to use this knowledge in providing intellectual richness to strategic business discussions.

A. Economic factors: A Several HR audit trends predict prospects for sustainable global economic growth and create value. Following are they:

a) Workforce quality – The collective knowledge and skill level of workers continuous to increase on a global scale.

b) Workforce flexibility – the movement of people from one industrial sector to another encourages growth where growth is possible and greater productivity where demand is diminishing.

c) Investment in new products, services and technology - process and equipment activities anticipated to continue upwardly spiraling waves wrongly trait upward fluctuations in stock price.

d) Health – The cost of maintain human health is an issue concern for the company as a whole as well as for individual companies.

e) Increasing wage disparity: a real wage for the top income bracket continue to sharply decline at 1.5%per year in India. Meanwhile average real wage of those in lower income brackets continue to decline.

f) Productivity improvement and long term economic optimism – most developing countries are experiencing strong growth in labor productivity.

B. Regulatory factors: ask any group of line or HR managers during HR audit if they believe that the world is becoming more or less regulated. It certainly feels that way – especially in the light of legislation about the involvement discrimination harassment privacy, board composition, whistle blowing and so on and on. HR professional must understand during HR audit for creation of value. The massive world mid trend is towards deregulation and the implication of this trend in order to all value at the strategy table.

III. Work force demographics: - Workforce demographics that influence the pool of labor available to conceive, develop, produce, distribute and sell products and services or changing in turbulent wage. HR professional during HR audit must have a specific data of five categories of demographics trends:

1. Declining workforce growth
2. Increasing age of the workforce
3. Changing gender balance
4. Ethnic diversity and
5. Diminishing family economic health is most relevant for business discussions in order to create value and delivery.

IV. Globalization

1. The large MNCs that derive much of economic globalization have jobs and work that tend to be geographically mobile. It is really helpful in creation of value and its implication.
2. Hr audit analyze that global population growth in low income countries provides the greater labor supply on a global scale while at the same time technology driven productivity improvement have reduced labor demand in high income countries that is a setback to the value addition.
3. Especially in developed countries there has been as shift away from the relatively more organized manufacturing sectors to the less organized sectors. This has really added the value on the living sundered of the individuals has been improved.
4. HR audit also shows that most low income countries that are moving on the global paying field tend to have weak traditions of unionized work force is a hurdle to the value addition.

VALUE CREATION METHODOLOGY OF HR AUDIT

Value creation requires the use of number of methods for HR audit. The methods are presented below. These methods are used in combination and creation of value requires the use of all the methods:

1. Individual interview

The auditors normally make it a point to interview the top level management and senior managers individually.

ISSN 2394 - 7780

2. Group Interviews
Group interview are conducted normally for groups of four to eight individuals because in an audit of companies having thousand of employees, it is not feasible to meet everyone individually.

In both individual and group interviews for HR, audit the following open-ended questions are normally asked:

a) What do you see as the future growth opportunities and business to run your business, or direction of the company?

b) What skills and competencies does the company have of which you are proud of?

c) What skills and competencies do you need to run your business, or to perform your role, more effectively at present?

d) What is the strength of your HR function?

e) What are the areas in which your HR function can do better?

f) What is good about your HR subsystems, such as performance appraisal, career planning jobs rotation, training, quality, circles, induction training, recruitment policies, performance counseling, and worker development programmes?

g) What is weak about them? What can be improved?

h) What changes do you suggests strengthening HR in your company?

i) What do you think are the ways in which line managers can perform more developed role?

3. Workshop
In some cases individual and group interviews are substituted by large scale interactive process (LSIP) workshop. In such workshop a large numbers of participant ranging from 30 – 300 can be gathered in a room and asked to do the HR audit. The workshop also can be used to focus specifically on individual HR systems like performance appraisal that is the current need of value creation.

4. Questionnaire Method
The questionnaire has over 250 items and requires about 90 minutes to complete. It can be administered individually or in a group. In this method the groups of respondents are called randomly in a room and are being explained the objective and the process of HR audit and administer the questionnaire then and there itself. The most significant use of questionnaire method is that it helps in benchmarking for value.

5. Observation
The observation can be made using a checklist of questions by physical verification of the workplace including the plant, the machinery room, canteen, toilets, training rooms, hostels, hospitals, schools, living colony etc. in order to assess the extent to which a congenial and supportive human welfare oriented climate exists in the company.

6. Analysis of secondary data
It can give a lot of insights into the HR assets and liabilities of the company like analysis of age profiles of the employees, of the training attended, if the minutes of the meetings held etc, help in determining the assets and liabilities.

7. Analysis of reports, records, manuals and other published literature
Published literature of the company, such as manual reports, marked handouts, training calendar, personal manual and various circular issued from time to time are also likely to help in assessing the strengths and weaknesses of HR audit in creation of value.

HR AUDIT AND VALUE CREATION AMONG INVESTORS
The success of an HR audit should be measured not by how well its design and implementation go but by what the initiative does for the organization for the key stake holders. HR action creates value only when they create a sustainable competitive advantage. Investors care about share holders return or market value. HR audit can take six actions to link their work to stakeholders' value.

1. Become investors literate.
2. Understand the importance of intangible.
3. Create HR practices that increase intangible value.

ISSN 2394 - 7780

4. Highlight the importance of intangible value to total share holders return.
5. Design and deliver intangible audit.
6. Align HR practices and investors requirements.

HR AUDIT AND ITS IMPLEMENTATION

1. Build value through organization and people
2. Develop capabilities of shared mindset, talent, speed, collaboration, leadership, accountability, learning and the like throughout the organization.

Capability	Definition
Talent	We are good at attracting motivating and retaining competent and committed people
Speed	We are good at making important changes happen fast.
Shared mindset	We are good at ensuring that customers and employees have positive images of and experiences with our organization.
Accountability	We are good at the disciplines that results in high performance, collaboration. We are good at working across boundaries to ensure both efficiency and leverage.
Learning	We are good at generating and generalizing ideas with impact.
Leadership	We are good at embedding leaders throughout the organization who deliver the right results in the right way- who carry our leadership broad.
Customer connection	We are good at building enduring relationship of trust with targeted customers.
Innovation	We are good at doing something new in both content and process.
Strategic unity	We are good at articulating and sharing a strategic point of view.
Efficiency	We are good at managing cost of operation.

HR AUDIT AND VALUE CREATION AMONG CUSTOMERS

Keeping a customer is more profitable than attracting a new one. With ever expanding global competition, however today a customer is tend to be both demanding and exacting, so keeping their requirement ongoing across the broad attention. The customers' expanses are often based on perception of:

1. Reliability – Dependability and accuracy.
2. Responsiveness - promptness of service.
3. Assurance – Trust and confidence.
4. Empathy – Personal care and attention.
5. Presentation – Appearance of strategy in personnel.

We suggest following five specific things that HR professionals know and do to improve customer experiences:

1. Develop customer literacy
2. Think and act like a customer
3. Measure and track the firm's share of targeted customers and the customer value proposition.
4. Align HR practices to the customer value proposition.
5. Engage target customer in HR practices.

INTERNAL STAKEHOLDERS, LINE MANAGERS AND EMPLOYEES

Measuring activities is often easier than measuring outcome (delivery). It is easier to measure the percentage of manager who receives forty hours of training than to tract the impact of the training on managerial performance. But outcomes (Delivery) are what ultimately determine value and they can become as tangible- and as measurable as the activities. Internal stakeholders outcome take the form of organization capabilities and individual ability. Capability represents the identity and reputation of the organization; ability the competence skill and knowhow of the employees. Value can be added to line managers in four primary ways:

1. Resolve misconceptions of HR
2. Build relationships of trust.
3. Focus on delivery.
4. Prioritize capabilities and create an action plan for delivering them.

ISSN 2394 - 7780

ROLE OF HR AUDIT IN BUSINESS IMPROVEMENT

The experiences of the companies discussed above indicate that HR audit can give many insights into company's affairs. HR audit is also cost effective. In audit it costs as low as US $ 10000 – 25000. The auditors normally camp in the organization for one to two weeks, make their observation, and give their reporting in a month's time. They normally make preliminary presentation at the end of their visit. The following are some of the favorable consequence of HR audit that have been observed:

1. It can get the top management to think in term of strategic and long term business plans.
2. Changes in styles of the top management.
3. Role clarity of HR department and the role of line manager in HR.
4. Improvement in HR system.
5. Increased focus on human resource and human competencies.
6. Better recruitment policies and more professional staff.
7. More planning and more cost effective training.
8. Strengthening accountability through appraisal system and other mechanisms.
9. Streamlining of other management practices.
10. TQM interventions.
11. It can enhance the ROI (Return on Investment) of the HR function.

CONCLUSION

Investment in HR Audit must be made by each organization because it really helpful to create value and its justifiable delivery that must be taken care in a rightful manner because it brings discipline in action with respect to stake holders – employee, customers, line manager and investors that will suitable for the long run growth of the organization. The HR audit itself is rarely a failure. However no way of refusing such an HR audit, it can have some negative results but it is due to failures of implementations. HR audit does give evaluations of individuals for creation of value and its effective delivery and focuses on units and systems.

REFERENCES

1. Knell Eric "A Need for More Human (Resources) Audits; Sept, 29th 2011.
2. Anthony J. Rucci, Steven P. Kirn and Richard T. Quinn,"The Employee-Customer-Profit Chain and Sears,"Havard Business Review 76, no.1 (1998): 82.
3. Wayne Brockbark and Dave Ulrich," Avoiding SPOTS: Creating Strategic Unity," in Handbook of Business Strategy, ed. Harold E. Glan (Boston: Warren, Gorham & Lamont,1991)
4. http://www.rbl.net/Survey/hrvalueproposition.html
5. Noronha P.A." Human Resource Management," Pub. SCDL, Pune, (2006): 261.
6. Sanjeev Rinku, Khanna Parul,"Ethics and Values in Business Management," Pub. Ane Books Pvt. Ltd., New Delhi, (2008): 13
7. Karpagan M., "Environmental Economics," Pub. Sterling Publishers Private Limited, New Delhi, (1991): 252
8. www.sterlingpublishers.com

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

ANTROPOMETRIC STUDY OF ANGANWADI CHILDREN OF SILIGURI URBAN AREA

M. Sarkar[1], S. Prabha[2], G.P. Mandal[3] and P. Baidya[4]
Research Scholar[1] and Assistant Professor[2], Department of Home Science, Jharkhand Rai University, Ranchi
Associate Professor[3], Department of Animal Nutriton, WBUAFS, Kolkata
Medical Officer[4], Saptibari Primary Health Centre, Maynaguri

ABSTRACT
Nutritional status was assessed between 1 to 6 years age group in Anganwadi centres at Siliguri Municipality area in Darjeeling district in West Bengal. Socio demographic profile of the parents of those children were also collected. Five Anganwadi centres were selected randomly.Anthropometric measurements such as weight. height and mid upper arm circumference were taken among 250 children who were enrolled in the Anganwadi centres. Mid upper arm circumference was recorded between 1-5years age. The data revealed that girls were more severely underweight than boys whereas boys were more severely wasted than girls. According to the MUAC, percentage of <-3SD was double for boys in respect to girls. Severe wasting was high in 1-2 and 3-4 years age group. In case of education, mothers were lower educated than the fathers. The income level of the families was moderate.

Keywords: Anganwadi Children, Siliguri, Anthropometric measurements, Nutritional status, Z-score

INTRODUCTION
Today's children are the citizen of tomorrow's world, so their survival and development are the very necessary for the future development of the nation (WHO [1]). Without optimal growth and development of children, economic development of the country is unsuccessful (Husan [2]). A child's entire growth and development is depended on the food given to him during the first five years as these is the period of highest growth and development (Shills [3]). Under nutrition has an immense retarding effect on growth and development and may cause growth failure and permanent impairment of the body (Osmani [4]). Under nutrition during childhood increases the vulnerability to infection and disease and risk of premature death. In developing countries, malnutrition is an important factor contributing to illness and death (Biswas [5]). Delayed cognitive development and various health impairments are related to chronic under nutrition (Scrimhaw [6]). Malnutrition in children is a silent emergency leading to almost seven million child death (approximately 55% of all child death) yearly. Globally, 26%, 10% and 31% children are moderately to severely underweight, wasted and stunted respectively (UNICEF [7]). In India more than half (54%) of all death before 5 years are due to malnutrition (Silva [8]). The prevalence of underweight children in India is the highest in the world, and is nearly double that of Sub-Saharan Africa (Alim [9]). The WHO health statistics in 2012 showed that the proportion of stunting in India was 47.9% and underweight was 43.5% (WHO [10]). IN 2005-2006, the survey conducted by National Family Health Survey (NFHS)-3 also showed that 48% children in India was stunted, 20% and 43% children were wasted and underweight respectively and 45% of less than three years' children were malnourished (NFHS-3 [11]). In India about 30% of children born with low birth weight (Ramchandran [12]). In 2010, Maitra found that one in every three children under three years of age is undernourished in India (Maitra [13]). To handle this problem of malnutrition, the Government of India has launched the ICDS program on 2nd October in1975. The objective of ICDS is provided in a package of six services comprising of supplementary nutrition, pre-school education, immunization, health check-up, nutrition and health education, and referral services to the children below six years and pregnant and lactating mothers (NFHS-3 [11]). Despite of several achievements of ICDS scheme, 45.9% children below three years are still underweight ((NFHS-3 [11]). There has been limited progress in improving the prevalence of child malnutrition of less than one percentage point per year during 1998-99 (NFHS-2: 47%) and 2005-06 (NFHS-3: 45.9%) (Shanawaz [14]).

Globally child growth is used to assess nutritional and health development of a child (Biswas [5]). Compared to other health assessment tools, measuring child growth is a relatively inexpensive, easy to perform and non-invasive process (WHO [15]). So, anthropometric examination is a popular tool in research on health and nutritional condition of children.

This study is aimed to study the nutritional status of Anganwadi children of Siliguri at west Bengal.

MATERIAL AND METHODS

Study Design
The study was a community based cross sectional study. In Darjeeling district, Siliguri Municipality area was selected for the study which was held in the month of May in 2016.

ISSN 2394 - 7780

Selection of Anganwadi Centres and Children
In the Siliguri area, there are 104 running Anganwadi centres at present. The name of these Anganwadi centres were written in the pieces of paper separately. Papers were folded and kept in a jar and mixed then blindly. Among those papers five papers were taken randomly to avoid bias.

Data Collection
To conduct this study, written approval was taken from the District Project Officer (DPO) of ICDS and also concern was taken from ICDS officers.

Anthropometric measurements such as height, weight and mid upper arm circumference were taken between 1-6 years children who were enrolled in the Anganwadi centres. Among 250 children, 116 children were boys and 134 were girls. The age of the children was recorded from the Mother and Child Protection Card supplied by the Government.

Digital weighing machine was used to take the weight. The reading was taken to the nearest 100gm. The weight was taken with minimal clothing and bare foot.

Height/Length board of UNICEF (Union Nations Children's Fund) was used to take the length and the reading was taken to the nearest centimetre. By bare foot, height was taken.

By using MUAC (Mid Upper Arm Circumference) tape of UNICEF, MUAC was recorded to the nearest centimetres. MUAC was taken between age group of 1-5years.

For recording the data about socio demographic profile of the parents of said children a questionnaire was used which was given in Table 5.

Analysis of Data
The anthropometric indices were calculated using reference medians recommended by the World Health Organization (WHO) and classified according to standard deviation units (SD; z-scores), based on WHO criteria (Olack [16]).

The following indexes of nutritional status were used (WHO [17,18])

a) Weight for age (to detect underweight)

b) Height for age (to detect stunting)

c) Weight for height (to detect wasting)

d) MUAC for age (to detect under nutrition)

In the all above form of malnutrition, <-2_SD Z-Score indicates the moderate form and <-3_SD indicates the severe form of respective type of malnutrition. Wasting indicates acute or recent malnutrition whereas, stunting represents long term or chronic nutritional deficiencies. Underweight is a measure for both acute and chronic malnutrition.

Above 2 z-score value is considered as normal for each index.

The educational and occupational level of the parents was divided into three groups. The groups were graded as below-

For educational level
a) Below primary

b) Primary to higher Secondary

c) Above higher secondary

For occupational level
a) Labour and housewife (for female)

b) Business holder

c) Service worker

Family income of the parents was also divided into three categories. The highest and the lowest income was identified and the mean and SD of the total income of all family was calculated and then the income was categorised as below (Snedecor [19])

a) Lower [(lowest income to (mean-SD)]

b) Moderate [(mean-SD) to (mean+SD)]

c) Higher [(mean+SD) to highest income]

ISSN 2394 - 7780

RESULT

Age Distribution

All 250 children were categorised into six age group. The number of children in the age group of 1-2 years, 2-3 years and 2-3 years the number of children were 57 (22.8%), 47 (19.8%) and 56 (22.4%) respectively (Table 1). In the last two groups i.e. 4-5 years and 5-6 years the number of children were 65 (26%) and 21 (8.4%) respectively.

Sex Distribution

Among 250 children 46.4% were boys and 53.6% were girls. In the age group of 1-2 years, 2-3 years and 3-4 years' boys were 52.63%, 38.30%, 44.64% and girls were 47.37%, 61.70% and 55.36% respectively (Figure 1). In 4-5 years' group boys and girls both were equal (50% each). In 5-6 years' boys were 42.86% and girls 57.14%.

Malnutrition

From the data of the mid upper arm circumference, the prevalence of moderate malnutrition among the children was 12.22% and severe malnutrition was 6.87% (Figure 2). Table 2 also showed that girls (14.18%) were suffering more from moderate malnutrition than boys (7.76%) whereas, the prevalence of severe malnutrition was high in male (4.31%).

Underweight

Among the children 26.8% were moderate under nutrition and 6.4% was severely under nutrition (Figure 3). In the Table 2, the data showed that 24.14% male and 29.10% female were in moderate malnutrition. Girls had more underweight (8.21%) than boys (4.31%). The prevalence of moderate underweight was more in 3-4 years and 4-5 years' age group than other age group (Table 3). Severe underweight was high in the age group of 3-4 and 4-5 years' age group.

Wasting

Severe wasting was more in boys (3.45%) (Table 2). The percentage of moderate wasting in both boys and girls was same (Approx. 11%). 12.8% children belonged in moderate wasting and 2.4% children was in severe wasting (Figure 3). Moderate wasting was more profound in the age group of 4-5 years (37.94%). 2-3 years and 5-6 years' age group had same prevalence of wasting. Children belonged to 1-2 and 3-4 years' age group had highest level (33.33% each) of severe wasting than other group.

Stunting

22.4% children and 18% children had moderate and severe level of stunting (Figure 3). Among boys moderate stunting was little high whereas, among girls severe stunting was high (Table 3). Moderate level of stunting was high in the age group of 1-2 and 4-5 years' age group. Severe stunting was highest (35.56%) in the age group of 1-2 years. Table 3 showed that there was a decreasing tread in the severe wasting in the higher age group from 1-2 years' age group.

Parent's Education

58.4% father had below primary education level and only 14% had above Higher Secondary (HS) (Table 4). 96% mother had not passed primary level of education whereas, only 1.2% passed HS.

Parents' Occupation

40% father were labourer and 51.6% mother were either housewife or labourer (Table 4). 57.6% and 48% father and mother were involved in Business. Rest 2.4% father and 0.4% mother were service holder.

Family Income

Majority of the family were in the moderate level of income group (77.6%) (Table 4). Only 12% were in the highly income level group.

DISCUSSION

The present study showed that there are many malnourished children in the Anganwadi centres even after successive running of ICDS services throughout India. Studies conducted by Alhaji *et. al.* showed that 26.6% children were underweight and 32.5% were stunted all over the world (Alhaji [20]). More than half of the world's under nourished people live in India (Alim [9]). In this study total prevalence of malnutrition was 19.09% (moderate 12.22% and severe 6.87%). Underweight, Stunting and wasting was found as 33.2% (moderate 26.8%, severe 33.2%), 40.4% (moderate 22.4%, severe 18%) and 15.2% (moderate 12.8%, severe 2.4%) respectively. Approximately Bandopadyay *et. al.* found the result similarly where the prevalence of wasting, stunting and underweight were 17%, 16.8% and 42.3% respectively in Mumbai (Bandopadyay [21]).

ISSN 2394 - 7780

Mitra *et. al.* also reported prevalence of underweight 90% and stunting 47.5% in Chatrisgarh (Mitra [22]). Similarly, at Purulia in West Bengal, Chowdhury *et. al.* found underweight 33.7%, wasting 29.4% and stunting 17% (Chowdhury [23]). Mishra reported that 54% children were underweight, 52% stunted and 17% were wasted (Mishra [24]). In this study malnutrition was more above 2 years of age. Wasting, stunting and underweight were more between 1-5 years of age compared to 5-6 years' age group. Study conducted by Arepalli and Rao showed severe malnutrition constituted 7.58% at Kurnool district and malnutrition was more among children above 3 years of age (Arepalli [25]). Ramalho *et. al.* also found that malnutrition was more among children more than 3 years' age (Ramalho [26]). Bhanali *et. al.* found that more than 60% children were normal in 0-3years compared to any other age group (Bhalani [27]). Dongre *et. al.* reported 23.1% infant (less than 35 months) were undernourished compared to the children more than 35 months where 59.5% children were under nourished (Dongre [28]). The present study found that girls were more underweight compared to boys. But severe malnutrition and wasting were more commom in boys. Amosu *et. al.* also reported that malnutrition was more common in girls (Amosu [29]). The study of Mukherjee showed malnutrition was more common in boys (Mukherjee [30]). Husan *et. al*. also reported that the prevalence of malnutrition and stunting was more in boys (Husan [2]). The study conducted by Shanawaz *et. al.* showed that males were more severely malnourished compared to females (Shanawaz [14]).

Maximum mother and more than half of father had education level below primary. Similarly, Husan *et. al.* found that 25.20% mother of the children had education level up to primary and 57.4% were illiterate. In case of father the data were 19% and 53.6% respectively (Husan [2]).

Garg *et. al.* in Gaziabad and Bhandari *et. al.* in Rajasthan reported the prevalence of malnutrition was higher among the children below 5 years' age in spite of the services provided by ICDS centres (Garg [31] and Bhandari [32]). More study should be conducted in the different parts of India to find out malnourished children. To minimize the malnutrition further improvement of the present services should be made and also should introduce nutritional intervention programs. Health, nutrition and personal hygiene education should be given more effectively and routinely. There is still need to use WHO standard at the grass route levels to correct malnutrition.

CONCLUSION

There were many children who were suffering from malnutrition even after successive running of ICDS centres in India. Girls were more severely underweight and stunted than boys. Stunting is the cause of chronic malnutrition. So, girls were suffering from malnutrition long time. Severe wasting was high in boys. Children between 4 to 5 years age group were more affected by all type of malnutrition than any other age group. Stunting was high among the other type of malnutrition. Maximum parents were educated up to primary level. Very few parents passed HS. So, it can be concluded that to improve the ICDS service, it should be supervised regularly. If needed some changes to be included. It should be inspected that all the enrolled children are coming in the centre regularly or not. Moreover, parents should be educated more so that they were more aware about the nutrition of their children.

ACKNOWLEDGEMENT

All the Anganwadi workers and helpers and also the parents of the children were very much co-operative. They helped heartily to conduct the study peacefully. District Project Officer (ICDS) of Darjeeling district and Child Development Project Officer (CDPO) of Siliguri Urban area are greatfully acknowledged for approving this study.

REFERENCES

1. World Health Organization. Research to improve implementation and effectiveness of school health programmes. Geneva. WHO. 1996.1,9,10-15
2. Husan I, Zulkifle M, Ansari AH. An assessment of nutritional status of the children of government urdu higher primary schools of Azad Nagar and its surroundings areas of Bangalore. Archives of Applied Science Research. 2011; 3(3):167-176
3. Shills ME, Young VREd. Modern nutrition in health and disease. Philadelphia. Lea and Febiger 1998; 50-58
4. Osmani SR, Sen AK. The hidden penalties of gender inequality:Fetal origins of ill health. Ecol Hum Biol 2003; 1:105-121
5. Biswas S, Bose K and Bhadra M. Mid-upper Arm Circumference Based Undernutrition among Bengalee Children of Chopr in West Bengal. Iran J Pediatrics 2010; 20(1):63-68
6. Scrimshaw NS. Nutrition and Health from Womb to Tomb. Nutrition Today 1996; 31:55-56

ISSN 2394 - 7780

7. UNICEF. The State of World's Children Report. New York. UNICEF. 1998.
8. Silva V and Silva S. Nutritional Status of Anganwadi Children under the Integrated Child Development Services Scheme in a Rural Area in Goa. International Journal of Scientific Study 2015; 3(7):217-221
9. Alim F and Jahan F. Assessment of Nutritional Status of Rural Anganwadi Children of Aligarh under the ICDS (Integrated Child Development Services) and Rural Health. Stud Home Com Sci 2012; 6(2):95-98
10. WHO. Health Statistics 2012. Available from: http://www.who.int/gho/publications/world_health_statistics/2012/en/.
11. National Family Health Survey (NFHS-3) India 2005-06. Nutrition in India. Ministry of Health and Family Welfare. Government of India. Available from: http://rchiips.org/nfhs/NFHS-3%20Data/VOL-1/India_volume_I_corrected_17oct08.pdf
12. Ramchandran P. Poverty nutrition linkage. Indian Journal of Medical Research 2007; 126:249-261
13. Maitra P, Rammohon A, Ray R, Robitaille M C. Food consumption patterns and malnourished Indian children: is there a link? Department of Economics. Monash University 2010; 19/10
14. Shanawaz, Nasir AA, Sunder S *et. al.* An evaluation of nutritional status of children in Anganwadi Centre of Hyderabad district of Andhra Pradesh stateusing WHO z-score technique. Global Journal of Medicine and Public Health. 2013. Vol 2(6):1-6
15. World Health Organization. Use and Interpretation of Anthropometry. Technical Report Series No. 854. Geneva. 1995.
16. Olack B, Bruke H, Breiman RF. Nutritional status of under-five-children living in an informal urban settlement in Nairobi, Kenya. J Health Popul Nutri 2011; 29: 357-363.
17. World Health Organization.WHO Multicentre Growth Reference Study Group. WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development. Geneva. World Health Organization 2006; 312.
18. World Health Organization.WHO Multicentre Growth Reference Study Group. WHO Child Growth Standards: Head circumference-for-age, arm circumference-for-age, triceps skin fold-for-age and subscapular skin fold-for-age: Methods and development Geneva: World Health Organization 2007; 217.
19. Snedecor WG, Cochran WG.Statistical Methods. Oxford and IBH publication. New Delhi. India.1994
20. Alhaji M and Allen S. Paediatric review Management of severe malnutrition-time for a change? Africa Haelth 2002; 24:21-23
21. Bandopadyay DA. Nutritional Survey of school children,Navi Nagar Mumbai. Medical Journal and Forum India 1998; 44(1):31-34
22. Mitra M, Kumar PV, Chakraborty S, Bharati P. Nutritional status of Kumar Tribal Children, Chittisgarh. Indian J of Paediatrics 2007;74(4):381
23. Chowdhury SD, Chakrobory T, Ghosh T. Prevalence of under nutrition in Santal children of Puriliya district West Bengal. Indian Paediatrics.Jan 2008; 45(1):43-46
24. Mishra VK, Lahiri S, Luther NY. Child Nutrition in India. National Family Health Survey Reports. Mumbai. International Institute of Population scierce 1999.
25. Arepalli S and Rao GV. Study of Nutritional status of preschool children in areas of Kallur Primary Health Center,Kurnoorl District. International Journal of Medical Science and Public Health 2016; 5(1):2351-2354
26. Ramalho AA, Mantovani SA, Delifino BM *et. al.* Nutritional status of children under 5 years of age in the Brazillian Western Amazon before and after the Interoceanic higfhway paving:a population-based study.BMC Public Health.2013; 13:1098
27. Bhalani KD, Kotecha PV. Nutritional status and gender differences in the children less than 5 years of age attending anganwadis in Vadodara city. Indian J Comminuty Medicine 2002; 27:124-129
28. Dongre AR, Deshmukh PR, Garg BS. Perceived responsibilities of anganwadi works and malnutrition in rural wardha. Online J Health Allied Scs 2008; 7(1):3

ISSN 2394 - 7780

29. Amosu AM, Degun AM, Atulomah NOS, Olanrewju MF. A study of the nutritional status of under-5 children of low-income earners in a South-Western Nigerian. Community.Curr Res J Bio Sci 2011; 3(6):578-585
30. Mukherjee K. 384Malnutrition in under five children in Turbhe stores urban slum in Navi Mumbai. Int J Med Sci Punlic Health 2014; 3(9):1127-1131
31. Garg SK, Singh JV, Bhatnagar H. Nutritional Status of Children (1-6 years) in slum of Gaziabad city. Ind J Community Medicine 1997; 22(2):70-73
32. Bhandari B, Gupta AP, Mandowara SL *et. al.* Decadal changes in nutritional and immunization status of ICDS beneficiaries. Indian J Maternal and Child Health 1993; 4(1):9-10

TABLES

Table-1: Distribution of Age of Anganwadi Children (N=250)

Age Group	Total
1-2 year	57 (22.8%)
2-3 year	47 (18.8%)
3-4 year	56 (22.4%)
4-5 year	65 (26%)
5-6 year	21 (8.4%)
Total	250 (100%)

Table-2: Prevalence of malnutrition (%) in Anganwadi children (N=250)

Parameters	Boys (%)	Girls (%)
Weight for age Z-score		
Normal	71.55	62.69
Underweight	24.14	29.10
Severe Underweight	4.31	8.21
Weight for height Z-score		
Normal	85.34	86.57
Wasting	11.21	11.94
Severe Wasting	3.45	1.49
Height for age Z-score		
Normal	57.76	61.2
Stunting	25.86	19.40
Severe stunting	16.38	19.40
MUAC for age Z-score		
Normal	87.93	83.58
<-2SD	7.76	14.18
<-3SD	4.31	2.24

Table-3: Prevalence of malnutrition among Anganwadi children according to their age

Type of Malnutrition	1-2year	2-3year	3-4year	4-5year	5-6year	Total
	No of child	No of child	No of child	No of child	No of child	
Weight for Height						
Normal	22.79	19.53	23.72	25.12	7.44	100
Wasting	20.69	13.79	10.34	37.94	13.79	100
Severe wasting	33.33	16.67	33.33	0	16.67	100
Weight for Age						
Normal	22.74	19.16	21.56	26.35	7.79	100
Underweight	23.88	17.91	23.88	25.37	8.96	100
Severe Underweight	18.75	18.75	25	25	12.5	100
Height for Age						
Normal	18.12	18.12	23.49	28.19	9.4	100
Stunting	25	19.64	21.43	26.79	7.14	100
Severe Stunting	35.56	20	20	17.78	6.66	100

ISSN 2394 - 7780

MUAC for Age						
Normal	27.84	19.59	23.71	26.8	0	100
MUAC <-2SD	10.71	25	28.57	35.72	0	100
MUAC <-3SD	0	28.57	28.57	42.86	0	100

Table-4: Socio-demographic profile of parents (N=250)

Parameter	Father (%)	Mother (%)
Education		
Below primary	58.4	96
Primary to Higher secondary	27.6	2.8
Above Higher Secondary	14	1.2
Occupation		
Labourer or Housewife (Mother)	40	51.6
Business	57.6	48
Service	2.4	0.4
Income		
Lower	10.4	
Moderate	77.6	
Higher	12	

Table-5: Interview questionnaire of Mothers

A. Identification	
1. Name of the respondent	
2. Village	
3. Gram Panchayat	
4. Block	
5. District	
B. General Information	
1. Gender	
2. Date of Birth	
C. Specific information of parents	
1. Occupation	
a) Father	
b) Mother	
2. Education	
a) Father	
b) Mother	
3. Monthly Family Income	

ISSN 2394 - 7780

FIGURES

Figure-1: Sex distribution of Anganwadi children

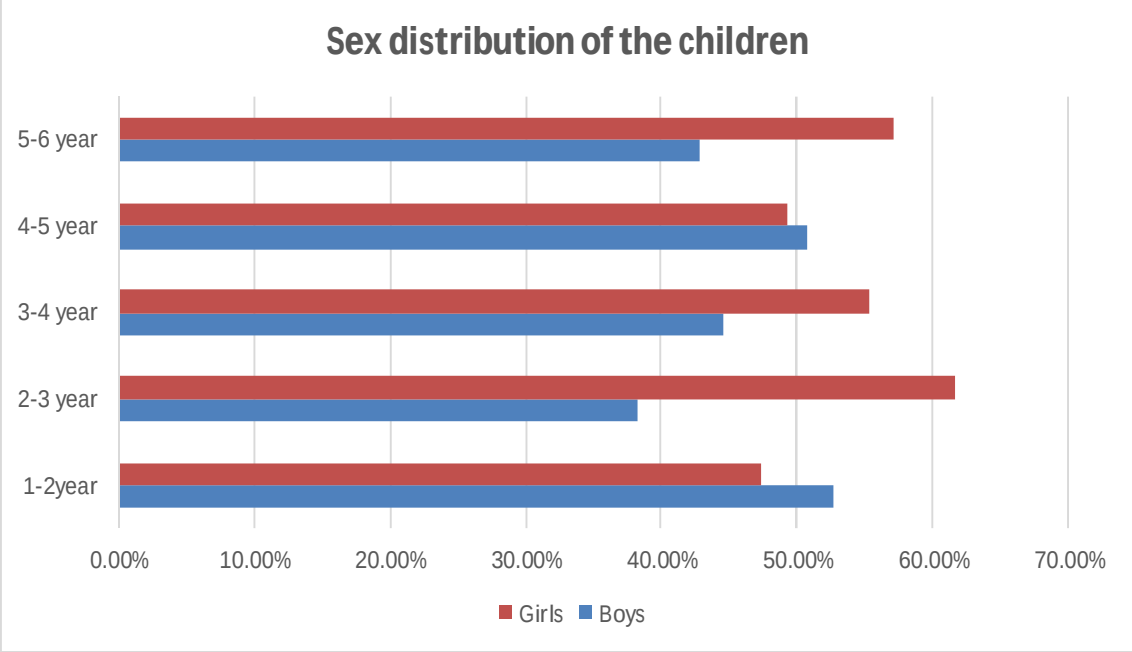


Figure-2: Distribution of malnutrition among Anganwadi children

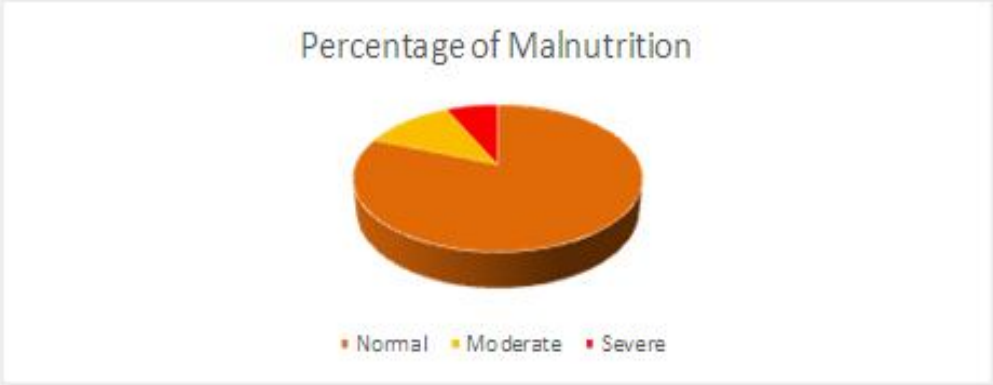
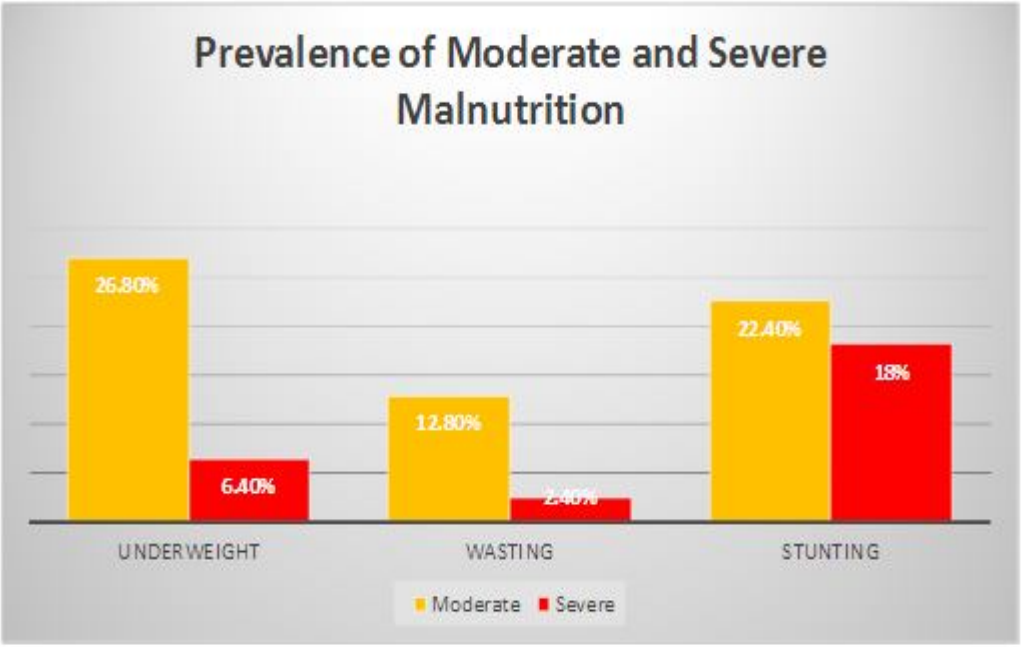


Figure-3: Total Percentage of prevalence of Severe and Moderate Malnutrition among Anganwadi children



International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

TRENDS IN TEACHING PRACTICES FOLLOWED AT BUSINESS SCHOOLS: STUDY OF SELECTED B-SCHOOLS OF JHARKHAND

Richa Ritwika and Dr. Rumna Bhattacharyya
Research Scholar and Associate Professor & PhD Coordinator, ICFAI University, Jharkhand

ABSTRACT
Background – Purpose of this paper is to explore various aspects of teaching practices. With advancement in technology there has been advancement in the methods used for teaching. However main objective of teaching is to inculcate required skills which will be useful for students in getting jobs.

Objectives – The objectives of this paper are to understand the effectiveness of teaching methodology with relation to skills of students at management institutions. Another objective is to determine the frequency of various teaching methodologies being adopted at management institutions.

Methodology – An empirical approach has been adopted for developing this paper. For developing this paper various literature in relation to the topic are reviewed and mentioned in the literature review section. Data is collected from those teaching at different management institutions located at Jharkhand. Questionnaire survey has been used for data collection. Sample size for this paper is 40 faculty members teaching at different management in Jharkhand.

Findings/results – Statistical tools have been used to analyze the data collected from faculty members. Descriptive statistics and regression analysis have been used to derive results mentioned in the objectives. This research will provide an insight into teaching practices which will be useful for institutions providing higher education.

Keywords: Teaching Practices, Higher Education, Management Education

I. INTRODUCTION
Education plays a key role for development of any nation and teachers are an important stakeholder in this. Teachers have the responsibility to pass on knowledge to those who have willingness to learn. With the advancement of technology the methods used for teaching have also advanced. Universities are adopting new methods for teaching as they have the responsibility to develop creative minds. These creative minds will be employed and make the real world a better place. There is a linkage between methods being adopted and the knowledge being gained by students. Methods need to be effective to ensure the overall education quality is improved.

In the recent times employers have become conscious about the workforce they hire from universities and colleges. Educational institutions have a greater responsibility to ensure they are able to develop quality students who can be employed and help in economic growth of nation. In this the role of teacher is not only limited to passing on knowledge but now they have to play the role of trainer, mentor, or coach. Various new techniques have been adopted to impart knowledge and also to ensure employable students are generated. This paper tries to explore the teaching methodologies which have been adopted at business schools. The study of this paper is limited to business schools in Jharkhand.

II. LITERATURE REVIEW
2.1. Evolution of Education in India
Education in India can be traced back since third century. During the ancient India knowledge was given by Gurus to the students. Students would live in the house of guru irrespective of the social differences [5]. With the development of letters, education started being imparted in written form through palm leaves and bark of trees. During this period the focus of education was mainly upon religion and warfare.

1500 BC to 600 BC was the Vedic period and during this period focus was upon learning Veda, exploring the nature, and acquiring skills which would be useful in their occupation [5]. During this period evidences have been found related to herbal medicine. Texts of this period reveal that exploratory learning process was encouraged. Reasoning and questioning was used by teachers and students in search of truth.

During ancient India education was open for all and it was imparted for free to the students. However students would make a voluntary contribution and this contribution is known as Gurudakshina [5].

During the medieval era Nalanda, Takshila, Ujjain, and Vikramshila universities came into existence and higher education started flourishing. Each university focused on the specialization of specific area of study. Nalanda

ISSN 2394 - 7780

was the biggest university during this period [5]. There were various areas such as art, architecture, astrology, philosophy, literature, arthashastra, law, and medicine which were learnt by the students.

In 20th century on the recommendation of Macaulay, the British introduced and founded the present system of education in India. Teachings were introduced in English with the idea of expanding the English market [5]. Many English schools and colleges were founded by British which would promote their ideas and interests. It was decided by Lord Harding that only those Indians who had knowledge of English would be appointed for government jobs. It was decided to establish universities in Bombay, Madras, and Calcutta and in 1857 universities in these three places came into existence.

In 1947 India got independence and after independence education has become responsibility of both state and centre government [5]. Government has been making efforts of providing education to every individual in the country. As per the Indian constitution education is the fundamental right of people. With various efforts literacy rates have raised which has also helped in the economic growth of India. However various challenges are being faced especially in providing higher education.

Earlier education system mainly focuses on a teacher-centred approach where a teacher played an active role while the students just followed the instructions of teachers.

2.2. Challenges in Education

However there are various challenges which the educational institutions are facing to achieve the goal of developing quality students who can be employed. Following are some of challenges which are faced by educational institutions:

- Lack of clarity among teachers for adoption of new methods of teaching. Teachers are unable to understand the necessity for adoption of new methods of teaching [1]. They believe that the way they got education they achieved knowledge in the similar way the current students can gain knowledge.
- There are various approaches and numerous criteria to impart education. There are limited resources available for teaching and there is no conventional method of describing which approach will be best suited for a given content [2]. More practical orientation and scientific knowledge is needed to understand the advantages and disadvantages of various approaches.
- Coordination between requirement of job markets and building of students into workforce is not proper [10]. The job market is changing dynamically but the colleges have not been able to transform according to the job market. Industry academia interaction is low.

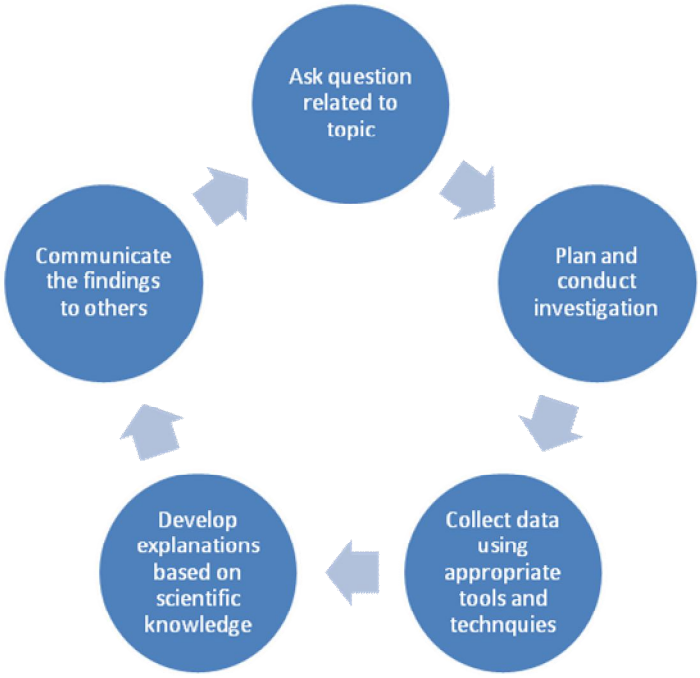
2.3. Innovation in Teaching

Even though there are various challenges being faced by educational institutions in the recent years a lot of experimentation in the area of education is happening at a global level. The idea behind these experimentations is to develop intellectual functions among the learners. Education no longer is about communicating things but has become an important service for developing intelligent workforce.

In the recent years various methods have been adopted to make sure students gain the required knowledge. Various innovations which have been happened in the teaching method are being listed below:

- Case-based learning – As the business environment is changing a need was felt to reduce gap between theory and practice. In this method students are given a real life business problem and divided into groups [4]. Students investigate the problem and teachers only guide the students in finding the solutions. It is the responsibility of students of linking the problems with the theoretical framework and they arrive to solution. This method also helps in teamwork among students and helps in building confidence among students.
- Inquiry-based learning – In this method students get an opportunity to pose a question or problem on the topic taught by teacher. Here teacher has a challenge to make sure students are engaged in the learning process [3]. The process just does not stop at posing questions but students should develop critical and scientific thinking and investigate the question. Below is a pictorial representation of tasks of this method.
- Project-based learning – In this method learning is organized around projects which help in gaining knowledge and skills which will last for long-term. In this also students do their own research and find the solutions [6]. However the important thing in this method is that the skills which are acquired are relevant to the current business scenario. Projects might vary in depth but they provide hands on opportunity to students and this is related to the course curriculum.

ISSN 2394 - 7780



- Resource-based learning – In this method teachers provide required resources to students which helps in learning process [9]. It involves establishing texts and tools which guide in understanding the ways in which different resources can be used. Students use various tools and manipulate the resources and this helps them understand different contexts and gain knowledge.
- Game-based learning – The idea of this method is to provide learning in a fun way. Games are used as learning tools where students are engaged in and acquire required knowledge and skills [4]. It keeps the students highly engaged and refreshes and motivates students in the learning process. These experiences gained help in reducing the mistakes in future. However games need to be effectively designed so that the required goal can be achieved. It is important to determine what the students will be taught otherwise they will fail to gain the central idea and connect it with the real world problem.

III. METHODOLOGY

For developing this paper various literatures from journals, articles, newspaper, magazine, and books have been reviewed. Primary data has been collected from different business schools in Jharkhand. A questionnaire survey has been used to collect data. For this paper a sample size of 40 respondents have been used. These respondents are the teaching faculties at the various business schools. Descriptive statistics has been used to analyze the data.

IV. FINDINGS/RESULTS

Teachers have rated the effectiveness and frequency of use of various teaching methodologies. Below is the mean, median, and mode for effectiveness and frequency of teaching methods.

4.1. Mean

Table-1: Mean of effectiveness and frequency of teaching methods

	Effectiveness	Frequency
Lecture method	3.88	4.19
Case Method	4.12	3.49
Role Plays	3.84	2.91
Power point presentation	3.91	3.63
Assignments	3.93	3.65
Group activity	4.26	3.40
Evaluation process	3.98	3.79
Business games and simulation	4.16	3.12
Guest lecturers	4.12	3.16
Films / Video clips	3.81	2.72
Management seminars	4.09	3.05

ISSN 2394 - 7780

4.2. Median

Table-2: Median of effectiveness and frequency of teaching methods

	Effectiveness	Frequency
Lecture method	4.00	4.00
Case Method	4.00	4.00
Role Plays	4.00	3.00
Power point presentation	4.00	4.00
Assignments	4.00	4.00
Group activity	4.00	4.00
Evaluation process	4.00	4.00
Business games and simulation	4.00	3.00
Guest lecturers	4.00	3.00
Films / Video clips	4.00	3.00
Management seminars	4.00	3.00

4.3. Mode

Table- 3: Mode of effectiveness and frequency of teaching methods

	Effectiveness	Frequency
Lecture method	4.00	4.00
Case Method	4.00	4.00
Role Plays	4.00	4.00
Power point presentation	4.00	4.00
Assignments	4.00	4.00
Group activity	5.00	4.00
Evaluation process	4.00	3.00
Business games and simulation	5.00	3.00
Guest lecturers	5.00	3.00
Films / Video clips	4.00	2.00
Management seminars	5.00	3.00

Group activity, business games and simulation, guest lectures, and management seminars are considered as most effective methods which are useful in effective learning of students.

Even though all these methods are considered to be effective in the learning of students; most respondents have indicated that the frequency of use of these methods is less. There could be various factors which could be having an impact on the lower usage of these methods.

V. CONCLUSION

The concept of education is still the same where there is a guru whom in the modern era we call teacher. This guru is responsible for imparting knowledge and with advancement of technology various new methods of teaching have also evolved. Even though these methods are considered to be effective in providing education the frequency of use of these methods is low. If a qualitative student has been developed then the use of modern methods will have to increase. There challenges which are stopping the use of modern methods of teaching need to be addressed.

VI. BIBLIOGRAPHY

1. Arunachalam, P., Higher Education Sector in India: Issues and Imperatives. *Journal of Global Economy , 6* (4), 267-2911, 2010.
2. Avhad, S., Emerging Issues and Challenges in Higher Education. *International Monthly Refereed Journal of Research In Management & Technology , 2,* 53-56, 2013.
3. Coombs, G., & Elden, M., Introduction to the Special Issue: Problem-Based Learning as Social Inquiry—PBL and Management Education. *Journal of Management Education , 28,* 523-535., 2004
4. Dabholkar, V., & Krishnan, R. T., *8 Steps to Innovation.* Noida: Thomson Press (India) Ltd, 2013.
5. Gupta, D. &. Gupta, N. Higher Education in India: Structure, Statistics and Challenges . *Journal of Education and Practice , 3* (2), 17-25, 2012.

ISSN 2394 - 7780

6. Hallinger, P., & Lu, J., Implementing problem-based learningin higher education in Asia: challenges, strategies and effect. *Journal of Higher Education Policy and Management , 33* (3), 267-285, 2011.

7. Mallick, D., Life Skill Teachers and Their Role in Higher Education. *Indian Journal of Research , 4* (3), 6-7, 2015.

8. Mishra, D. V., Globalization and Indian Higher Education. *Journal Of Educational and Instructional Studies in the World , 3* (1), 8-14, 2013.

9. Monteiro, R., & Shetty, L., Introduction of Life Skills Education in Curriculum for Creative and Positive Social Functioning among Young Students. *International Journal of Engineering Research and Modern Education , 1* (1), 332-341, 2016.

10. Satonkar, N., Ghatage, P., Kavade, G., Patil, P., Gaikwad, A., Desai, S., et al., Strengthening Industry Institute Interaction (III) for improvement in campus placement and industry Tie-up of Automobile Engineering Department in RIT: A Quality Circle Approach. *Journal of Engineering Education Transformations , 30* (4), 52-57, 2017.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

A REVIEW OF MATHEMATICAL MODEL & INVENTORY MANAGEMENT CONTROL TECHNIQUES IN AUTOMOBILE RETAIL SECTORS: FSN & VED ANALYSIS

Rojalin Barik[1], B. K. Mahatha[2] and C. R. Mishra[3]
Mathematics Department[1], Einstein Academy of Technology & Management, Bhubaneswar, Odisha
Department of Mathematics[2], Jharkhand Rai University, Ranchi
Department of Commerce[3], D.K.N College, Odisha

ABSTRACT
Inventory management & control is the process of efficiently overseeing the constant flow of unit's an existing inventory. Spare part management plays an important role for desired commodities availability at an optimum cost. Inventory management is necessary for maintaining the spare parts in every production unit and retail sectors. Inventory control is the most important for production in the cost of product. Material is like cash in cost accounts and hence it need to be controlled. Systematic stock control over the storage & utilization of material, stock is referred to as stock control. Another angle having many spare parts will mean extra cost time & resources that company has to supply. This paper presents a spate part classification methods based on item movement in store department and criticality. FSN analysis and VED analysis, Both the analysis to find out fast moving, slow moving, non moving and VED analysis to find out vital, essential and desirable.

Keyword: Inventory control & management, criticality and models FSN analysis and VED analysis.

1-INTRODUCTION
Inventory management is a function responsible for co-ordination of planning, sourcing, purchasing, moving, storing and controlling materials / stocks in an optimum so as to provide pre-determined services to the customer at a minimum cost the important advantages of inventory management are better accountability, better performance, better growth & adaptability to electronic data processing. Material cost to be effective involves the co-operation of variables departments namely, purchasing department, receiving and inspection department, store departments, producing and stock department inventory control are managed by one integrated system. The manufacturing units and retail units, inventory control also protects the production and selling of materials lastly very simple words inventory control is a systmatic control over the purchasing, storing and using of materials so as to have the minimum possible cost of materials. The important features of inventory control system included.

(i) The quantity and specification of materials should be exact with the requirement of the product.

(ii) The price given to suppliers should be reasonable and the goods should be delivered in time.

(iii) Wastage, pilferage and cusses should be avoided at every stage of production.

(iv) Materials should be classified and properly codified to enable the smooth flow of production.

1.1-SPARE PART MANAGEMENT SYSTEMS
This system is depending on material and stock of finished products .Materials is the basic ingredient in every product. It constitutes a prime part of the total cost of production. In some manufacturing concern like textile, sugar, etc. Material constitutes 60 to 65% of the total cost. Therefore in order to reduce cost per unit proper control over purchase, storing and use of material must be exercised.

The designing of spare part inventory management system is very important for automobile sectors. It is aimed to find optional demand for a given spare parts management system i.e. how to determine optional inventory level in order to reduce cost.

Material required maintaining plant machinery equipments are known as spare parts. Then nuts, bolts and other mirror parts are some of the examples of spare parts.

An important role of inventory control can be satisfied by having the product ready and available when the customer wants it.

2.1-VED ANALYSIS
This method of control is suitable for spare parts in this system all spare parts are grouped in to three categories as:

'V'- For vital spare parts. There are critical parts, the stock-out of which will stop production immediately.

'E'- For essential spare parts. Their absence can be tolerated for few hours or even for a day. It means in their absence production can continue for few hour.

ISSN 2394 - 7780

'D' – For desirable spare parts. The absence of these parts even for a week cannot stop productions.

The prime aim of this control system is to trace the vital spare parts and store them to meet the sudden production stoppage. The criticality of the parts is more important than their money value. Similarly the material whose procurement is difficult is treated as critical & thus sufficient safety stock level should be maintained for those materials.

VED

VED (i.e.- Vital Essential and Desirable) analysis is used primarily for control of spare parts. The spare parts can be divided into their categories- Vital, essential or desirable keeping in view the criticality to production. The spares, the stock out of which even for a short time will stop production for quite some time and where the cost of stock out is very high are known as vital spares. The spare, the absence of which cannot be tolerated for more than a few hours or a day and the cost of lost production is high.

2.1.1-FSN ANALYSIS

Under this method stores are divided into four categories on the basic of their velocity of use these are

'F'- Fast moving materials which are consumed frequently.

'N'- Normal moving materials which are consumed during are year.

'S'- Slow moving materials which are used rarely- once on two to three years.

The purpose of this analysis is to

(i) Monitor fast moving materials to avoid their stock-out.

(ii) Place order for normal and slow moving materials carefully to avoid over stocking.

Whether they could be used or be disposed off. The fast and slow-moving classifications help in arrangement of stock in stores and their distribution and handling methods.

3-CRITICALITY DEFINITION AND MODELS

The classification model and criteria have been used in the after sales environment. In general, spare parts classification models can be seen to consist of one to two main components. First, the criteria and the number of different criteria need to be decided. Once those have been chosen, different groups need to be created based on the criteria. The spare part classification model suggested in this criticality is based on inventory control & management studies.. For the control criticality, three sub- categories were suggested such as failure predictability, number of suppliers, and delivery time.

Criticality Groups	Definition
1- On Demand Parts	❖ The component failure does not cause notable problems to the machine the system ❖ Problems can be withstood for more than Week ❖ Order on demand from the supplier
2- Central Stock Parts / Maintenance Agreement Parts	❖ Component failure caused noticeable problems and can be withstood for a short period of time ❖ Recommendation to keep spare parts in the central stock or having maintenance agreement with the supplier
3- Onboard parts	❖ Vital for the system and the failure needs to be corrected immediately ❖ Port authority dictates the repair to be done before the operations can be continued ❖ Recommendation to keep spare parts Onboard

Spare parts classification based on operational need provide a good foundation for further co-operation between the customer and retailers in terms of deciding who will stock what and where. For being able to develop guidelines for spare part inventory. The classification model considered in this study allows more detailed spare part recommendations and enough information to deciede the risk level they want to take.

3.1- Huiskonen et al. [1] divided criticality into process – and control criticalities. Kennedy, Patterson and Fredendall [2] have purposed of WIP inventory is to stabilize the fluctuation in production flow rate and the purpose of finished goods inventory is to balance the irregular customer demand. But, spare parts inventory

ISSN 2394 - 7780

assists the maintenance division for keeping the equipment in running condition. Unlike WIP inventory and finished goods inventory, spare parts are not intermediate or final products. Major difference between spare parts inventory and other manufacturing inventory is that spare part inventory level largely depends on the equipment use pattern and level of maintenance.

Willemain, Smart and Schwarz [3] have proposed the demand time of spare parts is usually unknown and irregular when corrective replacement method is used. The uncertainty and irregularity in demand pattern of spare parts make them slow moving items. Moreover, the intermittent demand makes the forecasting of spare parts difficult.

Vaughan et al. [4] has proposed even in the case of planned or preventive maintenance, the spare parts demand is irregular since defective but working parts may be identified during preventive maintenance.

Celebi, Bayraktar and Aykac [5] have proposed the unpredictable – demand, limited access and down time impact are the major constraints of management of spare parts. For efficient management of maintenance task, proper spare parts inventory management is important.

Diallo, Ait-kadi and Chelbi [6] have purposed the spare parts, they are purchased from the original manufacturer or their authorized representative. The limited access of spare parts increases lead time and encourages bulk purchase. An organization should rely on the manufacturer recommended maintenance and spare parts replacement schedule for the purchase volume.

Driessen, Arts Houtum, Rustendberg and Huisman [7] have purposed that sometimes lower inventory level of spare parts may lead to stock out and increased downtime which is a loss of production.

Kampem et al [8] has broadly categorized the inventory classification techniques into different categories based on the inventory modeling methods / approached.

Baets and Pintelon [9] developed a multi-criteria classification method based on spare parts criticality. The different parameters influencing spare parts criticality are equipment criticality, probability of failure of the item, replenishment time, number of potential supplier, availability of technical specifications and maintenance type. Based on these on these characteristics, spare parts are classified into three classes representing different levels of criticality (high, medium, low). The multi-criteria classification method is based on the AHP and the logic of decision diagrams. By combining these two techniques, numerous potential attribute influencing spare parts criticality are taken into account in an easy and rational manner.

Zeng, Y.R., Wnag, L. & He, J. [10] have proposed there is not a consensus which classification model and criteria would be the most suitable one to be used in the after sales environment. In fact, it is said that research literature does not even know the existence of a systematic and well-built criticality assessment process.

Vaisakh et al. [11] have proposed the combined use of FSN (Fast, Slow and Non Moving items) and VED analysis to classify inventory based on their consumption pattern and criticality. The inventory item included raw materials, spare parts and work in process inventory in stores of a chemical process industry. The authors indicate that this hybrid technique could substantially reduce the space and the inventory holding costs.

Lolli et al. [12] have broadly categorized the inventory classification techniques into different categories based on the inventory modeling methods / approached.

3.1.1 Figure & Table
According to this analysis the items are classified into

(1) Fast Moving (F)

(2) Slow Moving (S)

(3) Non Moving (N)

Fast moving goods are good indication for profitability. Slow moving (S) and Non-Moving (N) on the basis of their rate of consumption. The measures for slow moving goods are to the analyzed & steps should be taken to dispose them at the earliest. Non Moving goods increate the materials handling cost.

ISSN 2394 - 7780

Table -1: Opening Balance: 50

Date	Receipts Quantity	Returns Quantity	Adjustment Quantity	Issue Quantity	Closing Balance	Inventory Holding days
1/1/97	15	0	0	0	60	60
2/1/97	10	7	0	15	67	127
3/1/97	0	0	0	0	67	194
4/1/97	0	0	0	0	67	261
5/1/97	0	0	5 (+)	0	72	333
6/1/97	20	0	0	0	92	425
7/1/97	0	0	0	12	80	505
8/1/97	0	4	0	0	84	589
9/1/97	0	0	0	0	84	673
10/1/97	10	0	0	7	87	760
11/1/97	0	0	0	0	87	847
12/1/97	0	0	0	12	75	922
13/1/97	0	0	0	0	75	997
14/1/97	10	0	3(-)	0	82	1079
15/1/97	0	0	0	0	82	1161
Total	65	11	2(+)	46	-	-

Average of the material = $\frac{\text{Cumulative No of Inventory Holding Days}}{\text{(Total quantity received+Opening Balance)}} = \frac{1161}{115} = 10.09\ Days$

Consumption Rate= $\frac{Total\ Issue\ Quanity}{\text{Total Period Duraiton}} = \frac{46}{15} = 3.06\ Nos\ /Days$

Now list down the materials with average stay of the material =

$$\frac{\text{Cumulative No of Inventory Holding Days}}{\text{(Total quantity recieived + Opening Balance)}} = \frac{1161}{115} = 10.09\ Days$$

Table - 2

Item Code	Average Stay	Consumption Rate
1	10.09	3.06
2	7.5	5.2
3	8.23	4.71
4	4.2	2
5	6	5.1
6	12	5.76
7	8	3.98
8	9.11	4.48
9	11.12	5.23
10	7.31	4

Carry out the FSN analysis on the basis of Average Stay as below by sorting down in descending order of Average stay. Every company has its policy for defining FSN. Here FSN has been taken as F-10%, S-20% & N-70%.

Table-3

Item Code	Average Stay	Cum. Average Stay	% Average Stay	FSN Classification
6	12	12	14.36	N
9	11.2	23.2	27.77	N
1	10.09	33.29	39.85	N
8	9.11	42.4	50.75	N
3	8.23	50.63	60.61	N
2	7.5	66.13	79.16	S
10	7.21	73.34	87.79	S
5	6	79.34	94.97	F
4	4.2	83.54	100	F

FSN classification only on the basis of consumption rate.

ISSN 2394 - 7780

Table -4

Item Code	Consumption Rate	Cum. Consumption Rate	% Consumption Rate	FSN Classification
6	5.76	5.76	13.24	F
9	5.23	10.99	25.25	F
2	5.2	16.19	37.2	F
5	5.1	21.29	48.92	F
3	4.71	26	59.74	F
8	4.48	30.48	70	F
10	4	34.48	79.23	S
7	3.98	38.46	88.37	S
1	3.06	41.52	95.4	N
4	2	43.52	100	N

Now carry our final classification by combining both as under.

Table-5

FSN (Consumption Rate)	FSN (Average Stay)	Final FSN Classification
F	F	F
F	S	F
F	N	S
S	F	S
S	S	S
S	N	N
N	F	S
N	S	N
N	N	N

FSN Analysis, Identification of fast moving, slow moving and no moving inventory, Inventory Control using FSN analysis, Inventory Analysis.

3.1.2. VED Analysis

Organizations mainly use this technique for controlling spare parts of inventory. VED-Vital, Essential and Desirable analysis is used primarily for control of spare parts. The spare parts can be divided into three categories- Vital, Essential, Desirable keeping on view the criticality to production.

VED ANALYSIS

Vital-(V) Used maximum 4 times

Essential-(E) Used minimum 2 to maximum 3 times

Desirable- (D) Used once

V- There are 6 times in the list. Here ed.no like 5353 and 5301 have been in use regularly. So it is beter to follow the existing model for them. But for the items with around 4 units of consumption, only 1 hob can be present in the main store.

E- There are 6 items in the list. They are moderately used items thus are not very critical. Therefore 1 unit quantity in the main stores and 2 units at setting may be enough.

D- There are 14 items in the list. These are rarely used items. Single units of these in both tool crib main store would be enough.

VITAL

Table-6

S No	ED NO	PRODUCTS	ISSUES
1	5353		3
2	7007		4
3	5319	13	3
4	5335	28	3
5	7013	20	3
6	5301	16	3

ISSN 2394 - 7780

ESSENTIAL

Table-7

S No	ED NO	PRODUCTS	ISSUES
1	2003	31	2
2	7027	42	2
3	5334	78	2
4	7026		2
5	5316		2
6	2015	33	2

DESIRABLE

Table-8

S No	ED NO	PRODUCTS	ISSUES
1	5302	62	1
2	7716	78	1
3	2006	26	1
4	2004	26	1
5	5354	78	1
6	5351	42	1
7	2009		1
8	5326	21	1
9	2017	53	1
10	2014	27	1
11	2016	51	1
12	5301	14	1
13	7004	78	1
14	5112	20	1

4-CONCULSION

It has been conclude that in this paper aims to keep optimal inventory level of an automobile sectors with the Analysis of FSN &VED from table-1 to table-8.The proposed model gave more significant results of average of the material, consumption rate and average stay of the materials . Carry out of FSN analysis on the basis of average stay as below sorting down in descending order average stay, the results of FSN analysis identification of fast, slow,& non moving inventory, Mainly use the VED analysis techniques for controlling spare parts inventory management and have mentioned from table-6 to table-8.The analysis of VED and gave the results of vital is 4 units consumption and 1 item has been present main store. Then essential 6 items list shows in table no-7, 1 units quantity in main store and 2 setting may be enough. The desirable 14 items in table no-8 the list these are rarely used items of the above models of spare part inventory. Lastly conclude that the result of inventory control is the life blood of the automobile retail sectors.

REFERENCES

1. J. Huiskonen, “Maintenance of spare parts logistics: Special characteristics and strategic choices” International Journal of Production Economics vol. 71, no. 1-3, pp. 125-133, 2001.
2. WJ Kennedy, JW Patterson, and LD Fredendall, “An overview of Recent Literature on Spare Parts Inventory”
3. TR Willemian, CN Smart, and HF Schwarz, “A New Approach to Forecasting Intermittent Demand for Service Parts Inventories”, International Journal of Forecasting, 20,375-378, 2004.
4. TS Vaughan, “Failure Replacement and Preventive Maintenance Spare Parts Ordering Policy”, European Journal of Operational Research, 161, 183-190, 2005.
5. D Celebi, D Bayraktal, and DSO Aykac, “Multi Criteria Classification for Spare Parts Inventory”, 38th International Conference on Computer and Industrial Engineering, Beijing, China, 1780-1790, 2008.
6. C Diallo, D Ait-Kadi and A Chelbi, “An Integrated Approach for Spare Parts Provisioning, Frontiers in Science and Engineering”, An International Journal Edited by Hassan IT Academy of Science and Technology, Web http://www.fsejournal.org/docpaper/1312.df, 2009

ISSN 2394 - 7780

7. MA Driessen, JJ Arts, GJ van Houtum, WD Rustenberg, and B Husman, "Maintenance Spare Parts planning and control: A Framework for Control and Agenda for Future Research, (Working Paper)", Beta Research School for Operations Management and Logistics, Web. http://beta.ieis.tue.nl/node/1572, 2010.
8. T.J. van Kampen Van, R. Akkerman, and D.P Van Donk, "SKU classification: A literature review and conceptual framework," International Journal of Operations and Produciton Management, vol. 32(7), pp. 850-876, July 2012.
9. Molenaers, Herman Baets, Liliane Pintelon & Geert Waeyenbergh, "Criticality classification of spare parts: A case study", Int. J. Production Economics, 140 570-578, 2012.
10. Y.R. Zeng, L. Wang. & J. he, "A novel approach for evaluating control criticality of spare parts using fuzzy comprehensive evaluation and GRA" International Journal of Fuzzy Systmes, Vol. 14, No. 3, pp. 392-401 2012.
11. P.S Vaisakh, J. Dileeplal, and V. Unni, "Inventory Management of Spare Parts by Combined PSN and VED (CFSNVED) Analysis," International Journal of Engineering and Innovative Technology, vol. 2(7), pp. 303-309, Jan. 2013.
12. F. Lolli, A. Ishizaka and R Gamberini, "New AHP- Based approaches for multi criteria inventory classification." International Journal of Production Economics, vol, pp. 62-74, Oct. 2014.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

EVALUATION OF GENOTYPES AGAINST MAIZE STEM BORER (*CHILO PARTELLUS* SWINHOE) IN KHARIF SEASON

Shanti Kurly and Binay Kumar
Department of Entomology , Faculty of Agriculture, Birsa Agricultural University, Kanke, Ranchi, Jharkhand

ABSTRACT
Twenty five genotypes were screened for verifying susceptibility to stem borer (Chilo partellus) infesting under natural field condition during Kharif season 2010-11 in research farm of Birsa Agricultural University, Ranchi, Jharkhand. KDMH017, X88557, X88691, KMH218+, JH31285 (IR), MUKHYA108, EC3160, KH717, KH9452, VMH4060 had minimum leaf injury level (1.0-2.0). The five genotypes viz. KMH3426, JH31292, SAPUNCH171, VEH09-2, JH31242 showed leaf injury level of 2.0-3.0. Altogether 15 genotypes were found to be in the least susceptible category and rest ten was grouped into the moderately susceptible category which showed mean leaf injury score above 3.0 per plant.

Keywords: Genotypes and Stem borer (Chilo partellus)

I. INTRODUCTION

Zea mays L., a cereal crop of Gramineae family is referred to as the "Queen of Cereal" due to its inherent high genetic yield potentials and can be cultivated widely in all Agro-ecological zones of arid, semi-arid, temperate and tropical regions of the world (*Ferdu et al*., 2002). It can be grown in all the season in India, but *Kharif* (monsoon) is the main growing season in Northern India. Maize grain contains about 10 percent protein, 4 percent oil, 70 percent carbohydrates, 2-3 per cent crude fiber, 10.4 percent albuminoides, 1.4 percent ash. Its protein "ZEIN" is deficient in two essential amino acids, tryptophan and lysine. It also contains significant quantities of vitamin E calcium and phosphorus. It can be used for manufacturing starch, alcohol, acetic acid, lactic acid, syrup, vinegar, resin powder, fuel for torpedoes, artificial leather, boot polish etc. the green cob is roasted and consumed by the people with great interest. Maize grains are milled into broken grits for making grovel for human consumption (Singh *et al.,* 2006). Chaudhary (1983) reported that maize is used as raw material in the paper, textile, laundry, refining and food industries (sweetening of candies, ice-creams or bakery products) and chemical industries. He also mentioned that maize oil contains vitamins, is used in pharmacy and has a hypocholestermic effect in man and animals. The intending input of maize is high nutritive potential food for human being utilization (UN, 2000). The maize crop is popularly grown in following states in India viz., Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Karnataka, Punjab, Rajasthan, and West Bengal. The Karnataka, state occupies an area of 9.60 lakh ha with the annual production of about 27.20 lakh tonnes and an average productivity of 2833 kg /ha in maize cultivation (Anonymous, 2009). In Jharkhand, maize is grown in about 1.86 lakh ha. with a production of 2.69 million tonnes and productivity of 1.45 ton/ha, which is again nearly 13.2 per cent less than the national average (Shabnam, 2009). *Chilo partellus* (Swinhoe) is a major pest of maize and sorghum and also infests other crops like sugarcane, millets and paddy. Yield loss due to this pest is about of 26.7 to 80.4 per cent in different agro-climatic regions of India (Chatterji *et al.,* 1969, Singh and Kanta 2006). During *Kharif* season the pest maize stem borer is widespread. This pest infests the plant at all stages (Pradhan, 1969). According to Bhanukiran and Panwar, (2000) the maize stem borer (*Chilo partellus* Swin.) is a key pest and able to cause losses between 24.3 and 36.3 % in different agro-climatic regions of India. The insecticides have residual effects and insect pests may develop resistance against certain insecticides due to indiscriminate use of insecticides (Raynolds, 1970). The technology regarding maize germplasm resistant to insect pests can be the economical, more productive and free from any environmental pollution and other biohazards as in case of pesticides.

II. MATERIALS AND METHODS

The experiment was conducted on maize crop at research farm BAU, Kanke, Ranchi during *Kharif* 2010-11. Twenty-five genotypes were taken viz. KDMH017, X88557, X88691, KMH218+, KMH3426, JH31292, JH31285(1R), NMH803, MUKHYA108, SAPUNCH171, HKH313, VEH09-2, MCH42, BL2802, EC3160, EH1858, JH31242, KH717, KH9452, KMH3712, MCH37, VMH4060, HM8, HM9 and Suwan which was the entry as a control. All the genotypes were grown uniformly with proper agronomical practices and special attention was given to keep the plots free from insecticidal contamination. The crop was grown in *Kharif* seasons in the year 2010 and 2011 with a randomized block design (RBD). Each genotype replicated twice and each replication divided into three rows. Row length, row to row and plant to plant distances were kept at 5.0m, 0.75m, and 0.25m respectively. The observations, concerning with the number of healthy as well as infested plants and completely dried whorls (caused by stem borer) were recorded at 2-3 leaf and 6-7 leaf stages of the

ISSN 2394 - 7780

plant in every plot. On the basis of the observations, mean per cent plant infestation was worked out. The other parameters viz., mean per cent stem tunneling, mean tunnel length and mean number of exit hole were counted by following steps: At the harvest, six randomly selected plants were uprooted from each entry, the stems were split open, the total number of exit holes on the stem due to borer were counted the entire stem, the total length of stem and tunnel length were measured. The extent and intensity of pest infestation for each genotype were determined by using following formulae.

$$\text{Percent infestation} = \frac{\text{No. of infested plants / plot}^{-1}}{\text{Total number of plants / plot}^{-1}} \times 100$$

$$\text{Percent stem tunneling} = \frac{\text{Average length of tunnel}}{\text{Average plant height}} \times 100$$

The obtained data were statistically analyzed. Finally, the maize genotypes were separated into the group of resistance / moderately susceptible / least susceptible / highly susceptible on the basis of leaf injury rating of the 1-9 scale of Sarup *et al.* (1979). The leaf injury rating was recorded at 30-35 days after sowing. The leaf injury rating scale (1-9) was used for evaluating genotypes against damage of maize stem borer. There are one to nine descriptive visual rating scales which are as follows.

Table-2.1: Leaf Injury Rating Scale

Visual rating	Description
1	Apparently healthy plant.
2	Plant showing slightest damage on leaf or few pinholes on 1-2 leaves.
3	Plant showing more pin holes or shot holes on 3-4 leaves.
4	Plants showing injury (pin holes, shot holes, slits) in about one-third of total number of leaves and mid-rib tunneling on 1-2 leaves, if any.
5	Plants showing 50% of leaf damage (pin-holes, shot-holes, slits, streaks) and mid-rib damage, if any.
6	Plants showing varied types of leaf injury in about two-third of the total number of leaves.
7	Plants with every type of leaf injury and almost all the leaves damaged.
8	The entire plant showing maximum leaf injury and likely to form dead-heart (such plants usually show stunted growth).
9	Dead-heart

III. RESULT AND DISCUSSION

Genotypes viz. KDMH017, X88557, X88691, KMH218+, JH31285 (IR), MUKHYA108, EC3160, KH717, KH9452, VMH4060 had minimum leaf injury level (1.0-2.0). The five genotypes viz. KMH3426, JH31292, SAPUNCH171, VEH09-2, JH31242 showed leaf injury level of 2.0-3.0. Altogether 15 genotypes were found to be in the least susceptible category. The remaining genotypes showed leaf injury level above 3.0 and were observed as a moderately susceptible category. Pal and Bandopadhyay (2006) also screened 14 maize germplasms against stem borer and found that 5 germplasms had no infestation of stem borer but others were either moderately susceptible or susceptible. Similar observations were also reported by Rao and Panwar, 1996; Arabjafari and Jalali, 2007 and Tafera *et al.*, 2011). The four genotypes viz. KDMH017, X88557, EC3160, VMH4060 had a mean incidence of stem borer ranging from 20 to 30 per cent whereas X88691, JH31285 (IR), KH717 and KH9452 received 30-40 per cent incidence of stem borer. The remaining 17 genotypes received more than 40 per cent mean plant infestation. The genotypes KDM017 & KH717 received 4.5 and 4.8 per cent stem tunneling respectively whereas 5-10 per cent tunneling were noted in X88557, X88691, KMH218+, KMH3426, JH31296, JH31285 (IR), MUKHYA108, SAPUNCH171, HKH313, MCH42, BL2802, EC3160, EH1858, KH9452 and HM8. The remaining 8 genotypes received more than 10 per cent stem tunneling (*Table 3.1*). These types of stem tunneling record also found by Mulye (2000). The mean number of exit hole ranged between1.75 to 6.79. The genotypes which had mean number of exit hole less than 5 were KDMH017 (1.75), X88691 (2.06), KH717 (2.06), X88557 (2.39), KMH218+ (2.39), KH9452 (2.39), EH1858 (2.39), VMH4060 (2.74), KMH3426 (3.11), JH31285 (IR) (3.11), MUKHYA108 (3.11), MCH37 (3.11), SAPUNCH171 (3.50), BL2802 (3.50), HM8 (3.50), JH31292 (3.91), MCH42 (3.91), VEH09-2 (4.79) and KMH3712 (4.79). The

ISSN 2394 - 7780

remaining genotypes had more than 5 mean number of exit holes. They were EC3160 (5.26), NMH803 (5.75), HM9 (5.75), JH31242 (6.26), HKH313 (6.79) and Suwan (6.79) (*Table 3.2*). The present findings are in accordance with the findings of earlier workers (Tefera *et al.*, 2011; Uma *et al.*, 2000; Dass *et al.*, 2006).

Table 3.1: Screening of different genotypes against Chilo partellus

Sl. No.	Hybrid Name	Mean plant infestation (%)	Mean Stem tunneling (%)	Mean leaf injury score/plant
1	KDMH017	20.3 (26.78)	4.5 (12.25)	1.0
2	X88557	24.3 (29.53)	5.2 (13.18)	1.5
3	X88691	30.7 (33.65)	6.0 (14.18)	1.7
4	KMH218+	48.5 (44.14)	7.3 (15.68)	1.0
5	KMH3426	55.6 (48.22)	8.2 (16.64)	2.5
6	JH31292	53.3 (46.89)	6.1 (14.30)	2.5
7	JH31285(1R)	30.6 (33.58)	6.5 (14.77)	1.5
8	NMH803	56.2 (48.56)	12.4 (20.62)	3.5
9	MUKHYA108	51.8 (46.03)	8.6 (17.05)	2.0
10	SAPUNCH171	57.1 (49.08)	7.4 (15.79)	2.5
11	HKH313	52.8 (46.61)	9.6 (18.05)	3.5
12	VEH09-2	54.5 (47.58)	10.5 (18.91)	2.5
13	MCH42	59.2 (50.30)	8.3 (16.74)	3.5
14	BL2802	49.8 (44.89)	5.8 (13.94)	3.5
15	EC3160	21.0 (27.28)	10.0 (18.44)	1.5
16	EH1858	60.3 (50.94)	6.8 (15.12)	3.5
17	JH31242	48.7 (44.25)	11.8 (20.09)	3.0
18	KH717	31.4 (34.08)	4.8 (12.66)	1.5
19	KH9452	35.2 (36.39)	7.4 (15.79)	1.5
20	KMH3712	53.6 (47.06)	11.1 (19.46)	3.5
21	MCH37	66.2 (54.45)	14.2 (22.14)	4.0
22	VMH4060	29.3 (32.77)	10.7 (19.09)	1.5
23	HM8	62.5 (52.24)	8.7 (17.16)	3.5
24	HM9	62.8 (52.42)	11.6 (19.91)	3.5
25	Suwan	73.5 (59.02)	15.5 (23.19)	4.5
SEm(±)		3.81	1.44	-
CD (P=0.05)		11.18	4.23	-
CV (%)		12.38	12.04	-

*Figures in parentheses are the values of angular transformation.

Table-3.2: Screening of different genotypes to find out tolerant/ resistance sources against maize stem borer

Sl. No.	Hybrid Name	Mean plant height (cm)	Mean tunnel length (cm)	Mean number of exit hole
1	KDMH017	236.7	6.2	1.75 (1.5)
2	X88557	236.3	5.8	2.39 (1.7)
3	X88691	243.6	7.5	2.06 (1.6)
4	KMH218+	202.9	8.4	2.39 (1.7)
5	KMH3426	209.9	9.8	3.11 (1.9)
6	JH31292	239.5	8.7	3.91 (2.1)
7	JH31285(1R)	217.4	8.0	3.11 (1.9)
8	NMH803	198.9	14.0	5.75 (2.5)
9	MUKHYA108	217.9	9.2	3.11 (1.9)
10	SAPUNCH171	211.0	8.0	3.5 (2.0)
11	HKH313	206.4	11.3	6.79 (2.7)
12	VEH09-2	201.8	12.4	4.79 (2.3)
13	MCH42	211.5	9.7	3.91 (2.1)
14	BL2802	190.1	6.5	3.5 (2.0)
15	EC3160	185.0	11.2	5.26 (2.4)

ISSN 2394 - 7780

16	EH1858	205.0	7.8	2.39 (1.7)
17	JH31242	190.6	12.6	6.26 (2.6)
18	KH717	180.1	5.4	2.06 (1.6)
19	KH9452	177.3	8.6	2.39 (1.7)
20	KMH3712	203.7	11.9	4.79 (2.3)
21	MCH37	208.1	15.0	3.11 (1.9)
22	VMH4060	200.3	11.9	2.74 (1.8)
23	HM8	176.5	9.4	3.5 (2.0)
24	HM9	169.1	12.5	5.75 (2.5)
25	Suwan	195.0	17.5	6.79 (2.7)
	SEm(±)	13.86	0.67	0.41
	CD (P=0.05)	40.69	1.97	1.22
	CV (%)	9.58	9.49	7.17

* Figures in parentheses are the value of $\sqrt{X+0.5}$ transformation.

I. REFERENCES

1. Anonymous, "Agricultural Statistics at a Glance", Published by Centre for Monitoring Indian Economy, 2009, PP. 56-59.
2. K.H. Arabjafari and S.K. Jalali, "Identification and analysis of host plant resistance in leading maize genotypes against spotted stem borer, *Chilo partellus* (Swinhoe) (Lepidoptera: Pyralidae)", Pak. J. Biol. Sci., Vol. 10, No. 11, PP. 1885-1895, 2007.
3. Y. Bhanukiran, and V.P.S. Panwar, "In vitro, efficacy of neem products on the larval of maize stalk borer", Ann. Pl. Protec. Sci. Vol. 8, PP. 240-242, 2000.
4. S.M. Chatterji, W.R. Young, G.C. Sharma, J.V. Sayi, B.S. Chahal, B.P. Khare, Y.S. Rathore, Y.P.S. Panwar and K.H. Siddiqui, "Estimation of loss in yield of maize due to insect pests with special reference to borers", Indian J. Ent., Vol. 31 PP. 109-115, 1969.
5. A.R. Chaudhary, "Maize in Pakistan, Agricultural Research Coordination Board, Univ. Agric. Faisalabad", 1983.
6. S. Dass, J.C. Mehta, R.K. Moudgal, K.S. Dhanju, D. Pal, D.P. Singh and V. Kumar, "Identification of morphological traits in maize for its least susceptibility to *Chilo partellus"*, Ann. Pl. Prot. Sci., Vol. 14, No. 1, PP. 33-37, 2006.
7. A. Ferdu, K. Demissew and A. Birhane, 2002, "Major insect pests of maize and their management: A Review", In: Nigussie M., D. Tanner and A.S. Twumasi (Eds.) "Enhancing the Contribution of Maize to Food Security in Ethiopia", Proceeding of Second National Maize Workshop, Addis Ababa Ethiopia, 12-16 Nov. 2001.
8. S. Mulye, "Screening of sorghum genotypes against shoot fly (*Atherigona soccata* Rondani)) and stem borer (*Chilo partellus* Swinhoe) and low cost protection technology for sorghum shoot fly", P.G. Thesis, Department of Entomology Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur College of Agriculture, Indore (M.P.), 2000.
9. S. Pal and S. Bandyopadhyay, "Field evaluation of some maize germplasms against stem borer, *Chilo partellus* (Swinhoe) and aphid, *Rhopalosiphum maidis* (Fitch.)", J. Appl. Zool. Res., Vol. 17, No. 1, PP. 13-14, 2006.
10. S. Pradhan, "Increase in India's pest problems", Span, Vol. 12(2), PP. 81-83. e.f. R.A.E. 'A' 61(5): 486-487,1969.
11. K.R. Rao, and V.P.S. Panwar, "Study on oviposition-damage relationship in respect of shoot fly species (*Atherigona soccata* and *A .naqvii*) in maize", Ann. Pl. Prot. Sci., Vol. 4, No. 2, PP. 172-173, 1996.
12. H.T. Raynolds, "Current pest control problems of cotton in the South western United States", Int. Pest Control, PP. 14-17,1970.
13. P. Sarup, K.K. Marwaha, V.P.S. Panwar and K.H. Siddiqui, "Studies on insect plant relationship evaluation of introduction on nursery for resistance to the maize stalk borer, *Chilo partellus* (Swinhoe) under artificial infestation", J. Ent. Res., Vol. 1, No. 2, PP. 151-157, 1979.

ISSN 2394 - 7780

14. S. Shabnam, "Effect of soil ameliorants and nutrient levels on productivity of maize (*Zea mays* L.)", P.G. Thesis, Dept. of Agronomy, Faculty of Agriculture, Birsa Agriculture University. Kanke, Ranchi Jharkhand. 2009.
15. S.K. Singh, S.K. Chauhan, R.P. Singh, R.K. Singh and R.B. Singh, "Studies on abiotic factors related to yield gaps across the environment in tropical maize (*Zea mays* L.)", Ann. Agric. Res., Vol. 27, Issue 4, PP. 373-376, 2006.
16. V.P. Singh and U. Kanta, "Feeding behaviour and dispersal of artificially reared maize stem borer, *Chilo partellus* (Swinhoe) (Lepidoptera: Pyralidae)", Indian J. Ent., Vol. 68, Issue 2, PP. 166-170, 2006.
17. T. Tefera, S. Mugo, Y. Beyene, H. Karaya and R. Tende, "Grain yield, stem borer and disease resistance of new maize hybrids in Kenya", Afr. J. Biot., Vol. 10, No. 23, PP. 4777-4783, 2011.
18. K. Uma, K. Ramanjeet, U. Kanta and R. Kaur, "Response of maize germplasms to maize stem borer under field conditions", Insect Environ., Vol. 6, Issue 2, PP. 91, 2000.
19. United Nations, "United Nations statement on food security in Pakistan", The UN system in Pakistan, PP. 38, 2000.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

CONSTRUCTION OF NORMS FOR COMBINED MOTOR FITNESS TEST

Sujit Kumar Pal[1] and Dr. Badshah Ghosh[2]
Research Scholar[1], Jharkhand Rai University, Ranchi, Jharkhand
Associate Professor[2], Department of Physical Education, Panskura Banamali College, Medinipur, West Bengal

ABSTRACT
In sports and physical education, as in life, teachers and coaches are constantly measuring and evaluating. They measure their students, players, associates, opponents, programme, teachings, strategies, coaching, techniques and many other facts of the educational aspects.

Measurement techniques can be applied in both the product and the process. Evaluation occurs when special techniques are used to measure the process of the physical education directly.

A norm is a scale that permits conversion from a raw score to a score capable of comparisons and interpretations. If a test is accompanied by Norms, its utility is enhanced. The students (n =1816) were selected from male (n = 1012) and female (n= 804) hailing from different area of North 24 Parganas of West Bengal to participate in combined Motor Fitness Test whose age ranged between 17 to 21 years.

The purpose of the present study was to find out the performance of the subjects. Norm based on the quantitative data was obtained through the test. The test scores ranged from 12.00 to 31.14 seconds in the case of male subjects while it was 12.20 to 37.69 seconds for the female subjects.

The giving score at 2nd extreme of both ends of the scale for the performance considered as excellent and low and 3rd extreme of both ends taken as good and below average and middle position of score always considered average. The percentile scale was prepared to find out the status of the subject.

Keywords: Performances, Norms, Percentile Scale

INTRODUCTION
Motor Fitness is an individual's proud possession, as it cannot be purchased rather it has to be earned through a daily routine as a set of motor exercises. It is evident that physically fit citizens are an asset and weak individuals are a liability to the nation. It is a responsibility of every nation to promote fitness among its citizens as physical fitness is a basic requirement. In case if the physique is either under developed or stiff and active with lack of in sports and physical education.

Measurement in physical education can be applied for two basic purposes. It may be used to measure status and programme. However, when this same measurement is repeated on the groups several times, the programme or achievement may be noted.

A norm is a scale that permits conversion from a new score to score capable of comparisons and interpretations, if a test is accompanied by norms. The norms are not appropriate and should not be used for interpretative purpose.

STATEMENT OF THE PROBLEM
The study was undertaken for the construction of norms of Combined Motor Fitness Test as formulated by the Teachers working in undergraduate colleges of North 24 Parganas district of West Bengal.

DELIMITATION
The study was confined to the boys and girls of 17-21 years age group. The study was restricted to the following components of Combined Motor Fitness, strength, agility, power, arm, shoulder coordination, hand eye coordination and rapid movement for balancing on beam during movement.

LIMITATIONS
During the course of the study the scholar could not take into account of dietary habits, climatic conditions and environmental factors. The unaccounted factors were considered limitation of the test.

PURPOSE OF THE STUDY
The purpose of the study was to determine the performance of the subjects to construct a norm based on the quantitative data as obtained through the test.

SIGNIFICANCE OF THE STUDY
The result of the study might be helpful for determining the level of motor fitness of students studying in various Institutions. The obtained result might be helpful for Physical Educators and Coaches for selecting a

ISSN 2394 - 7780

group of individual for training and competition. The results might be used for comparing groups in respect of motor fitness. Further, the study might help individuals irrespective of sex difference to be fitness aware.

REVIEW OF THE RELATED LITERATURE

Bhatia[1] (2001) constructed norms on selected motor fitness components for ages between 13 to 17 years, studying in school of Greater Gwalior. School children between the ages of 13-17 years were selected as subjects. The test items were selected at subjects. The test items were 50 meter Dash, standing Broad jump, and Sit ups, Stroke Stands for balance and 600 meter Run / Walk. The raw scores were standardized into T-scale, Hull Scale and Percentile Scale.

Singh et. al.[2] (2010) compared the anthropometric measurements and body composition of field hockey teams of India, Pakistan and Sri Lanka. It was found that there were no significant differences in height and weight among the three teams, with the Pakistani players recording a slightly higher weight. The Pakistan team had a significant higher upper arm length ($P< 0.05$) and bi-hammers diameter ($P <0 < 0.05$) as compared to the Sri Lanka and India teams. The teams had significantly less wrist circumference ($P < 0.05$) , hand width ($P < 0.05$) and lean body mass ($P < 0.05$) as compared to the India and Pakistan teams. The Indian team had significantly less percentage body fat than the other two teams. Body composition depends during the season and out of season also to attempt analysis of features specific to field position. Singh et. Al.[3] (2011) finds out the difference in selected anthropometric variables in volleyball players in different levels of performances. The results revealed that loser players were inferior in block jump and spike jump along with the height and weight. This showed that the team with better height and weight along with good jumping ability had better performance in the tournament.

METHODOLOGY

The selection of subject orientation measures procedure for administering tests, collection of data reliability of the instrument and statistical model used for analysis of data were described.

SELECTION OF SUBJECTS

One thousand eight hundred sixteen (n= 1816) students were selected from male (n= 1012) and female (n=804) candidates belonging to different areas of North 24 Parganas district of West Bengal. Only those students had been considered under this study who could perform the task assigned to them at Netaji Satabarshiki Mahavidyalaya, Haripur, North 24 Parganas district of West Bengal.

CRITERION MEASURES

The criterion measures combined motor fitness means –

- Moving balancing beam as fast as possible
- Dodging past the eight flags indicating the agility
- Jumping over the hurdles (on both legs) indicating the leg strength
- Passing underneath the hurdles indicating agility as well as co-ordination
- Running at brisk pace indicating speed of the subject
- The time elapsed to complete measured as test score.

TEST ADMINISTRATION

The objective of the Combined Motor Fitness test is to ascertain the motor fitness of the subjects. Reliability and validity of the test has been measured in the following way: 99 students (66 boys and 33 girls) were chosen randomly and were asked to go through Indiana Motor Fitness test as well as Combined Motor Fitness test and a high relativeness of 0.70 was obtained.

Reliability of the test was established by correlating the test scores with the Indiana Motor Fitness test and it was found to be high (0.70). The test was formulated by the teacher working in an undergraduate College of West Bengal where Physical Education subject is a general discipline.

Equipment used for this study includes Table, balancing beam, hurdles, stopwatch, signal flag and measuring tape.

The performer was instructed to stand on the balancing beam (width 10 cm and depth 15 cm) with the height of 90 cm for males and 75 cm for females. On the signal the performer started moving fast on the balancing beam and dodged passed eight flags (height 150 cm) and at a distance of 1.43 meters. The first flag was set at a distance of 4 meters from beam.

ISSN 2394 - 7780

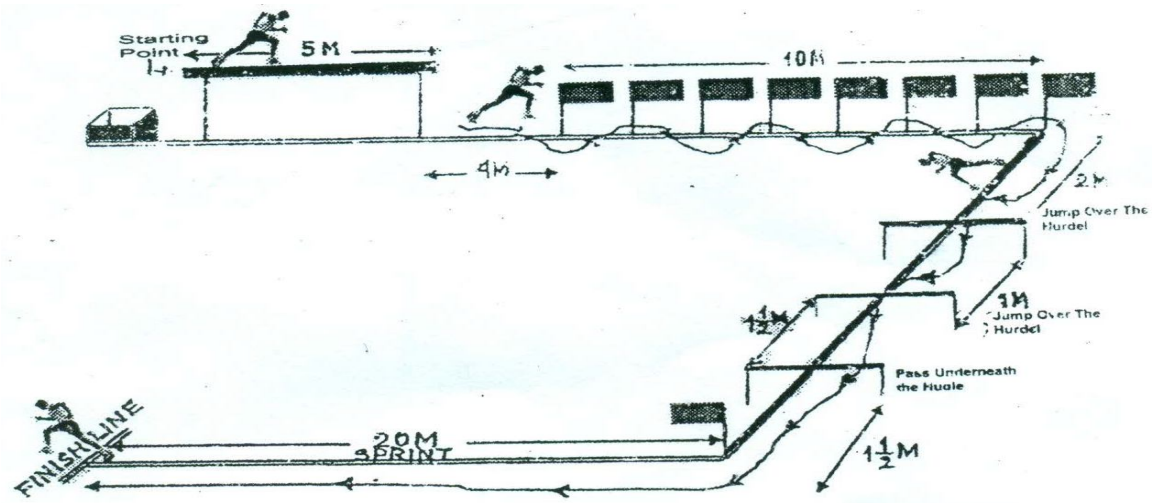


DIAGRAM NO - 1

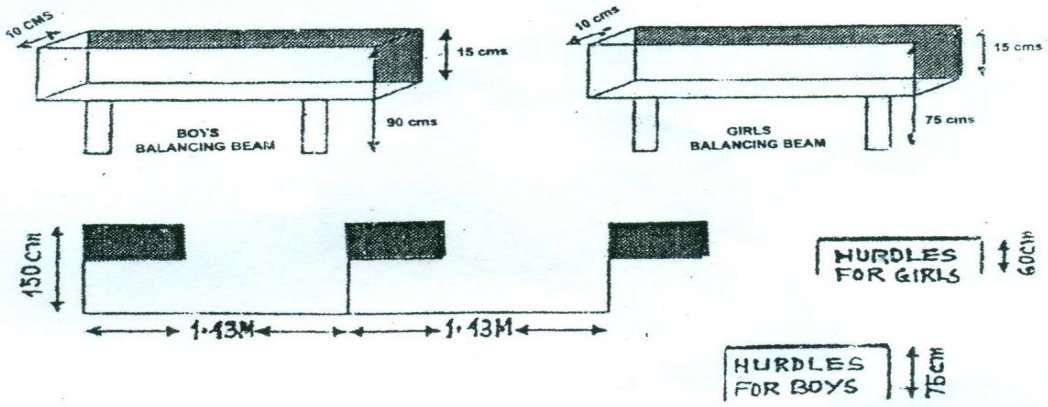
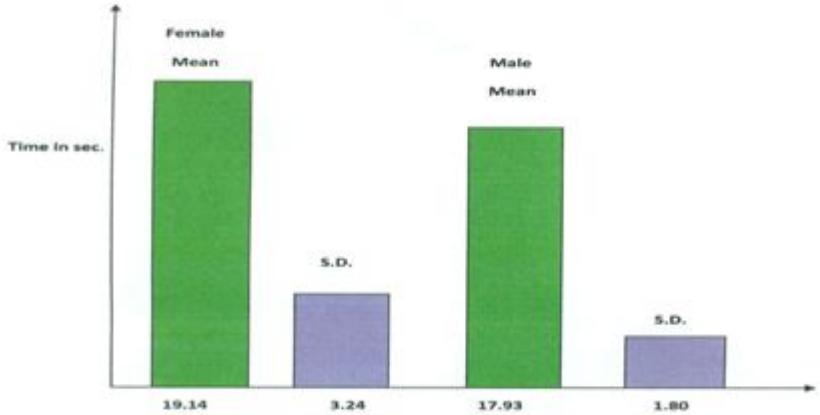


DIAGRAM NO - 2

DIAGRAM OF COMBINED MOTOR FITNESS TEST

Double leg jump over each of the two hurdles for candidates of height 75 cm for men and 60 cm for women. Third hurdles height was same and 1.5 meters distance and turning to the right, sprinted distance of 20 meters was set.



Mean & S.D. of scores in Motor Fitness Test.

Figure No.: 2

ISSN 2394 - 7780

Subject performing Chin up of Indiana Motor Fitness Test: Figure 3

Subject performing Chin up of Indiana Motor Fitness Test: Figure 4

Subject performing Push up of Indiana Motor Fitness Test: Figure 5

Subject performing Broad Jump of Indiana Motor Fitness Test: Figure 6

ISSN 2394 - 7780

Measurement Taking during Standing Broad Jump: Figure 7

ADDITIONAL MEASURES TAKEN

The additional measures are warming up, motivation to give their best and to be attentive.

RELIABILITY OF THE DATA

The data were collected by more than two experts and the reliability of the data established by the split half method.

RELIABILITY OF INSTRUMENTS

The reliability of instruments had been considered based on the reputation, acceptability and standard of the company manufacturing the instruments used in this study. Thus balancing beam, stopwatch and measuring tape used in the study were manufactured by a reputed concern following standard products. All the instruments used were available at the Netaji Satabarshiki Mahavidyalaya, Haripur.

COMPETENCY OF THE TESTERS

Competency of the testers is the investigator himself with the help of his Ph.D scholars of various Institutions of West Bengal. They conducted the test and collected the data. They had been also engaged in their profession for years together. Thus they were regarded as competent enough for the purpose of the present study.

STATISTICAL PROCEDURE: ANALYSIS OF DATA AND RESULTS OF THE STUDY

The obtained data were processed and percentile scores were calculated for preparing the norms. On the basis of the percentile scores 7-Point Scale was prepared to categorize the performances of the subjects on motor fitness test as the find out, male motor fitness, their mean, Standard Deviation, female motor fitness, their mean and standard deviation. The obtained data were presented in the following table:

Variable	**Scores**			
Motor Fitness	***Male***		***Female***	
	Mean	***SD***	***Mean***	***SD***
	17.93	1.80	19.14	3.24

The percentile scores were calculated and on the basis of those norms for males and females were prepared which is applicable to those seeking Physical Education Examination at the BA (undergraduate course) , Ist , 2nd and 3rd year General only. On the basis of the norms the performances were categorized in a 7-Point scale – superlative, excellent, good, average, below average, low and worst performance.

NORMS CATEGORIZED ON 7-POINT SCALE FOR MALE and FEMALES with PERCENTILE SCORES

Category	Superlative	Excellent	Good	Average	Below Average	Low	Worse
Male	Less than 14.69	14.70-15.12	15.13-15.49	15.50-16.01	16.02-16.66	16.67-17.75	17.76 +
Female	Less than 15.70	15.71-17.00	17.01-17.95	17.96-19.65	19.66-20.95	20.96- 21.95	21.96 +

The norms for motor fitness test on combined motor fitness test were constructed in terms of percentile scores. The test scores ranged from 12.00 to 31.14 seconds for male subjects while it was 12.20 to 37.69 seconds in regard to female subjects.

Such a scale was prepared due to the limited range of performance as subjects were categorized in the two parts-namely Male and Female. That happened because of the nature of the test. The giving score at 2nd extreme

ISSN 2394 - 7780

of both ends of the scale for the performance were excellent and low and 3rd extreme of both ends were good and below average and middle position of scores were always average.

Keeping the drawbacks of the percentile, it was thought appropriate to categorize subjects into 7 categories like superlative, excellent, good, average, below average, low and worst performance.

Keeping the educational reforms in mind, there is a trend to award grades rather than the score in order to reduce stress and anxiety among the performer. Thus grading under normal distribution yielded a suitable scale.

CONCLUSIONS

1. Range of performance time on the motor fitness test in regard to male subject was 12.00 seconds to 31.14 seconds and with regard to female it ranged from 12.20 seconds to 37.69 seconds.
2. Calculated the Mean and Standard Deviation of the scores of Male and Female respectively.
3. The Percentile scale was prepared to find out the status of the subject.
4. Due to some drawbacks in percentile score , the performance were categorized in a 7-Point Scale , i.e.

Category	Superlative	Excellent	Good	Average	Below Average	Low	Worse
Percentile Score	76+	66-75	56-65	46-55	36-45	26-35	25 and less

REFERENCES

1. Barrow, Harold.M, "Man and Movement: Principle of Physical Education". (Philadelphia: Lea and Febiger, 1983)
2. Barrow, Harold.M, and MC.Gee.Rosemary, "Practical Measurement in Physical Education and Sports". (Philadelphia: Lea and Febiger, 1983)
3. Debnath, Manika, "Construction of Norms for Specific Physical Fitness of Females Gymnastics at Various Levels", Proceedings of National Seminar of application of Statistics and Computers in Physical Education and Sports; LNIPE; Deemed University, Gwalior; March 2005.
4. Singh. J, "Norms Profile of Specific Skills of Male Indian Handball Players" in Proceedings of The International Congress on Sports Medicine; Exercise Science, Physical Education and Yogic Science, LNIPE, Deemed University, Gwalior, February 12-15, 2008.
5. Chaniyara N.J., " Constructions of Norms of Physical Fitness Test for the admission in Certificate Course of Physical Education for women in Gujrat State ", in Proceedings of the International Congress on Sports Medicine; Exercise Science, Physical Education and Yogic Science, LNIPE, Deemed University, Gwalior, February 12-15,2008.
6. Verma.J.P ," A Statistical Approach for Developing weighted Norm based and Difficulty Rating on Selected Fitness Parameters for Boys in the age group 13-16 years" in Proceedings of the International Congress on Sports Medicine; Exercise Science, Physical Education and Yogic Science, LNIPE, Deemed University, Gwalior, February 12-15,2008.
7. Madhuri Waghchaine M.S," Development of Norms for Selection of Women Volleyball Players of Pune University, Pune" in Proceedings of the International Congress on Sports Medicine; Exercise Science, Physical Education and Yogic Science, LNIPE, Deemed University, Gwalior, February 12-15,2008.
8. Canadian Commission for UNESCO," International Charter of Physical Education and Sports". (Paris Canadian Commission for UNESCO; 1979)
9. Merjorie Phillips and Dean Summers," Bowing, Norms and Learning Curve for College Women" ; Research Quarterly 21, No.4 (December 1950)
10. Johnson, Berry L. and Nelson Jack.K, " Practical Measurement for Evaluation in Physical Education" , (Delhi, Surjeet Publishers, 1982)

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

EMULSIFICATION POTENTIAL OF BIOSURFACTANT PRODUCING BACTERIUM ISOLATED FROM CRUDE OIL CONTAMINATED SOIL

Varsha Singh[1], Padmini Padmanabhan[2] and Sriparna Saha[3]
Department of Bio-Engineering[1, 2], Birla Institute of Technology, Mesra, Ranchi, Jharkhand
Department of Computer Science and Engineering[3], Indian Institute of Technology, Patna, Bihar

ABSTRACT
Potent indigenous biosurfactant producing bacterial isolate SP1002 from crude oil contaminated soil from Haldia oil refinery was isolated by an efficacious enrichment and screening technique. Several methods have been described to identify different biosurfactant producing strains and these methods are mainly based on the surface or interfacial activity of the culture supernatant. Furthermore, a few screening concept explores the hydrophobicity of the bacterial cell surface. Several oil and hydrocarbon substrates such as diesel oil, kerosene and xylene were used by bacterium SP1002 as carbon source for producing biosurfactant during growth. Due to the synthesis of biosurfactant by the bacterium SP1002, surface tension of the culture medium has been lowered to 27.953 mN m^{-1} from 68 mN $m^{-1.}$ In various oil and hydrocarbon such as kerosene, diesel, engine oil, hexane, toluene and xylene microbial surfactant were proficient to form stable emulsions. Chemical characterization of SP1002 shows the extracellular production of lipids and glycolipids biosurfactant. Stability of biosurfactant was studied at elevated temperatures (70˚C), broad pH range (2-10) and high salinity (10% NaCl). Strain SP1002 in addition to biosurfactant production, it is also capable to use up hydrocarbons as their sole sources of carbon and energy, thus suggest its role in environmental application in removing hydrocarbon contaminants present in oil polluted sites. SP1002 can be used in microbial enhanced oil recovery.

Keywords: Emulsification; Biosurfactants; Surface Tension; Hydrocarbons; Environmental contaminants

I. INTRODUCTION

Surfactant is molecules comprised of a hydrophilic (water-loving) and a hydrophobic (water-hating) part. The hydrophilic head-group with a hydrophobic tail-group in combination is collectively referred to as a surfactant. Surface-active compounds produced by microbes, constitute of hydrophilic head and hydrophobic tail, is described as biosurfactants [1]. Biosurfactants synthesized by microbes are chemically active surface compound that is able to utilize substrates like simple sugars, hydrocarbons and oils from contaminated environment. They can reduce surface and interfacial tension amongst liquid and solid substance which will diffuse them as emulsion in liquids. Reference [2] has comprehensively reviewed the biosurfactants with respect to their physiology, chemistry, fermentative production, genetics and potential commercial applications.

Biosurfactants possess several advantages, for example biodegradability and eco-friendly nature, effectiveness at very low concentration, high selectivity, low toxic level as well as its competence to function at extreme environmental conditions, such as pH, salinity, and temperature that makes them commercially useful for applications in different industry [3, 4]. The lipophilic domain of biosurfactant is usually a protein or a peptide which consists of large portion of hydrophobic side chains or else hydrocarbons chain of fatty acid comprising of ten to eighteen carbon atoms, however the hydrophilic domain comprised of hydroxyl, phosphate, carboxylate, and an ester or sugar group [5].

Biosurfactants are distinct group of surface active molecules synthesized by aerobic microorganisms in liquid culture broth and requires source of carbon, essentially carbohydrates, fats, hydrocarbons and oils for their metabolic process [6]. The microbial derived surfactants facilitates the hydrocarbons availability to the microbes for their growth by increasing the area at the aqueous interfaces of hydrocarbon across their cell membranes, hence increasing the use by microorganisms and it also helps in safeguarding the microbes from adverse environmental conditions [7]. Biosurfactant are amphiphiles that act amidst two different polarity solutions by reducing surface tension, hence helps in accessing hydrophobic substrate due to improved contact area amid insoluble compounds (essentially hydrocarbons and oil) results in their mobility, availability to microbes, thus biodegradation of hydrophobic compounds [8].

Biosurfactants is classified into two classes, class I which embodied low molecular-mass molecules, for example lipopeptides, phospholipids and glycolipids, helps in lowering surface and interfacial tensions effectively; whereas class II composed of high molecular mass polymer agents such as particulate and polymeric surfactants with sufficient emulsion stabilizing quality [3]. Biosurfactant by lowering the interfacial tension amidst the two different phases allow the two non miscible phases to interact promptly [9]. The biosurfactant producing bacterial isolate SP1002 reported in this study are considered promising with the aim of

ISSN 2394 - 7780

increasing the solubility and biodegradation of hydrophobic organic compounds in the environmental contaminants.

II. MATERIALS AND METHODS

2.1. Media and Culture Requirements

For enriching sample selectively for biosurfactant producing bacteria, a mineral salt medium (MSM) were used. The following media composition was taken 2.3 g/L NH_4NO_3, 1.4 g/L K_2HPO4, 0.012 g/L KH_2PO4, 0.6 g/L $MgSO4{\cdot}7H_2O$, 0.04 g/L NaCl, 0.01 g/L $CaCl_2$, 0.01 g/L $FeSO_4{\cdot}7H_2O$ and 1.0 g/L yeast extract and the pH of medium was set to 6.9. Hydrocarbon was added to the autoclaved medium, using filter sterilized AXIVA 25 mm diameter filter (0.22µm pore size). On different sources of carbon like diesel, kerosene, n-hexane, n-octane, xylene and engine oil, growth of microbe and production of biosurfactant were studied. Culture inoculated medium was kept for incubation in an orbital shaker at 37 ˚C with agitation of 180 rpm for 24 hrs.

2.2. Screening and Isolation of Potent Biosurfactant Producing Bacteria

Soil samples contaminated with crude oil were collected from Haldia oil refinery from India. To enrich biosurfactant producing bacteria, 100 ml carbon free mineral salt medium (MSM), and 1.0 g sample of crude oil contaminated soil collected from Haldia oil refinery were added in an Erlenmeyer flask and was supplemented with 2% (v/v) of diesel at 37 ± 2 °C incubation with agitation of 180 rpm for 7 days. Thereafter, enrichment culture (1 ml) were transfer into another liquid medium until the medium gets turbid, then these suspensions were streaked on MSM agar plates, in order to isolate single colonies. MSM agar plates supplemented with hydrocarbon were used to screen isolated colonies and incubated for 24 h at 37 ˚C [10]. Development of clear halo zone around the growing colonies in solid media shows positive surfactant activity.

2.3. Measurement of Surfactant Activity

The surfactant property of the extracellular medium during the growth of the isolate SP1002 was qualitatively measured by drop collapse test and quantitatively by using plate method the measurement were done using Kruss-k 8600 E interfacial tensiometer (Germany) at room temperature. All measurements were carried out on culture supernatant by centrifuging the cultures sample at 10,000 rpm for 10 mins [11]. About 40 – 60 ml culture supernatant is required to measure the force required to detach a plate from a surface. Synthetic surfactant (Tween 20 and SDS) at 1% concentration were used for comparison and distilled water was used as a control. All the values were recorded in triplicates.

2.4. Determination of Emulsification ACTIVITY

The emulsification potential of bacterial culture sample SP1002 were calculated by adding 6 ml of oil or hydrocarbon and 4 ml of culture supernatant in screw-cap glass test tubes, vortexes for 2 min at high speed thereafter allow to place for 24 hrs. The height of the emulsion layer was measured after 24 hrs at room temperature. Thereafter, emulsification index (E_{24}) was calculated as the percentage (%) of the height of emulsion formed divided by the total height of the solution in test tube (cm) [12, 13 and 14]. Positive control sodium dodecyl sulphate (SDS) and negative control phosphate buffer saline (PBS) was taken. The percentage of emulsification index (E_{24}) was calculated by applying the following Eq (1). [11]

$$E24\% = \frac{\text{Height of emulsion} \times 100}{\text{Total height of Solution}} \quad (1)$$

2.5. Dry Cell Weight Measurement

Culture broth (70 ml) centrifuged at 10,000×g for 10 min to obtain culture biomass dry weight. At 660nm optical density (OD) of culture supernatant was measured. Pellet obtained after centrifugation was washed and suspended in distilled water and through 0.45 mm whatman qualitative *filter paper* from sigma-aldrich, it was filtered and finally placed on a pre-weighed dish and oven dried to get fixed weight at 98-100˚C.

2.6. Extraction of Biosurfactant

Culture broth was centrifuged at 10,000×g for 10 min; thereafter culture supernatant was used for extraction of the biosurfactant. Culture supernatant (200 ml) was extracted by two extractions using 50 ml of diethyl ether and by using 1N HCl (Merck, India) to adjust pH value 2.0 of the cell free broth. Reduced pressure distillation can be performed to remove solvent and for recovery of the product [10, 15].

2.7 Characterization of Biosurfactant

The chemical characterization of biosurfactant is preliminary carried out by TLC analysis. Silica gel TLC plate were used in separation of biosurfactant using chloroform: methanol: acetic acid (65:15:4, v/v/v) as a mobile phase. Carbohydrate and protein spots were visualized respectively; by the application of molish reagent 5 % 1-

ISSN 2394 - 7780

naphthol in 95% alcohol ninhydrin solution whereas to detect lipid fraction of biosurfactant, iodine crystals was used. Plates were oven dried slowly at 50°C for 10 mins after the application of the spraying agents.

2.8. Stability Study of Biosurfactant

The outcome of numerous parameters on the surface activity of the biosurfactant was studied. The cell free supernatant were adjusted to different pH values ranging from 2 to 12 by using sterile 1N HCl or 1N NaOH. Subsequently, the surface tension was measured. The effect of varied concentration of sodium chloride (0–10%, w/v) was added to the cell free broth and surface tension was measured as stated previously. Again in order to find out the biosurfactant thermal stability, the culture supernatant was incubated at different temperatures (4, 25, 30, 45, 70 ˚C) for 24 hrs and then surface tension was measured. The biosurfactant property was evaluated by surface tension, emulsification capacity and was compared to the readings before the heat treatment.

III. RESULTS

3.1. Screening and Isolation of Biosurfactant Producing Bacteria

By comprising several steps of enrichment method, 45 bacterial strains were isolated and tested for drop collapse assay; all strains were positive to the assay. By surface tension measurement surface activity of all the isolated strains were studied. Culture is promising and expected to give results if it lowers the liquid medium surface tension by less than and equal to 40 mN m^{-1} [16]. A proficient biosurfactant is defined as the one which is able to lower the value of surface tension of the growth medium by less than and equal to 20 mN/m [17].The surface activity of 16 strains was found to be efficient, in which the isolate SP1002 was selected for further studies since it form clear halo zone around colonies in solid media which shows positive surfactant activity as well as it lowers the value of surface tension to 27.953 mN m^{-1} from 68 mN m^{-1} after incubation of 48 hours and hence showed the maximum production of biosurfactant.

The biosurfactant producer's greater frequency is most likely due to the enrichment of potential microbes on hydrophobic water insoluble substrate; as a result it triggers biosurfactant production [18]. Oil reservoirs generally have high temperature and salinity. Hence, a further study was performed to evaluate the stability of emulsion produced by biosurfactant at different temperature and salinity. SP1002 were gram negative, non motile which showed rod-shaped morphology. SP1002 colonies were found to be slight yellowish, rough and opaque on nutrient agar medium. The strain was distinguished as given in bergey's manual of systematic bacteriology as a member of the *Pseudomonas* genus as it shows negative catalase test, positive oxidase test and it uses carbon source glycerol, maltose and mannitol whereas lactose were not utilized [19].

3.2. Biosurfactant Production

Production of biosurfactant was examined using diesel as the soles source of carbon. Figure(s) 1 depicts the SP1002 strain growth characteristics and the biosurfactant production. Maximal biomass concentrations of (2.2 gDCWl−1) were achieved after the growth of cultures for 36–56 hrs. The lowest surface tension measured for the culture supernatant was found to be 29.7 mNm−1. This was observed after 48 hours of incubation. After comparison with the surface tension values of earlier reported biosurfactants [10, 20] it is predicted that SP1002 biosurfactant is an effective biological surface active agent. At this point, the culture broth's emulsification capacity was not the maximum. It continued to increase with growth and biosurfactant production. Emulsification capacities along with biosurfactant concentration were in fact found to increase further with biomass production. This shows that the biosurfactant production is related to growth. The other microorganisms that produced biosurfactants also displayed similar results.

3.3. Effect of Carbon Sources on Growth and Production of Biosurfactant

Biosurfactant production by the strain SP1002 was studied, when grown on different immiscible substrates as sole carbon source. The strain SP1002 grown in MSM liquid medium supplemented with 2 % (v/v) carbon source for 48 hours and thereafter dry cell weight, emulsification capacity and surface tension were studied. Various types of carbon sources were used which include oil and hydrocarbons and it was observed that the strain could grow and produce biosurfactant. This shows that for the production of biosurfactant industrial wastes can be utilized as the substrate. Maximum production of biomass was recorded when the strain SP1002 was grown on diesel followed by kerosene as a sole source of carbon. The best emulsification capacity was observed in the culture when carbon source diesel and kerosene was used, whereas surface tension of the cell free broth was lowest when the cultures were prepared on diesel Figure(s) 2. In reference to the results, we can infer that the best carbon source for biosurfactant production for SP1002 is diesel. The surface tension reported were comparable when cultures grown on xylene (30.01mNm−1) and kerosene (30.18mNm−1). In case of engine oil, emulsification capacity found to be larger in the culture that was grown on it (87.54%). Even though, it shows lesser biomass yield and surface tension (31.20 mNm−1) in engine oil, but increase in the emulsification capacity reveals the effect hydrophobic substrates.

ISSN 2394 - 7780

3.4. Characteristics of Biosurfactant

Thin layer chromatography (TLC) is the elementary and broadly used method for preliminary chemical analysis of biosurfactants [10, 21]. Chloroform–methanol–acetic acid–water (25:15:4:2) were best solvent system to detect purified biosurfactant. TLC plate, on development in the solvent system shows lipid comprising spots with varied Rf value. These were similar to mycolic acid, monoglycerides, glycolipids and di-glycerides standard spots. The TLC plate after application with ninhydrin reagent indicates absence of amino acids moiety or protein in biosurfactant. The applications of naphthol–sulfuric acid reagent on the developed TLC plates reveal red spot which demonstrate the presence of carbohydrate in lipid extract. The biosynthesis of glycolipids as a surface active agent was studied for various bacteria, in combination with long-chain aliphatic or hydroxyl aliphatic acids that they are carbohydrates [22]. On the basis of the above mentioned findings it is presumed, extracellular production of biosurfactant by *Pseudomonas* are glycolipids and fatty acids in nature.

3.5. Emulsification

Good emulsification characteristics coupled with surface activity property is significant for biosurfactants for different environmental and commercial applications [23]. Study was done on the competence of biosurfactant produced by SP1002 to emulsify varied hydrocarbons and oil. The aromatic, aliphatic hydrocarbons and motor oil was emulsified by SP1002 biosurfactant, Figure(s) 3. Hydrocarbons n-hexane (83.92 %), xylene (83.45 %) and engine oil (87.54 %) were emulsified effectively and the emulsions were steady for 260 days at varied temperature range of 4, 25, 30, and 37°C whereas diesel (66.87%), n-octane (55.98%) showed poor emulsion. These results show that the emulsifier produced by SP1002 had high emulsification explicitness towards hydrocarbons and oil. The results clearly reveal the emulsification activity of the surfactant also depends on the interaction of hydrophobic domain of the surfactant with the immiscible substrates. Surface tension is not the only determining parameter.

3.6. Effects of Temperature, Ph And Sodium Chloride on Stability of Biosurfactant

3.6.1 Temperature Stability

The emulsification index was observed at various temperature ranges after 30 mins of incubation period. However, no significant changes were found. The biosurfactant produced by strain SP1002 was found to be thermo stable. This may be concluded as heating it at 70 °C caused no apparent effect on the emulsification activity and surface tension. For microbial biosurfactant production temperature is considered as the most desirable specification. An upsurge or lowering in activity of emulsification under high temperature conditions could be attributed due to the structural alteration in the biosurfactant molecules [24]. At high temperature stability of biosurfactant was mentioned by Reference [25, 26] for *P.aeruginosa* strain and *Brevibacterium aureum* MSA13, respectively.

3.6.2. pH STABILITY

The surface activity of the biosurfactant showed higher stability under alkaline conditions as compared to acidic. It remained comparatively stable to changes in pH range 2-12. At pH value 10, the emulsification activity (E_{24}) was observed 77%, whereas below the pH value 7 emulsification activities were decreased up to 55%. Additionally, under acidic conditions the samples became turbid at pH values lower than 6. This was caused due to the partly precipitated biosurfactant. Figure(s) 4 exhibit the change of the pH values on the properties of biosurfactant. The change in pH values on the surface tension was found to be insignificant. The emulsification capacity on the other hand was found to be sensitive to the change in pH values. Hence an increased pH shows affirmatory response on stability of emulsion.

3.6.3. Effect of Salinity

The effects of the addition of sodium chloride (NaCl) on the biosurfactant produced from strain SP1002 were observed. Most optimal stability of the biosurfactant was recorded at 6% NaCl concentration. The concentration of sodium chloride was increased till 8% (w/v) and the changes observed Figure(s) 5. At greater concentration of sodium chloride (NaCl), the emulsification activity retained by biosurfactant was 77%. It was observed that the biosurfactant shows stability at high salinity and alkaline pH. Such biosurfactants found to be helpful in environmental applications, like the bioremediation of oil spills by virtue of its stability in presence of salt and in alkaline conditions.

IV. CONCLUSION

In this present study biosurfactant producing strain SP1002 isolated from Haldia oil refinery showed the highest production of biosurfactant with diesel as a source of carbon. The biosurfactant produced has stability at broad range of temperature, alkaline pH and salinity. On emulsification activity and in the stability of emulsion, the increase in pH has a positive effect; such a biosurfactant may be useful for enhancing solubility of hydrocarbons. It also reveals the potential for further environmental application of the biosurfactant in

ISSN 2394 - 7780

enhancing biodegradation and removal of hydrocarbon contaminants present in oil polluted sites. Furthermore, it could be utilized in bioremediation of oil spills by virtue of its stability in presence of salt and in alkaline conditions. The thermo stability results highlight the potential use of the biosurfactant in microbial enhanced oil recovery (MEOR).

REFERENCES

[1] J. H. Kügler, L. Roes-Hill, C. Syldatk, and R. Hausmann, "Surfactants tailored by the class Actinobacteria," Frontiers in microbiology, vol. 6, pp. 212, March 2015.

[2] J.D. Desai, I.M. Banat, "Microbial production of surfactants and their commercial potential," Microbiology and Molecular biology reviews, vol. 61(1), pp. 47-64, March 1997.

[3] S.G. Kapadia, B.N. Yagnik, "Current trend and potential for microbial biosurfactants,'' Asian J. Exp. Biol. Sci., vol. 4(1), pp. 8, 2013.

[4] D.K. Santos, R.D. Rufino, J.M. Luna, V.A. Santos, A.A. Salgueiro, and L.A. Sarubbo, "Synthesis and evaluation of biosurfactant produced by Candida lipolytica using animal fat and corn steep liquor,'' Journal of Petroleum Science and Engineering, vol. 105, pp. 43-50, May 2013.

[5] J.M. Campos, T.L. Montenegro Stamford, L.A. Sarubbo, J.M. de Luna, R. D. Rufino, and I.M. Banat, "Microbial biosurfactants as additives for food industries," Biotechnology progress, vol. 29(5), pp. 1097-1108, September 2013.

[6] R.D. Silva, D.G. Almeida, R.D. Rufino, J.M.Luna, V.A. Santos, and L.A. Sarubbo, "Applications of biosurfactants in the petroleum industry and the remediation of oil spills," International journal of molecular sciences, vol. 15(7), pp. 12523-12542, July 2014.

[7] U. Aulwar, R.S. Awasthi, "Production of Biosurfactant and their Role in Bioremediation," Journal of Ecosystem & Ecography, vol. 6(3), pp. 202, 2016.

[8] A. Aparna, G. Srinikethan, and S. Hedge, "Effect of addition of biosurfactant produced by Pseudomonas ssp. on biodegradation of crude oil," International Proceedings of Chemical, Biological & Environmental Engineering, vol. 26, pp.71-75, February 2011.

[9] G. Soberón-Chávez, R.M. Maier, "Biosurfactants: a general overview," In Biosurfactants Springer, Berlin, Heidelberg, 2011, pp.1-11.

[10] P.G. Carrillo, C. Mardaraz, S.I. Pitta-Alvarez, and A.M. Giulietti, "Isolation and selection of biosurfactant-producing bacteria," World Journal of Microbiology and Biotechnology, vol. 12(1), pp. 82-84, January 1996.

[11] M. Abouseoud, R. Maachi, A. Amrane, S. Boudergua, and A. Nabi, "Evaluation of different carbon and nitrogen sources in production of biosurfactant by Pseudomonas fluorescens," Desalination, vol. 223(1-3), pp. 143-151, March 2008.

[12] T.A. Moussa, G. M. Ahmed, and S.M. Abdel-Hamid, "Optimization of cultural conditions for biosurfactant production from Nocardia amarae," J Appl Sci Res., vol. 2(11), pp. 844-850, 2006.

[13] A.S. Kumar, K. Mody, and B. Jha, "Evaluation of biosurfactant/bioemulsifier production by a marine bacterium," Bulletin of environmental contamination and toxicology, vol. 79(6), pp. 617-621, December 2007.

[14] C.D Cunha, M. Do Rosario, A.S. Rosado, and S.G. Leite, "Serratia sp. SVGG16: a promising biosurfactant producer isolated from tropical soil during growth with ethanol-blended gasoline," Process Biochemistry, vol. 39(12), pp. 2277-2282, October 2004.

[15] A.S. Abu-Ruwaida, I.M. Banat, S. Haditirto, A. Salem and M. Kadri, "Isolation of biosurfactant-producing bacteria, product characterization, and evaluation," Engineering in Life Sciences, vol. 11(4), pp. 315-324, January 1991.

[16] D.G. Cooper, B.G. Goldenberg, "Surface-active agents from two Bacillus species," Applied and environmental microbiology, vol. 53(2), pp. 224-229, February 1987.

[17] P.A. Willumsen, U. Karlson, "Screening of bacteria, isolated from PAH-contaminated soils, for production of biosurfactants and bioemulsifiers," Biodegradation, vol. 7(5), pp. 415-423, September 1996.

ISSN 2394 - 7780

[18] E.Z. Ron, E. Rosenberg, "Natural roles of biosurfactants. Environmental microbiology," vol. 3(4), pp. 229-236, April 2001.

[19] S.T. Williams, M.E. Sharpe, and J.G. Holt. Bergey's manual of systematic bacteriology, vol 4. Lippincott Williams & Wilkins, 1989.

[20] J. Thaniyavarn, N. Roongsawang, T. Kameyama, M. Haruki, T. Imanaka, M. Morikawa, and S. Kanaya. "Production and characterization of biosurfactants from Bacillus licheniformis F2. 2," Bioscience, biotechnology, and biochemistry, vol 67(6), pp. 1239-1244, January 2003.

[21] F.O. Bryant, "Improved method for the isolation of biosurfactant glycolipids from Rhodococcus sp. strain H13A," Applied and environmental microbiology, vol. 56(5), pp. 1494-1496, May 1990.

[22] S. Lang, "Biological amphiphiles (microbial biosurfactants)," Current Opinion in Colloid & Interface Science, vol. 7(1-2), pp. 12-20, March 2002.

[23] I.M. Banat, R.S. Makkar, and S. S. Cameotra, "Potential commercial applications of microbial surfactants," Applied microbiology and biotechnology, vol. 53(5), pp. 495-508, 2000.

[24] A. Persson, E. Österberg, and M. Dostalek, "Biosurfactant production by Pseudomonas fluorescens 378: growth and product characteristics," Applied Microbiology and Biotechnology, vol. 29(1), pp. 1-4, August 1988.

[25] C.N. Mulligan, B.F. Gibbs, "Correlation of nitrogen metabolism with biosurfactant production by Pseudomonas aeruginosa," Applied and environmental microbiology, vol. 55(11), pp. 3016-3019, November 1989.

[26] G.S. Kiran, T.A. Thomas, and J. Selvin, "Production of a new glycolipid biosurfactant from marine Nocardiopsis lucentensis MSA04 in solid-state cultivation," Colloids and Surfaces B: Biointerfaces, vol.78 (1): pp. 8-16, June 2010.

FIGURES

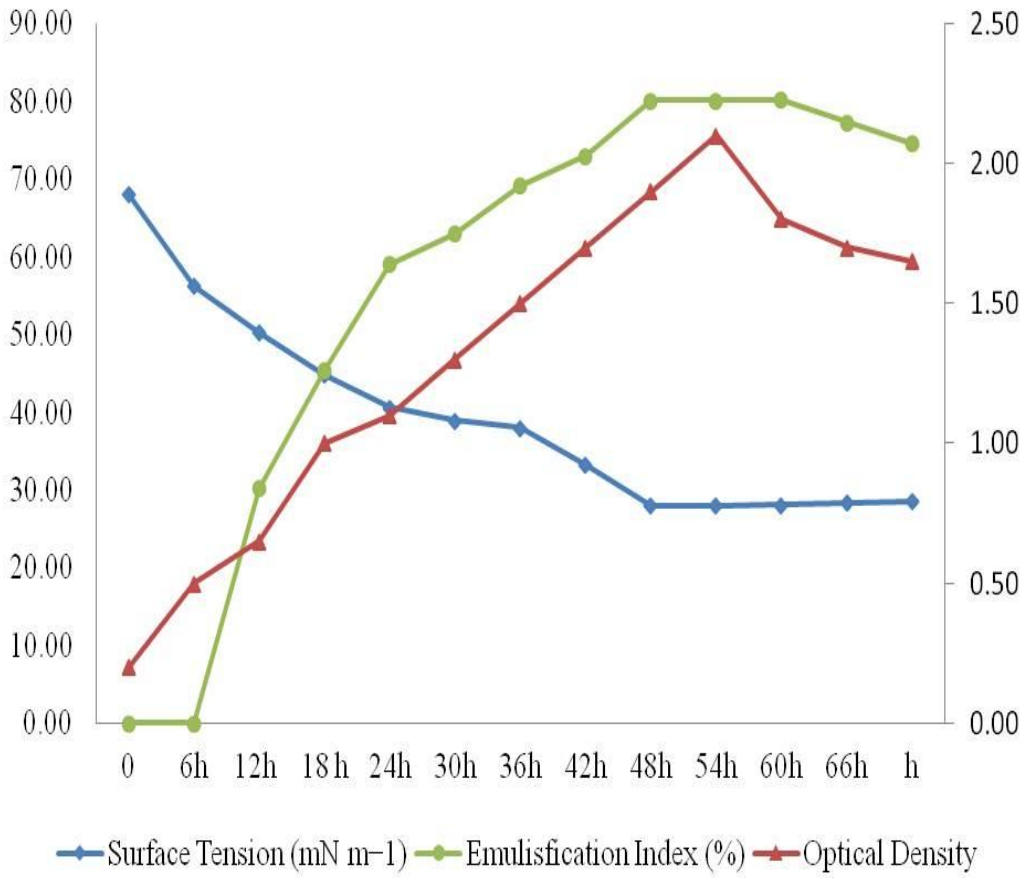


Figure-1: Biosurfactant production and Surface tension of the strain SP1002 at regular time interval during growth on mineral salt medium supplemented with 2% diesel at 37±2°C.

ISSN 2394 - 7780

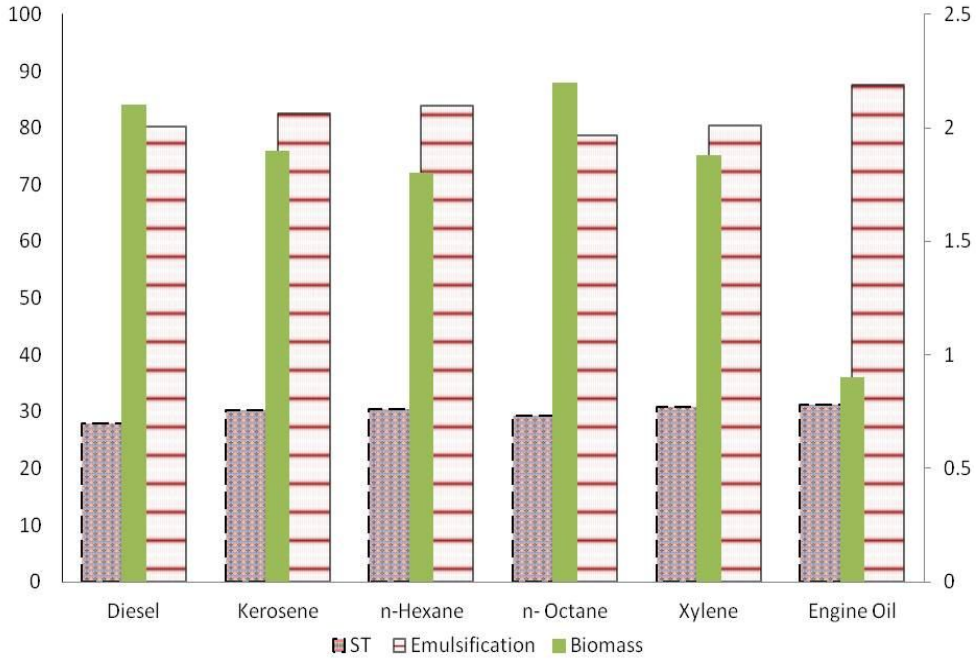


Figure-2: Effect of carbon source on growth, biosurfactant production and emulsification capacity of the strain SP1002.

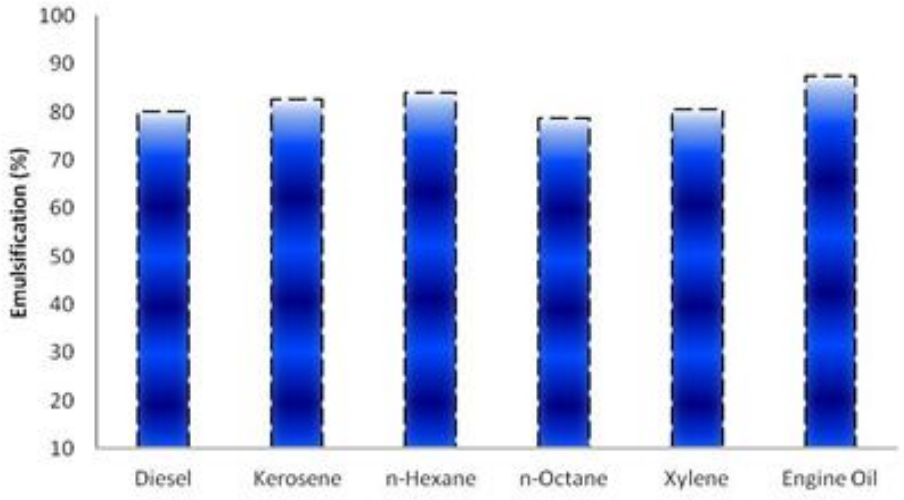


Figure-3: Emulsification capacity (EC) of the culture broth of SP1002 strain with various hydrocarbons and oils.

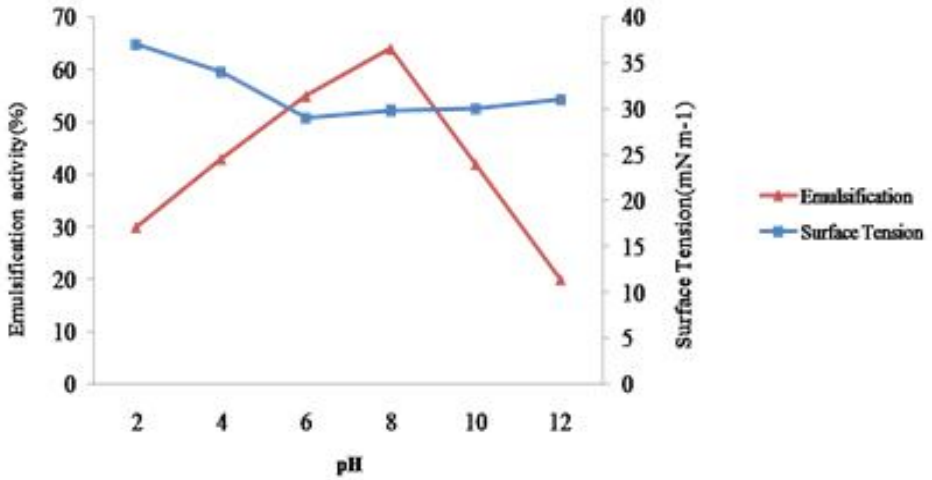


Figure-4: Effect of pH on the surface and emulsifying activities of culture broth of the strain SP1002

ISSN 2394 - 7780

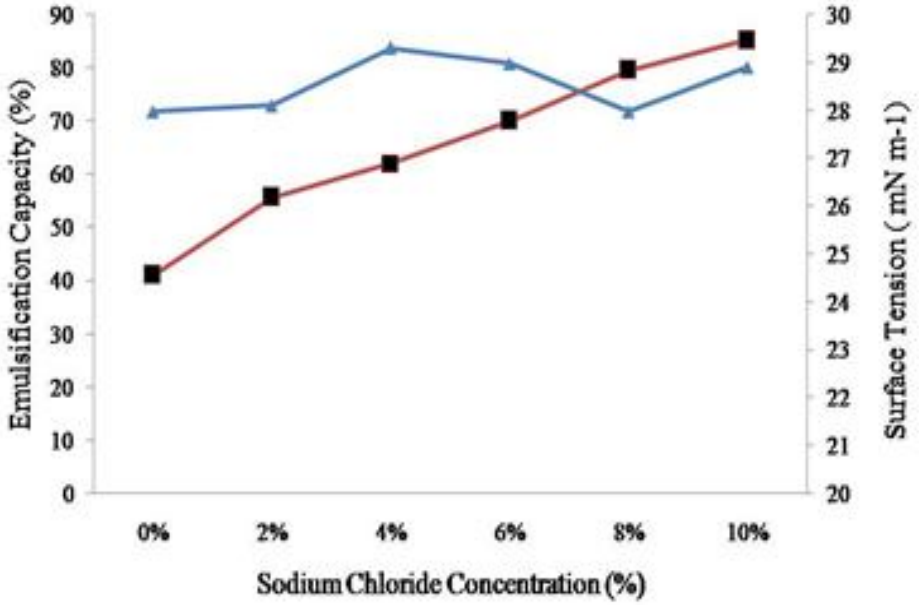


Figure-5: Effects of sodium chloride concentrations on the surface and emulsifying activities of the culture broth of the strain SP1002

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

IN-VITRO ANTIBACTERIAL SCREENING OF MUSCLE EXTRACT OF FRESHWATER EDIBLE CRAB, *SARTORIANA SPINIGERA* ON HUMAN PATHOGENS, ANTIBACTERIAL SCREENING OF MUSCLE EXTRACT OF FRESHWATER EDIBLE CRAB

K. Neetu
Research Scholar, P.G. Department of Zoology, Ranchi University, Ranchi

ABSTRACT
Freshwater crab Sartoriana spinigera is considered as one of the delicious protein food item of tribal people of Jharkhand. It's meat is also used as medicine to cure "Asthma" and even "Chronic fever". The present study has been undertaken to characterize antibacterial activity of meat of freshwater crab, S. spinigera against two gram negative human pathogenic bacteria, Escherichia coli and Klebsiella pneumoniae. In this assay two types of alcoholic solvent eg. Ethanol and Methanol were used for the muscle extract preparation. Standard Disc Diffusion method was carried out for the screening of antibacterial activities. E. coli showed maximum susceptibility of (18.33±0.58 mm) inhibition zone against ethanol extract, whereas methanol extract showed (15.83±0.76 mm) inhibition zone. The difference between these observations was found significant at 5% level advocating that ethanol extract have significantly more antibacterial sensitivity than methanol extract. Positive control with drug, Cephotaxime disc showed (21.83±0.76 mm) inhibition zone. Sensitivity test for methanol extract against K. pneumoniae showed the inhibition zone (13.50±0.5 mm) and for ethanol extract showed (19.50±0.50 mm). Inhibition zone for positive control with Ofloxacin disc was only (5.50±0.50 mm). Statistical analysis showed that sensitivity of both alcoholic extracts for K. pneumoniae are significantly higher than drug Ofloxacin at 0.01% level. Present findings suggest that freshwater crab's meat have good antibacterial activity against human pathogenic microbes. Therefore, they can be used to treat E. coli and K. pneumoniae pathogenic infections. In present paper the possibilities of use of S. spinigera muscle extract as an antibacterial agent has been discussed in detail.

Keywords: S. spinigera; Muscle Extract; Cephotaxime; Ofloxacin; t-test; ANOVA.

I. INTRODUCTION
S. spinigera (Crustacea, Decapoda) is a freshwater crab found abundantly in the muddy banks of wetland of Jharkhand, crawling, burrowing or even buried in the mud soil of the littoral region. This freshwater crab is a common food of the local population who believe in its medicinal value.

The crab meat is highly prized as food due to the presence of rich amount of protein, vitamins A & D, minerals, glycogen & free amino acids. It ranks third after shrimps and lobsters for their esteemed seafood delicacy and also the value of fishery they support. The crab fishery in our country is fast developing and there is a vast scope for the crab culture industry due to the culinary delicacy & nutritional richness of its meat.

The presence of antimicrobial peptides had also been reported in some crab species. Since crabs live in intimate contact with aquatic environment that is rich in pathogenic microbes, they are prone to infections by the microbes at various stages of their growth and the loss due to diseases can be enormous[1]. Antimicrobial peptides are important in the first line of the host defense system of many animal species[2]. The presence of antimicrobial peptides in the crab muscle may possibly be a defense mechanism in response to this. The emergence of new infectious diseases and resistance to antibiotics by the existing ones has led to the discovery of new drugs[3].

Over the past several years, many antimicrobial peptides have been found and characterized in crab species. The first antimicrobial peptide characterized was a prolin peptide of 6.5 kDa from the hemocytes of the shore crab *Carinus maenas*[4]. The antimicrobial peptide Callinecin is a cationic antimicrobial peptide of 3.7 kDa isolated from the blue crab, *Callinectus sapidus*[5]. Recently, Scygonadin, an anionic antimicrobial peptide isolated from seminal plasma of the mud crab *Scylla serrata*[6].

However, no report regarding meat of *S. spinigera* medicinal value in general or antibacterial properties in particular is available. The present investigation has been undertaken to identify and characterize the medicinal or antibacterial properties of the freshwater crab, *S. spinigera* muscle, if any.

II. MATERIALS AND METHODS
Collection of animal material
The animal specimen for the proposed study was collected from local market brought to Zoology Department Laboratory of Ranchi University. Care was taken to select healthy crabs. It was identified as *S. spinigera* (dark

ISSN 2394 - 7780

brown or black coloured freshwater crab) and carapace having only one antero-lateral spine belonging to Potamonidae family.

Preparation of the extracts

The extraction of tissue from the crab was done after[7]. 25g wet weight of freshly extracted tissue were soaked in ethanol and methanol each separately and maintained for 3 days. The extracts were filtered through whatman @No.1 filter paper and concentrated by evaporation using hot plate at 30^0C to obtain a dark brown gummy mass. The resultant residues were stored at 4^0C for further analysis.

Bacterial strains used

Bacterial strains namely *Escherichia coli & Klebsiella pneumoniae* were obtained from Rajendra Institute of Medical Scienes, Bariatu, Ranchi (Jharkhand) 834009. Strains were maintained at 4^0C on nutrient agar media. Each of the microorganisms were freshly cultured prior to susceptibility testing by transferring them into a separate sterile test tube containing nutrient broth and incubated overnight at 37^0C. A microbial loop was used to remove a colony of each bacterium from pure culture and transfer it into nutrient broth.

Preparation of media

The media was prepared by dissolving 28g of nutrient agar powder in 1 liter of distilled water. This mixture was heated while stirring to fully dissolve all components. Autoclaved the dissolved mixture at 15 lbs pressure at 121^0C for 15 minutes. Once the nutrient agar had been autoclaved, allowed it to cool at 55-56^0C. Nutrient agar was poured into each 100 mm petri dish (15-20 mL/plate) and was left on the sterile surface until the agar was solidified.

Preparation of inoculum

Each organism was recovered for testing by sub culturing on fresh media. A loopful inoculum of each bacterium was suspended in 2ml of nutrient broth for 4hrs at 37^0C. Standardization of the inoculum was made by preparing *McFarland* Standard and Compared with the turbidity of the inoculum.

Antibacterial assay

Antibacterial activity was carried out by using Standard Disc Diffusion method[8]. The test cultures (bacteria 1.5 x 10^8 CFU/ml) were swabbed on top of the solidified media & allowed to dry for 5 min. The human bacteria were maintained on nutrient agar plates. A constant amount of 2.8 mg of the extract/mL Dimethyl Sulfoxide (DMSO) was applied onto 6 mm sterile discs, allowed to dry at room temperature and extract loaded discs were placed on agar plates seeded with isolated bacteria and incubated at 37^0C for 24h. The susceptibility of the test organisms were determined by radius of inhibition zone around each disc. The Cephotaxime & Ofloxacin discs were used as a positive control and solvents discs were used as a negative control. All the extracts were tested with triplicate at attention of accurate results.

Statistical Analysis of Data

The recorded data was subjected to statistical analysis by using Student's t-test and one way ANOVA to determine the level of significance.

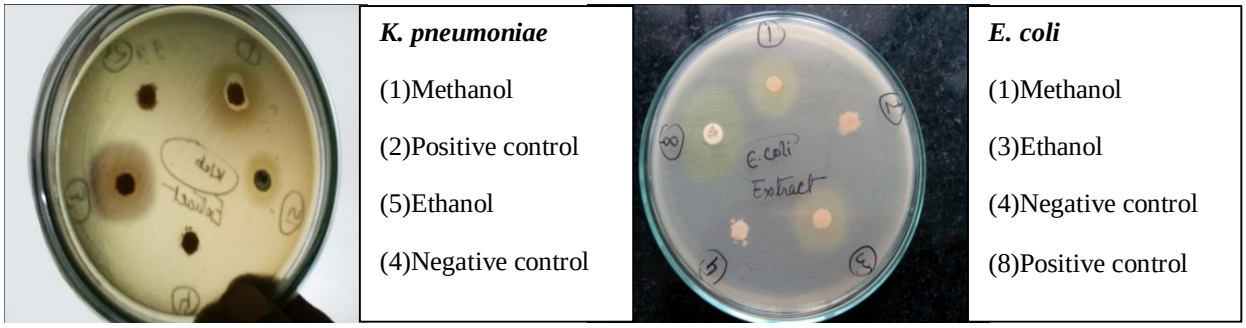


Fig-1: Antibacterial activity of wet muscle extracts using 2 types of solvent ethanol & methanol against 2 bacterial pathogens *E. coli and K. pneumoniae* using Standard Disc Diffusion Method.

Table-1: Inhibition zone of crude extracts (2.8mg/ml) of the wet muscle of *S. spinigera* against Gram negative human pathogens.

Different Solvents	Zone of inhibition (mm) against different bacterial strains	
	Escherichia Coli	***Klebsiella Pneumoniae***
Methanol	15.83±0.76	13.50±0.50

ISSN 2394 - 7780

Vs Ethanol	18.33±0.58*	19.50±0.50***
Methanol Vs +ve control	15.83±0.76 21.83±0.76***	13.50±0.50*** 5.50±0.50
Ethanol Vs +ve control	18.33±0.58 21.83±0.76**	19.50±0.50*** 5.50±0.50

*P<0.05 or significant at 5%, **P<0.01 or significant at 1%, ***P<0.001 or significant at 0.01%

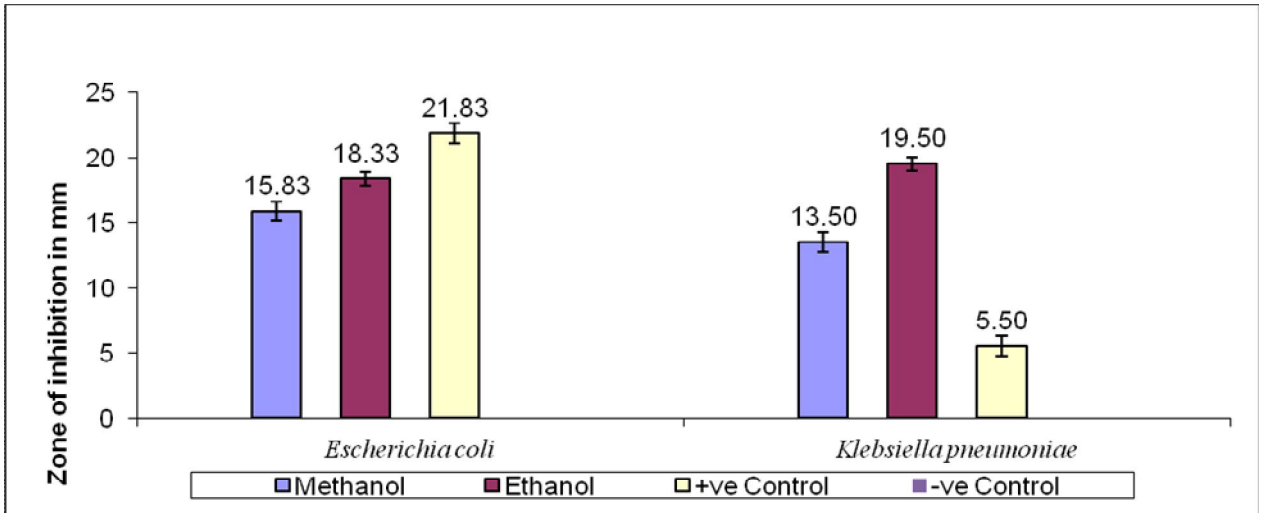


Fig-2: Antibacterial activity of the wet muscle tissue of freshwater crab *S. spinigera*

Table-2: ANOVA Table for mean difference observed in inhibition zone using different solvents against *E. coli*

Sources of Variation	Degree of Feedom	Sum of Squares	Mean Square	*F* value
Between groups	3	838.5	279.5	745.333*
Within groups	8	3	0.375	
Total	11	841.5		

*Significant at 1% level

Table-3: ANOVA Table for mean difference observed in inhibition zone using different solvents against *K. pneumoniae*

Sources of Variation	Degree of Feedom	Sum of Squares	Mean Square	*F* value
Between groups	3	666.5625	222.1875	1185*
Within groups	8	1.5	0.1875	
Total	11	668.0625		

*Significant at 1% level

III. RESULTS

The crude extract of freshwater crab species *S. spinigera* was screened against 2 human pathogenic bacteria for testing their antibacterial activities. The inhibition zones of wet muscle extracts using 2 types of solvent methanol and ethanol were used against the two test organisms *E. coli* and *K. pneumoniae.*

It was observed that maximum inhibition zone was found against *E. coli* in ethanol extract (18.33±0.58 mm) whereas in methanol extract against the same bacteria the zone of inhibition was found (15.83±0.76 mm). When these values were statistically analyzed difference was significant at 5%. The table also showed that maximum inhibition zone was in case +ve control (21.83±0.76 mm), for +ve control cephotaxime (30mg $disc^{-1}$) antibiotic was used. The difference between ethanol extract and +ve control were also analyzed and it was observed that the inhibition zone was significantly more in case of drug than ethanol extract (P<0.01).

In case of *K. pneumoniae* maximum inhibition zone was found in ethanol extract (19.50±0.50 mm) whereas in methanol extract the zone of inhibition was found (13.50±0.50 mm). When these values were statistically analyzed difference was significant at 0.01%, whereas for +ve control ofloxacin (5mg $disc^{-1}$) antibiotic was used in which the zone of inhibition was only (5.50±0.50 mm). The difference between ethanol extract and +ve control was also analyzed and it was observed that the inhibition zone was significantly more in case of ethanol extract (P<0.001).

ISSN 2394 - 7780

Table 2 and 3 showed analysis of varience test between group of means of different solvents against *E. coli* and *K. pneumoniae* and the obtained *F*-values were significant at 1% level. ANOVA was also done in between different colonies in the same solvent methanol, ethanol and positive control and the calculated *F*-values were significant at 1% level.

IV. DISCUSSION

Antibacterial properties of freshwater crabs viz. *Oziotelphusa senex senex* (Fabricus 1798), *Callinectes sapidus* marine crabs viz. *Charybdis lucifera* (Fabricius 1798), *Ocypode macrocera* (H. Milne-Edwards 1852), *Liagore rubromaculata* (De Haan, 1835) and some of the marine gastropods *Hemifusus pugilinus* (Born,1778) , *Natica didyma* (Roding , 1798), *Babylonia zeylanica* (Bruguiere,1789) and *Harpa conoidalis* (Lamarck,1822) are being increasingly reported from different parts of the world. It is because of potential pharmacological utilization. The first attempt to locate antimicrobial activity in marine organisms was initiated around 1950's[9,10]. In the present work, the extracts obtained from the muscle of freshwater crab *S. spinigera* showed strong activity against the tested bacterial pathogens. The results were compared with standard antibiotic drugs. Previous works showed that marine decapods crustaceans contain factors with antibacterial activity, particularly in the hemolymph or in the hemocytes. This property seems to be a common feature through the order[11]. In this present study, ethanol was selected as a suitable solvent as it gave good extraction efficiency. The ethanol extract of freshwater crab *S. spinigera* wet muscle tissue showed best antibacterial activity against bacterial pathogens *E. coli & K. pneumoniae.*

In case of *E. coli* maximum zone of inhibition was recorded (18.33 ±0.58 mm) in ethanol extract whereas in methanol extract the inhibition zone was observed (15.83±0.76 mm).When these values were statistically analyzed, difference was significant at 5% indicating that sensitivity was significantly more in ethanol extract. It was also observed that maximum inhibition zone was in case of +ve control (21.83±0.76 mm), for +ve control cephotaxime (30mg $disc^{-1}$) antibiotic was used. The difference between ethanol extract and +ve control were also analyzed statistically and it was observed that the inhibition zone was significantly more in case of drug than ethanol extract ($P<0.01$) indicating more sensitivity in drug than extract. Similar to this, maximum antibacterial activity against *E.coli* (14 mm) was reported in the hemolymph of a freshwater crab, *Ozeotalphusa senex senex* (fabricius 1798)[12].

In case of *K. pneumoniae* maximum inhibition zone was found in ethanol extract (19.50±50 mm) whereas in methanol extract the zone of inhibition was found (13.50±0.50 mm). When these values were statistically analyzed difference was significant at 0.01% advocating significantly more antibacterial activity in ethanol extract at 0.01%. Whereas for +ve control Ofloxacin (5mg $disc^{-1}$) antibiotic was used in which the zone of inhibition was only (5.50±0.50 mm).The difference between ethanol extract and +ve control was also analysed and it was observed that inhibition zone was significantly more in case of ethanol extract ($P<0.01\%$) than drug. Antibacterial activity against *K. pneumonia* (14 mm) was also reported in the haemolymph of marine *Ocypoda macrocera* (Milne Edwards 1852):A case study[13]. In the present study, it had been observed that a wide spectrum of antibacterial activity was found in both the solvent tested and these results indicated that crustaceans are good source for the search of new substances for drug development.

V. CONCLUSION

The biological significance of the presence of the antibacterial peptides in the crab muscle tissue is yet to be understood. Considerable effort is being put into investigating the therapeutic potential of these peptides. The present study indicated that the muscle tissue of freshwater crab *S. spinigera* would be a good source of antibacterial agents and would replace, the existing inadequate and cost effective antibiotics. Following these in our present study, the crab muscle tissue showed strong activity against the growth of selected bacteria. The result suggests that the crab can show antibacterial activity instantly to combat bacterial infection.

VI. REFERENCES

[1] Hudson, D.A., and Lester, R.J.G. 1994. "Parasites and symbionts of wild mud crabs, *Scylla serrata* (Forskal) of potential significance in aquaculture," *Aquaculture*, vol. 120, no. 3-4,pp.183-199.

[2] Boman HG.1995. Peptide antibiotics and their role in innate immunity annu rev. Immunol 13:61-92.

[3] Rameshkumar, G., Ravichandran,S., Kaliyavarathan, G., Ajithkumar, TT. 2009. Antimicrobial peptide from the crab, Thalaamita crenata (Latreille,1829) World journal of Fish and Marine sciences(2):74-79.

[4] Ai, HS., Liao, JX., Huang, X.D.,Yin, ZX.,Weng,S.P., Zhao, Z.Y. 2009. A novel prophenoloxidase 2 exists in shrimp hemocytes.Dev Comp Immunology:33:59-68.

[5] Ma, Z., Zhao, J., Wu, L., Shi, C., Zhang, C. (2010). The quantitative research of composite immune indicator for crustaceans. Fish Shellfish Immunology 28:187-192.

ISSN 2394 - 7780

[6] Spersad SV, Haug T, Vasskogt, Stensvag K. 2009. Hyastatin a glycin-rich multi-domain antimicrobial peptide isolated from the spider crab, *Hyas araneus* hemocytes.mol Immunol:46:2604-2612.

[7] Chellarm, C.M.E.G., Patterson, E.J.K. 2004. Antibacterial activity of the winged oyster *Pteria chinesis* (Pterioida: Pteridae). Indian J Mar Sci 33:369-70.

[8] Sri Kumaran N, Bragadeeswaran S, Thangaraj S. 2011. Screening for antimicrobial activities of marine molluscs *Thais tissoti* (Petit, 1852) and *Babylonia spirata* (Linnaeus,1758) against human, fish and biofilm pathogenic microorganisms. Afr J MicrobiolRes. 5(24):4155-4161.

[9] Berkholder, P.R. and Burkholder,L.M. 1958. Antimicrobial activity of horny corals. Science,pp: 1127-1174.

[10] Nigrelli, R.S., Jakowsk, S. and Carlent, I. 1959. Bioactive compounds from sponges. Zoologica, NewYork.pp:144-173.

[11] Haug, T., Kjuul, A.K., Sandsdalen, E. and Styrvold, O.B. 2002. Antibacterial activity in four marine crustacean decapods. Fish-shellfish Immunology, 12:371-385.

[12] Sumalatha,D., Jayanthi, J. and Raghunathan, MG. 2016. Antimicrobial Potential of hemolymph of a fresh water crab *Oziotelphusa senex senex* (Fabricius 1798). International Journal of Pharm Tech Research Vol.9, No.6,pp 156-160.

[13] Sivaperumal, P., Kamala, K., Natarajan, E., Dilipan,E. 2013. Antimicrobial peptide from crab haemolymph of Ocypoda macrocera (Milne Edwards 1852): A case study. International Journal of Pharmacy and Pharmaceutical Sciences Vol 5, Suppl 2.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

HEART DISEASE DIAGNOSIS AND PREDICTION USING WEKA DATA MINING TOOL

Rahul Deo Sah[1], Asit Kumar Mohapatra[2] and Raja Ram Dutta[3]
Research Scholar[1,2], Sri Satya Sai University of Technology and Medical Sciences, MP
Research Scholar[3], Birla Institute of Technology, Mesra, Ranchi

ABSTRACT
Cardiovascular sickness remains the greatest reason for passings worldwide and the Heart Disease Prediction toward the starting time frame is criticalness. As substantial measure of information is created in restorative associations (healing facilities, therapeutic focuses) however as this information isn't legitimately utilized. There is an abundance of concealed data introduce in the datasets. This unused information can be changed over into valuable information. For this reason we can utilize diverse information mining strategies. In this paper we discuss diverse estimation approachs of data mining that have been utilized for Heart ailment figure.[11][12] Information mining is a notable strategy utilized by wellbeing associations for characterization of infections, for example, dengue, diabetes and growth in bioinformatics examine. In the proposed approach we have utilized WEKA with 10 cross approval to assess information and analyze comes about. Weka has a wide assembling of different machine learning and information mining calculations. In this paper we have right off the bat characterized the Heart informational collection and after that looked at the changed information mining strategies in weka through Explorer, learning stream and Experimenter interfaces. Besides keeping in mind the end goal to approve our approach we have utilized a Heart dataset with 303 examples no of qualities 76 and utilized 14 ascribes to decide the forecast of sickness and their exactness utilizing characterizations of various calculations to discover the best execution. The essential objective of this paper is to describe data and help the customers in removing significant information from data and easily perceive a fitting figuring for exact judicious model from it. From the revelations of this paper time taken to construct the model in 0.01 seconds in Naïve Bayes and time taken to assemble the model in 0.19 seconds in SMO.The Naïve bayes and SMO are the best execution counts for requested exactness since they achieved most noteworthy accuracy= 100% with 84 precisely gathered cases, most extraordinary ROC = 0.904 , had smallest mean inside and out bungle and it required slightest speculation for building this model through Explorer and Knowledge stream comes about.

Keywords: Weka; Heart disease prediction; Data mining; Classification

I. INTRODUCTION
"Data Mining is a non-irrelevant extraction of obvious, in advance dark and potential important information about data". Essentially, it is a strategy of examining data from substitute perspective and amassing the gaining from it. The discovered learning can be used for different applications for example restorative administrations industry. Nowadays social protection industry makes considerable measure of data about patients, infection examination et cetera. Data mining gives a game plan of frameworks to discover disguised cases from data. An imperative test facing Healthcare industry is nature of organization. Nature of organization proposes diagnosing affliction precisely and gives suitable solutions to patients. Poor finding can provoke stunning results which are unsuitable. [10][11][12]

According to survey of WHO, 17 million total overall passings are a direct result of heart ambushes and strokes.[10][11] The passings due to coronary ailment in various countries happen due to work over-load, mental weight and various distinctive issues. As a rule it is found as fundamental reason for death in adults. Examination is jumbled and basic errand that ought to be executed accurately and successfully. The conclusion is frequently made, in light of pro's understanding and data. This prompts unwanted results and extreme restorative costs of meds provided for patients

II. HEART DISEASE
The heart is important organ of human body part. It is nothing more than a pump, which pumps blood through the body. If circulation of blood in body is inefficient the organs like brain suffer and if heart stops working altogether, death occurs within minutes. Life is completely dependent on efficient working of the heart. The term Heart disease refers to disease of heart & blood vessel system within it. A number of factors have been shown that increases the risk of Heart disease.[10][11]

- Family history
- Smoking
- Poor diet
- High blood pressure

ISSN 2394 - 7780

• High blood cholesterol

• Obesity

• Physical inactivity

• Hyper tension

Variables like these are utilized to break down the Heart malady. As a rule, analysis is for the most part in view of patient's present test outcomes and specialist's involvement. In this way the determination is a mind boggling undertaking that requires much experience and high aptitude. [13]

[3][4][7]Weka remains for Waikato Environment for Knowledge Analysis created at the college of Waikato in New Zealand and was executed in 1997 the product unreservedly accessible at http://www.waikato.ac.nz/ml/weka and written in java dialect. There are a few unique levels at which weka can be utilized. Weka contains modules for information characterization and precision to foresee infections. Weka has been utilized as a part of bioinformatics for findings and examination of coronary illness datasets. Weka has 49 apparatuses for preparing, 76 calculations for order and relapse, 8 calculations for grouping, and 3 calculations for discovering affiliation rules. Weka calculations are appropriate for producing prescient model precisely by removing valuable data from heart dataset through WEKA. Aside from weka scientists are presently moving towards distributed computing for sickness forecasts. It additionally offers offices, for example, grouping and investigation of tremendous datasets. The fundamental focal point of this paper is coronary illness expectation utilizing weka information mining apparatus and its utilization for order in the field of therapeutic bioinformatics. It right off the bat groups dataset and after that figures out which calculation performs best for analysis and forecast of coronary illness. From the discoveries of the trials directed it was uncovered that Naïve Bayes and SMO are the best calculations.

III. LITERATURE SURVEY

Different examinations have been done that have base on investigation of coronary sickness. [10][11]They have associated unmistakable data burrowing systems for conclusion and achieved assorted probabilities for different methods. An Intelligent Heart Disease Prediction System (IHDPS) is made by using data mining strategies Naive Bayes, Neural Network, and Decision Trees was proposed by Sellappan Palaniappan et al .[3]. Each system has its own quality to get legitimate results. To gather this structure disguised illustrations and association between them is used. It is on the web, straightforward and expandable. The desire for Heart affliction, Blood Pressure and Sugar with the guide of neural frameworks was proposed by Niti Guru et al. [13]. The dataset contains records with 13 properties in each record. The managed frameworks i.e. Neural Network with back inducing count is used for getting ready and testing of data The issue of perceiving obliged association rules for coronary disease estimate was considered by means of Carlos Ordonez [16]. The resultant dataset contains records of patients having coronary disease. Franck Le Duff et al. [9] develops a decision tree with database of patient for a remedial issue. Latha Parthiban et al. [10] foreseen an approach on preface of coactive neuro-fleecy derivation system (CANFIS) for gauge of coronary ailment. The CANFIS show uses neural framework limits with the soft basis and innate estimation. Kiyong Noh et al. [14] uses a portrayal methodology for the extraction of multiparametric incorporates by assessing HRV (Heart Rate Variability) from ECG, data pre-getting ready and coronary ailment outline. The dataset involving 670 social orders, appropriated into two get-togethers, to be particular ordinary people and patients with coronary sickness, were used to finish the trial for the agreeable classifier.

IV. PROPOSED PREDICTION SYSTEM

Today, various specialist's offices direct therapeutic administrations data using social protection information system; as the structure contains goliath measure of data, used to expel covered information for making shrewd remedial conclusion. The standard objective of this examination is to develop Intelligent Heart Disease Prediction System that gives finish of coronary ailment using recorded heart database. To develop this system, restorative terms, for instance, sex, circulatory strain, and cholesterol like 14 input characteristics are used. To get additionally fitting results, two more attributes i.e. bulkiness and smoking are used, as these characteristics are considered as fundamental properties for coronary disease. The data mining request strategies viz. SMO, REPTree, J48 and Naive Bayes are used.

V. DATA SOURCE

The publicly available heart disease database is used. The Cleveland Heart Disease database [11] consists of 303 records. The data set consists of 3 types of attributes: Input attribute which are listed below.[10]

ISSN 2394 - 7780

Attribute Information

% -- Only 14 used

% -- 1. #3 (age)

% -- 2. #4 (sex)

% -- 3. #9 (cp)

% -- 4. #10 (trestbps)

% -- 5. #12 (chol)

% -- 6. #16 (fbs)

% -- 7. #19 (restecg)

% -- 8. #32 (thalach)

% -- 9. #38 (exang)

% -- 10. #40 (oldpeak)

% -- 11. #41 (slope)

% -- 12. #44 (ca)

% -- 13. #51 (thal)

% -- 14. #58 (num) (the predicted attribute)

Input attributes

@relation cleveland-14-heart-disease

@attribute 'age' real

@attribute 'sex' { female, male}

@attribute 'cp' { typ_angina, asympt, non_anginal, atyp_angina}

@attribute 'trestbps' real

@attribute 'chol' real

@attribute 'fbs' { t, f}

@attribute 'restecg' { left_vent_hyper, normal, st_t_wave_abnormality}

@attribute 'thalach' real

@attribute 'exang' { no, yes}

@attribute 'oldpeak' real

@attribute 'slope' { up, flat, down}

@attribute 'ca' real

@attribute 'thal' { fixed_defect, normal, reversable_defect}

@attribute 'num' { '<50', '>50_1', '>50_2', '>50_3', '>50_4'}

"Detail input attributes"

VI. METHODOLOGY

With a particular ultimate objective to finish experimentations and executions [2][4][7]Weka was used as the data mining gadget. [12][13]Weka (Waikato Environment for Knowledge Analysis) is a data mining instrument written in java made at Waikato. WEKA is a better than average data burrowing mechanical assembly for the customers to bunch the exactness in light of datasets by applying differing algorithmic techniques and took a gander at in the field of bioinformatics. Voyager, Experimenter and Knowledge stream are the interface available in WEKA that has been used by us. In this paper we have used these data mining techniques to envision the survivability of coronary sickness through request of different computations precision.

ISSN 2394 - 7780

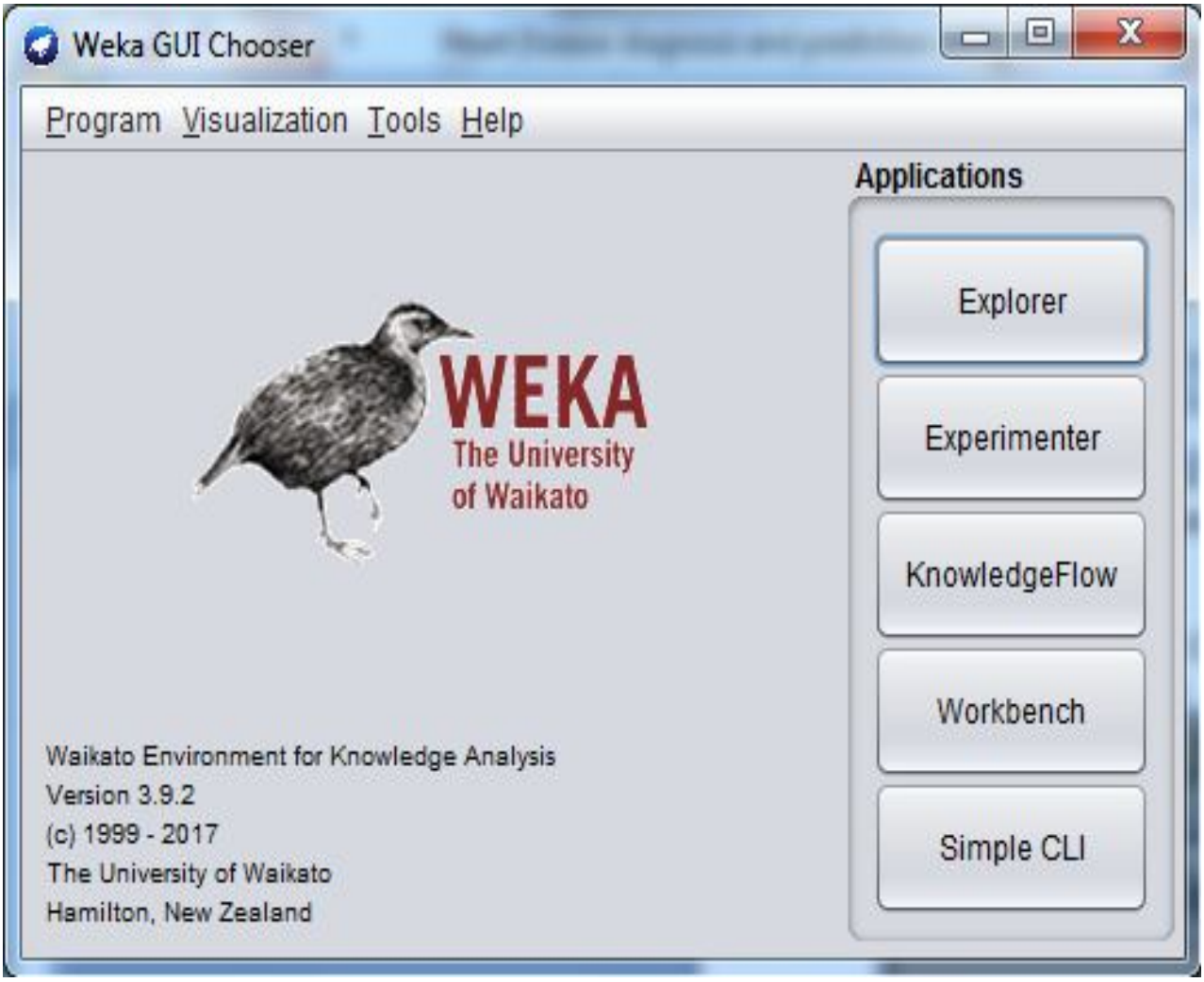
Envisions the interface of WEKA Data mining instrument. It has four applications:[12][13]

(1) Explorer: The explorer [2][4][7] interface has a couple of sheets like preprocess, organize, gathering, relate, select quality and picture. In any case, in this interface our central spotlight is on the Classification Panel

(2) Experimenter: This interface offers office to exact examination of different figurings on start of given datasets. Each figuring pursues 10 times and that the accuracy uncovered

(3) Knowledge Flow: It is a differentiating choice to the pioneer interface. The principle qualification among this and others is that here customer picks Weka section from toolbar and interfaces them to make a configuration for running the figurings

(4) Simple CLI: Simple CLI infers summon line interface. Customer performs exercises through a request line interface by offering bearings to the working system.



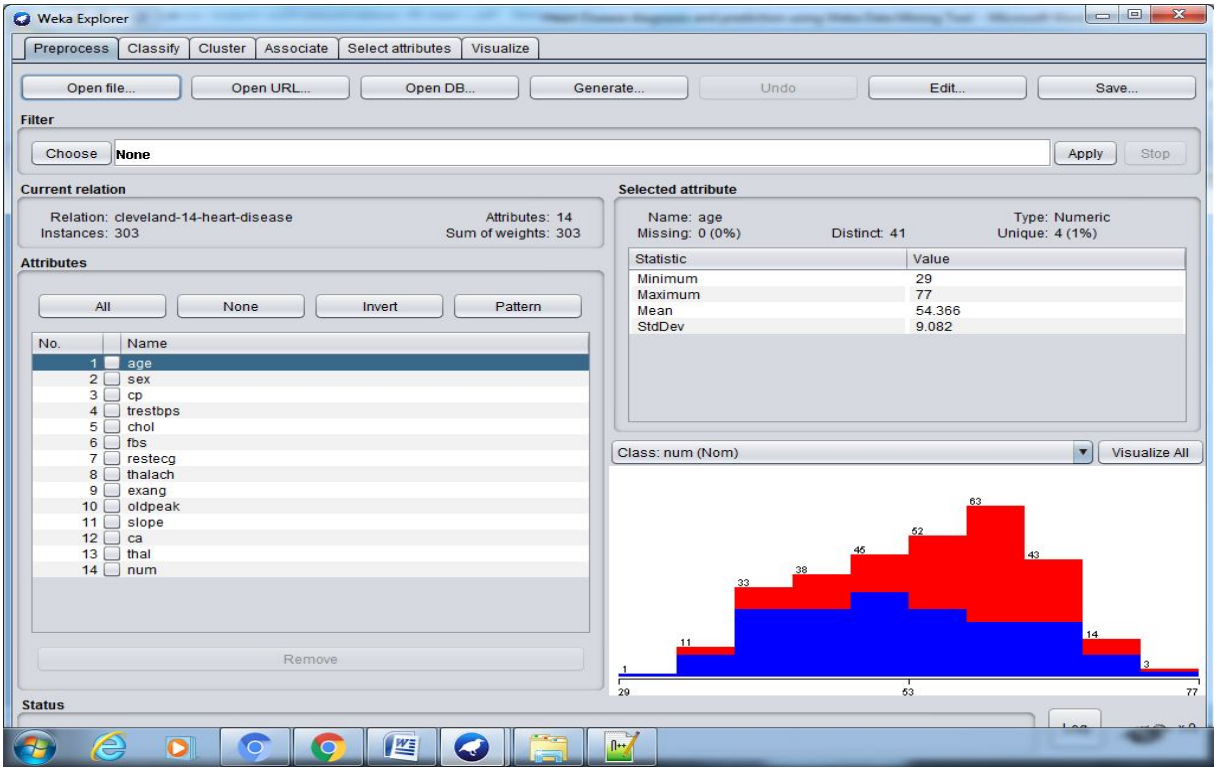
"Figure -1 Screenshot of Weka GUI Application"

Arrangement In information mining instruments grouping manages recognizing the issue by watching attributes of ailments among patients and analyze or foresee which calculation indicates best execution based on WEKA's measurable yield Table 1 demonstrates the WEKA information mining systems that have been utilized as a part of this paper alongside different requirements like informational index organize and so on by utilizing diverse calculations.[11][12]

Software	Datasets	Weka Data Mining Technique	Classification Algorithms	Operating System	Dataset File Format	Purpose
Weka	Clevelan d	Explorer Experimenter	Naïve Bayes J48 SMO REPTree	Windows 7	ARFF	Classificatio n

"Table-2: Different types of Weka Data Mining Techniques"

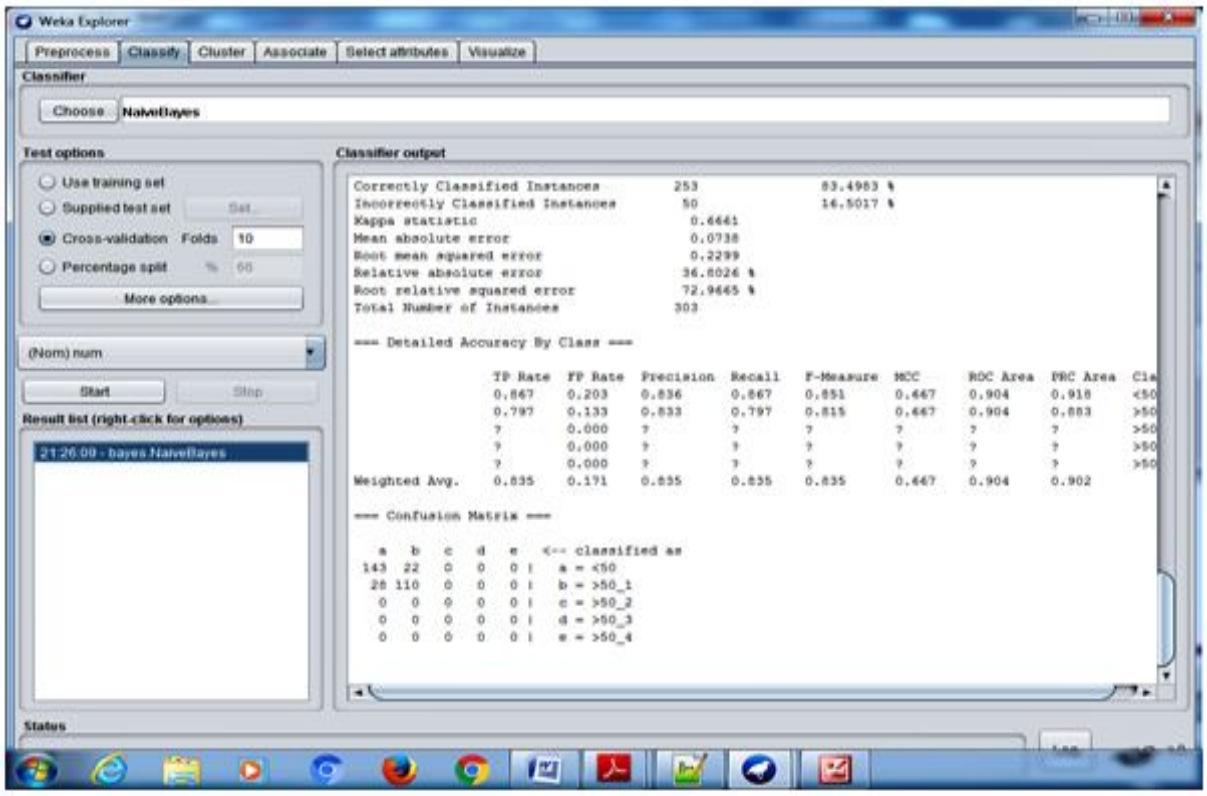
ISSN 2394 - 7780



"Figure-2: Screenshot View for Dataset Loading"

1. NAIVE BAYES

Bayes [1] is one of the figuring's that capacities as a probabilistic classifier of all characteristics contained in data test only and after that gatherings data issues. Running the counts using Naïve Bayes we separate the classifier yield with such an expansive number of estimations based yield by using 10 cross endorsement to make a desire for every event of the dataset.16 After running these computations we achieved a portrayal precision of 83.49% for 253 precisely requested events, botch rates achieved i.e. Mean Absolute Error is 0.0738, time taken for building model is 0.1 seconds and ROC zone is 0.904 these yields are gotten after these estimations are run.

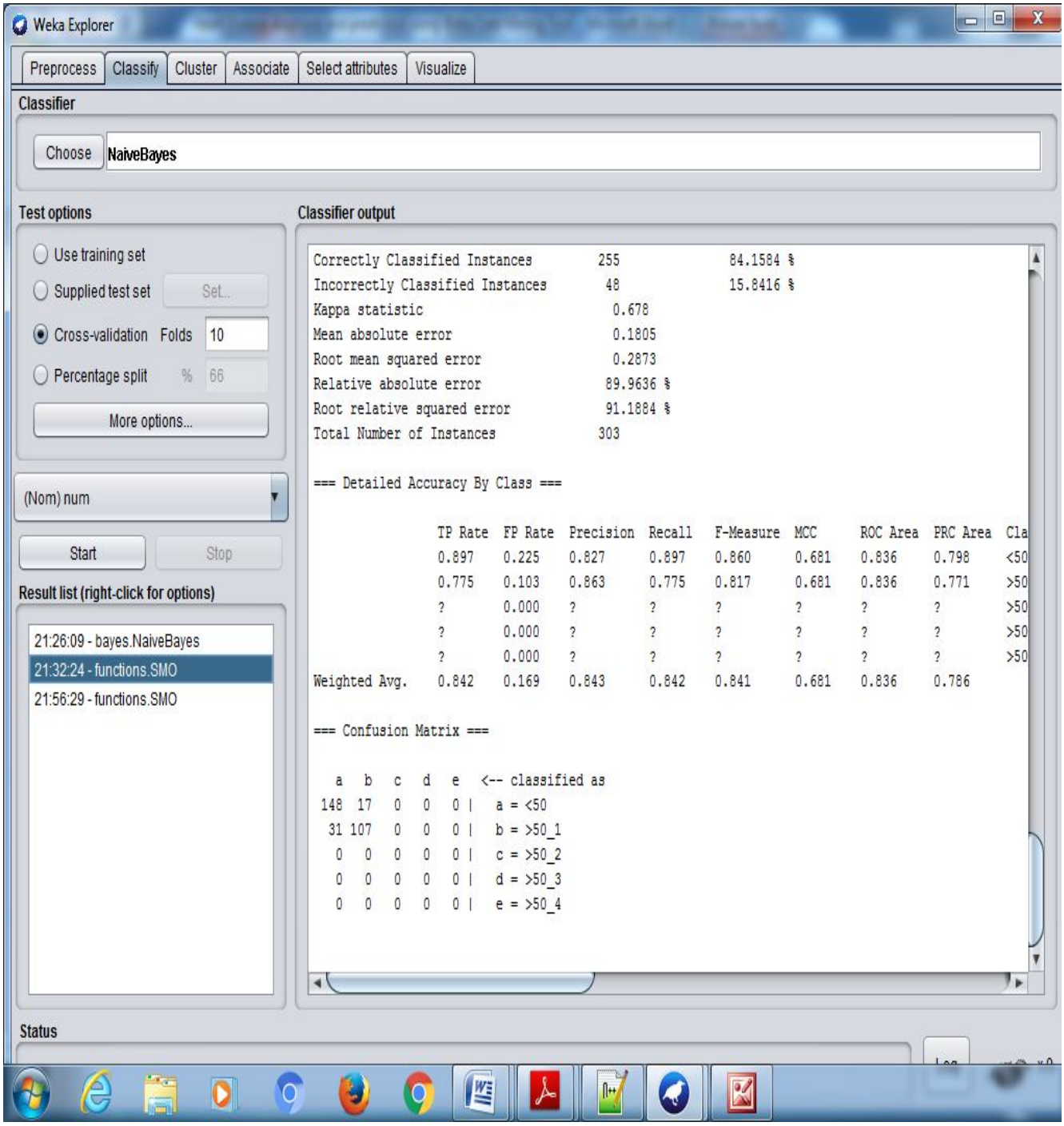


"Figure-3 Screenshot view for Naïve Bayes Algorithm"

ISSN 2394 - 7780

2. SMO

SMO is one of the methodologies used for gathering. In this paper we have used this figuring to part the data in light of dataset. Running this estimation we explored the classifier yield with different estimations in light of yield by using 10 cross endorsement to make a desire for each instance of dataset. Figure 4 shows the course of action precision of 84%, goof rates that is mean aggregate oversight got is 0.1805, time taken to collect show is 0.19 seconds and ROC region is 0.836 that is gotten subsequent to running these calculations.

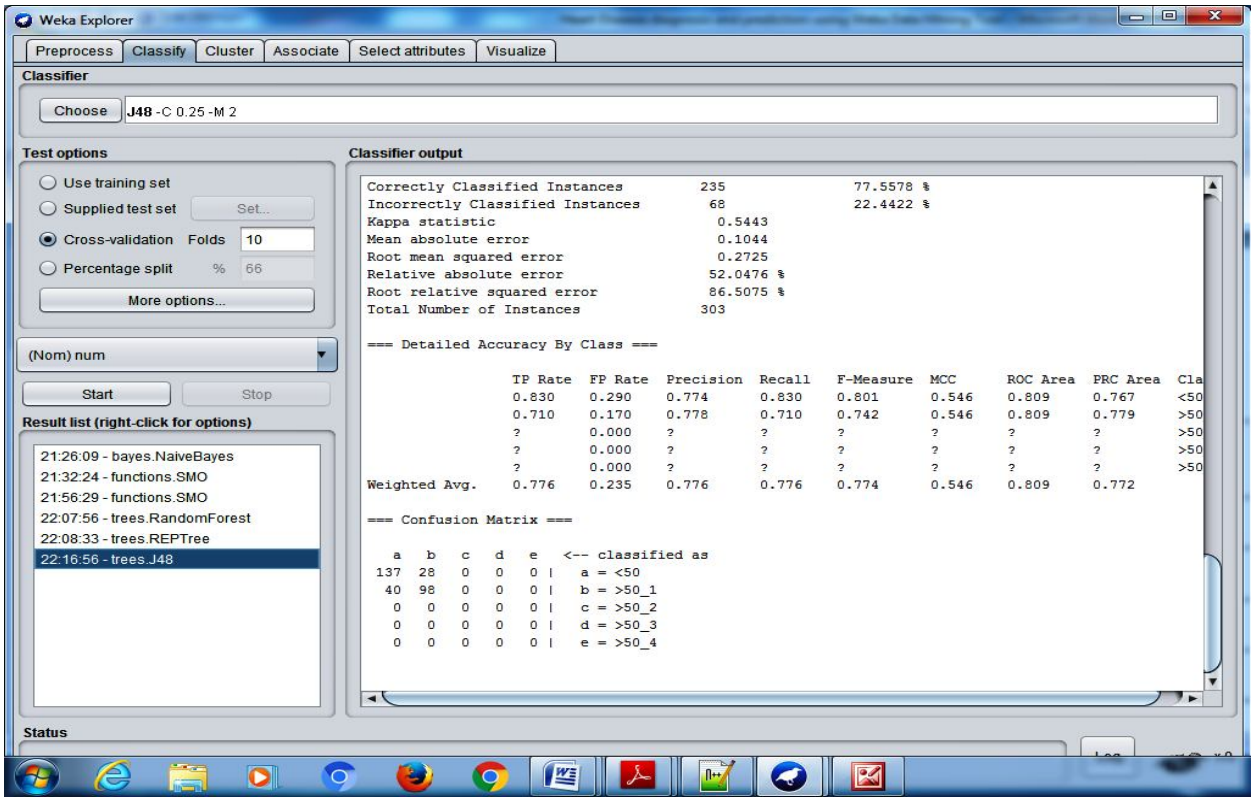


"Figure-4 Screenshot view SMO Algorithm"

3. J48

J48 has been used as a piece of this paper to pick the target regard in light of various credits of dataset to predict machine learning model and organize their accuracy. We have in like manner used J48 on our coronary ailment dataset. Resulting to running this count we inspected the yields got from the classifier, the yield gave a couple of estimations in perspective of 10 cross endorsement to make a desire for each event of dataset. Figure 5 exhibits the request accuracy achieved from this estimation i.e. 77% is the adequately requested precision for a gathering of 235 illustrations, mean through and through screw up obtained is 0.1044, time taken to make this model is 0.25 seconds, and ROC zone is 0.836.

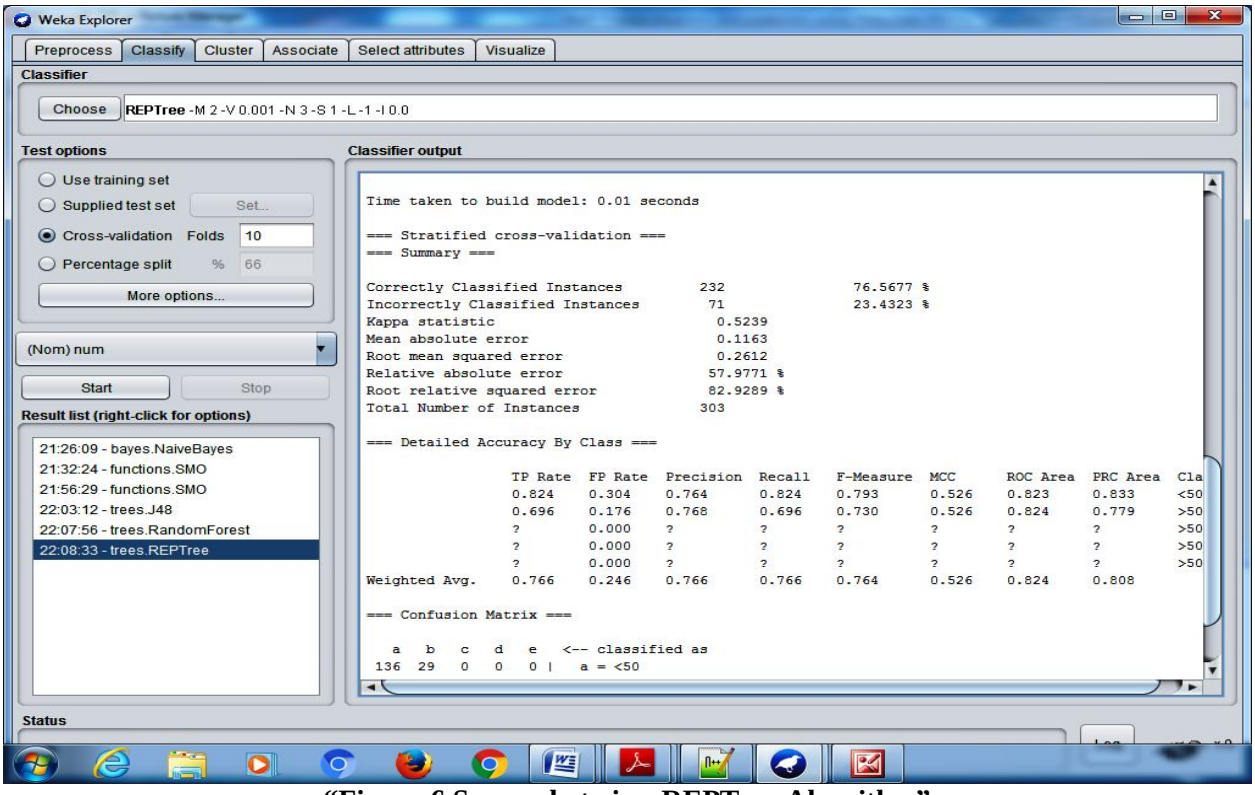
ISSN 2394 - 7780



"Figure-5 Screenshot view J48 Algorithm"

4. REPTree

REP Tree has been used as a piece of this paper to manufacture a decision and reduces bungles by organized estimations of numeric property and parts the events into pieces to portray the accuracy. Running the computation we analyze the classifier yield with bits of knowledge based yields by using 10 cross endorsement to make a desire for each event of dataset. In figure 6 gathering precision achieved exhibits that 76.5677 % are precisely requested exactness for 232 events, 23.4323 % mistakenly orchestrated accuracy for 71 cases, botch rates that is mean aggregate screw up is 0.1163, time taken to create indicate is 0.01 seconds and ROC zone is 0.824 these are said in yield.



"Figure-6 Screenshot view REPTree Algorithm"

ISSN 2394 - 7780

5. COMPARISON WITH ALGORITHMS

Algorithm	Correctly Classified Instances %Accuracy	Incorrectly Classified Instances %Accuracy	Mean Absolute Error	ROC Area	Time Taken to Build Model (seconds)
Naïve Bayes	83.4983	16.5017	0.0738	0.904	0.01 seconds
SMO	84.1584	15.8416	0.1805	0.836	0.19 seconds
J48	77.5578	22.4422	0.1044	0.809	0.08 seconds
REPTree	76.5677	23.4323	0.1163	0.824	0.01 seconds

"Table-3: Comparison with different types algorithms "

Algorithm	Correctly Classified Instances %Accuracy	Time Taken to Build Model (seconds)
Naïve Bayes	83.4983	0.01 seconds
SMO	84.1584	0.19 seconds

"Table-4: Experiment Algorithms Best accuracy"

Algorithm	Correctly Classified Instances %Accuracy	Time Taken to Build Model (seconds)
J48	77.5578	0.08 seconds
REPTree	76.5677	0.01 seconds

"Table-5: Experiment Algorithms Worst accuracy"

VII. CONCLUSIONS AND FUTURE SCOPE

We have immediately organized the Heart educational record and a short time later took a gander at the changed data mining frameworks in weka through Explorer, learning stream and Experimenter interfaces. Besides remembering the ultimate objective to affirm our approach we have used a Heart dataset with 303 events no of properties 76 and used 14 attributes to choose the desire for contamination and their accuracy using portrayals of different counts to find the best execution. The basic target of this paper is to depict information and empower the clients in expelling beneficial data from information and effortlessly to see a fitting estimation for correct canny model from it. From the disclosures of this paper time taken to produce the model in 0.01 seconds in Naïve Bayes and time taken to manufacture the model in 0.19 seconds in SMO.The Naïve bayes and SMO are the best execution estimations for asked for precision since they accomplished most unmistakable accuracy= 100% with 84 accurately assembled cases, most phenomenal ROC = 0.904, had scarcest mean all around mess up and it required least theory for building this model through Explorer and Knowledge stream happens. This structure can be furthermore expanded. It can use more number of data characteristics recorded above in table 1 and 2. Other data mining techniques can moreover be used for predication e.g. Packing, Time game plan, Association rules. The substance mining can be used to mine enormous measure of unstructured data available in restorative administrations industry database.

VIII. REFERENCES

[1] Dhamodharan S, *Liver Disease Prediction Using Bayesian Classification,* Special Issues, 4th National Conference on Advance Computing, Application Technologies, *May 2014*

[2] SolankiA.V., Data Mining Techniques using WEKA Classification for Sickle Cell Disease, International Journal of Computer Science and Information Technology,5(4): 5857-5860,2014.

[3] Joshi J, Rinal D, Patel J, Diagnosis And Prognosis of Breast Cancer Using Classification Rules, International Journal of Engineering Research and General Science,2(6):315-323, October 2014.

[4] David S. K., Saeb A. T., Al Rubeaan K., Comparative Analysis of Data Mining Tools and Classification Techniques using WEKA in Medical Bioinformatics, Computer Engineering and Intelligent Systems, 4(13):28-38,2013.

[5] Vijayarani, S., Sudha, S., Comparative Analysis of Classification Function Techniques for Heart Disease Prediction, *International Journal of Innovative Research in Computer and Communication Engineering*, *1*(3): 735-741, 2013.

[6] Kumar M. N., Alternating Decision trees for early diagnosis of dengue fever *.arXiv preprint arXiv: 1305.7331,2013.*

[7] Durairaj M, Ranjani V, Data mining applications in healthcare sector a study. *Int. J. Sci. Technol. Res. IJSTR,* 2(10), 2013.

[8] Sugandhi C , Ysodha P , Kannan M , Analysis of a Population of Cataract Patient Database in WEKA Tool , *International Journal of Scientific and Engineering Research* ,2(10) ,October ,2011.

ISSN 2394 - 7780

[9] Alam M., Shakil K.A., and Sethi S. ,Analysis and Clustering of Workload in Google Cluster Trace based on Resource Usage, *arXiv preprint arXiv: arXiv: 1501.01426*, 2014.

[10] Alam M., Shakil K.A., Recent Developments in Cloud Based Systems: State of Art, *arXiv preprint arXiv: arXiv: 1501.01323*, 2015.

[11] Chaitrali S. Dangare and Sulabha S. Apte, Improved Study of Heart Disease Prediction System using Data Mining Classification Techniques *International Journal of Computer Applications (0975 – 888) Volume 47– No.10, June 2012*

[12] Kashish Ara Shakil, Shadma Anis and Mansaf Alam *Dengue Disease Prediction Using Weka Data Mining Tool* [v1] Wed, 18 Feb 2015 09:52:55

[13] Nilesh Jagdish Vispute1, Dinesh Kumar Sahu2, Anil Rajput3 A Survey on Naïve Bayes Algorithm for Diabetes
Data Set Problems *Volume 3 Issue XII, December 2015IC Value: 13.98 ISSN: 2321-9653*

[14] K.Gomathi1, Dr. Shanmugapriyaa2 Heart Disease Prediction Using Data Mining Classification *Volume 4 Issue II, February 2016 IC Value: 13.98 ISSN: 2321-9653*

[15] Frawley and G. Piatetsky -Shapiro, Knowledge Discovery in Databases: An Overview. Published by the AAAI Press/ The MIT Press, Menlo Park, C.A 1996.

[16] Yanwei, X.; Wang, J.; Zhao, Z.; Gao, Y., "Combination data mining models with new medical data to predict outcome of coronary heart disease". Proceedings International Conference on Convergence Information Technology 2007, pp. 868 – 872

[17] Sellappan Palaniappan, Rafiah Awang, "Intelligent Heart Disease Prediction System Using Data Mining Techniques", IJCSNS International Journal of Computer Science and Network Security, Vol.8 No.8, August 2008

[18] Niti Guru, Anil Dahiya, Navin Rajpal, "Decision Support System for Heart Disease Diagnosis Using Neural Network", Delhi Business Review, Vol. 8, No. 1 (January - June 2007).

[19] Heon Gyu Lee, Ki Yong Noh, Keun Ho Ryu, "Mining Biosignal Data: Coronary Artery Disease Diagnosis using Linear and Nonlinear Features of HRV," LNAI 4819: Emerging Technologies in Knowledge Discovery and Data Mining, pp. 56-66, May 2007.

[20] Shanta kumar B.Patil, Y.S.Kumaraswamy "Intelligent and Effective Heart Attack Prediction System Using Data Mining and Artificial Neural Network". ISSN 1450-216X Vol.31 No.4 (2009), pp.642-656.

[21] Carlos Ordonez, "Improving Heart Disease Prediction Using Constrained Association Rules," Seminar Presentation at University of Tokyo, 2004.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

THE STUDY OF "GREEN MARKETING IN INDIA" – IMPORTANCE, CHALLENGES & ADVANTAGES

Monika Bhatia
Independent Research Scholar, Jharkhand Rai University, Ranchi

ABSTRACT
The globally accepted concept of Green Marketing is not new to the Indian Business Industry as well. It seeks its roots from early 1990 were when many Indian firms like Wipro understood the need of producing goods and services that are environmentally friendly and thus, contributing to the development of India sustainably. Green Marketing not only made a living safely in the era of global warming but allowed many such business firms in India to skim the cream by selling genuinely green products, making generous profits and enhancing consumer experiences year after year. The positive effect of education, social sites and ever-increasing generation – Gen Z (born after 1995), the green way of life is now a part of consumer's presence in India. India is expected to be the youngest nation in the world, with an average age of an Indian citizen to be 30, by the year 2022. It will be the driving force to the way businesses need to operate and run in India. With depleting natural amenities and increasing awareness, the Indian consumers are ready to pay a higher price to support and contribute to nature. Though the idea behind Green Marketing has not gained a mass reach so far due to challenges faced by Indian firms regarding financial requirements, attitudes, and beliefs, it is, however, expected to make a paradigm shift in India soon. In this study, an attempt has been made to understand the importance, challenges, and advantages of Green Marketing by the Indian firms.

Keywords: Green, Ecological, Eco-Friendly, Biodegradable, Reusable, Recycle, Organic

1. INTRODUCTION
The term green marketing came into the picture in the late 1980'sand early 1990's with one of the first books on green marketing entitled 'Ecological marketing,' which refers to the process of selling products and services based on their environmental benefits. There was a great deal of empirical research carried out to identify interest among consumers in using and purchasing green products (Mintel 1991). Analysis indicated that 92% of MNCs from Europe changed their products to address growing concerns about environmental pollution. (Vandermerwe and Oliff, 1990). Consumers from the developed countries including the USA and Western Europe were found to be more conscious about the environment (Curlo, 1999). Research in the last decade (Lee, 2009, Rahbar and Wahid, 2011, Lee 2008; D Souza 2004) has indicated that consumer is aware and are willing to pay more to be green (according to NMI 2007 LOHAS model).

Green marketing and eco-marketing belong to a group of approaches which seek to address the lack of fit between present marketing practices and the ecological and social realities of the broader marketing environment. Belz F Peattle K (2009): Sustainability Marketing: A Global Perspective, John Wiley & Sons.

Pride and Ferrell (1993) Green marketing, also alternatively known as environmental marketing and sustainable marketing, refers to an organization's efforts at designing, promoting, pricing and distributing products that will not harm the environment.

Polonsky (1994) defines green marketing as all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants, such that the satisfaction of these needs and wants occurs, with minimal detrimental impact on the natural environment.

Elkington (1994: 93) defines green consumer as the one who uses products that are not dangerous for the health of consumers or others. These products do not damage the environment during manufacture, use or disposal. They also do not consume a disproportionate amount of energy or cause unnecessary waste or use materials derived from threatened species or environments; involve the unnecessary use of or cruelty to animals; adversely affect other countries.

Green Marketing Model, also known as the green marketing mix, plays a pivotal role globally. This model extends beyond Product, Price, Promotion, Place and applies to most of the business entities manufacturing/offering products and services to be environmentally friendly.

There is limited research which has examined the impact of green marketing on consumers from emerging economies like India (Bhattacharya, 2011; Prakash, 2002). Most of the studies related to green consumerism have been made in well-developed countries, but there is a lack of studies in developing countries. (Jacob Cherian & Jolly Jacob, 2012)

ISSN 2394 - 7780

All industries, including those in India, have to follow these global guiding principles and standards so that the concerned product/service may be environmentally friendly in itself such as:

- Being manufactured sustainably,
- Not containing toxic materials or ozone-depleting substances,
- Able to be recycled and is produced from recycled materials,
- Leave low carbon footprints / emit low carbon in the environment, and
- Being designed to be repairable.

There are many initiatives in progress to promote Green Marketing in India. Green Technology, Housing and Agriculture, Sustainable Cities and Transport, Eco-friendly Services and Consumer Lifestyle. Refer to cases/examples section below. All such initiatives have a common goal to the core – to stabilize Indian ecological balance across air, land, and water. The Indian government (both central and individual state) promotes and incentivize such eco-friendly products and services which can help preserve the heritage of India from Kashmir to Kanyakumari.

2. OBJECTIVE OF STUDY

In this study, an attempt has been made to understand the importance, challenges, and advantages of Green Marketing by the Indian firms.

3. RESEARCH METHODOLOGY

This study paper has been exploratory and purely based on secondary sources of information that includes published articles, journals, World Wide Web.

4. LITERATURE REVIEW

According to Peattie (2001), the evolution of green marketing has three phases. The first phase is called "EcologicalGreen Marketing," and during this period all marketing activities were concerned to help environment problems and provide remedies for environmental problems. The second phase was "Environmental Green Marketing," and the focus shifted to clean technology that involved designing of innovative new products which could take care of pollution and waste issues. The third phase was "Sustainable Green Marketing" which came into prominence in the late 1990s and early 2000.

Prothero, A. & Fitchett, J.A. (2000) argued that greater ecological enlightenment can be secured through capitalism by using the characteristics of commodity culture to further progress environmental goals. Marketing not only has the potential to contribute to the establishment of more sustainable forms of society but, as a principal agent in the operation and proliferation of commodity discourse, also has a considerable responsibility to do so.

Oyewole, P. (2001) in his paper presented a conceptual link among green marketing, environmental justice, and industrial ecology. It argues for greater awareness of environmental justice in practice for green marketing. A research agenda is finally suggested to determine consumer's knowledge of environmental justice, and their willingness to bear the costs associated with it.

Karna, J., Hansen, E. &Juslin, H. (2003) interpreted that proactive marketers are the most original group in implementing environmental marketing voluntarily and seeking competitive advantage through ecological friendliness. The results also give evidence that green values, ecological marketing strategies, structures, and functions are logically connected to each other as hypothesized according to the model of green marketing used to guide this study.

Sanjay K. Jain &Gurmeet Kaur (2004) in their study of environmentalism which had fast emerged as a worldwide phenomenon discussed business firms too have risen to the occasion and have started responding to environmental challenges by practicing green marketing strategies. Green consumerism has played a catalytic role in ushering corporate environmentalism and making business firms green marketing oriented. Based on the data collected through a field survey, the paper assessed the extent of environmental awareness, attitudes, and behavior prevalent among consumers in India.

Brahma, M. &Dande, R. (2008), The Economic Times, Mumbai, had an article which stated that Green Ventures India is a subsidiary of New York-based asset management firm Green Ventures International. The latter recently announced a $300 million India focused fund aimed at renewable energy products and supporting trading in carbon credits.

ISSN 2394 - 7780

Mintel (1995) found a significant gap between consumers concern and actual green purchasing. It is found that still there are considerable barriers towards the diffusion of more ecologically oriented consumption styles.

Spruyt et al. (2007) suggested that the prediction of individual's behavior is dependent on the attitude of the consumer.

Gadenne et al., 2011; Wulf and Schroder, 2003, suggested that the measurement criteria of attitudes should be focused on a specific environmental issue like purchasing of green products.

5. WHAT ARE GREEN PRODUCTS/SERVICES?

It is widely accepted that the promotion of green technology and green products is necessary for the conservation of natural resources and sustainable development. Green products are, therefore

- Grown in original form
- Recyclable, reusable; and biodegradable
- Those which contains natural ingredients& non-toxic/approved chemicals
- Those which includes recycled contents and are non–polluting
- Those who have eco-friendly packaging, i.e., reusable, refillable containers

6. HOW TO "GO GREEN"?

- Switch off the electrical appliances when not in use
- Do not use more of polythene bags
- Use organic food whenever possible
- Switch over to LED lights and television sets, eco-friendly air conditioners
- Save water
- Avoid driving wherever possible
- Increase use of non-conventional sources of energy like solar power
- Use more recyclable products
- Think green, spread green, stay green

7. THE STUDY: IMPORTANCE, CHALLENGES & ADVANTAGES

There is a limited research work in India and other developing nations on the green marketing covering the shift since early 1990 till 2018. Through this study, below are some of the aspects which suggest the importance of green marketing in India, the critical challenges faced by businesses and consumers, and the key advantages of green marketing that India can benefit at large. Through this study, it becomes clear that it is the responsibility of *"businesses"* to keep producing green products/services through a proper supply chain system. Business should continuously educate masses through marketing campaigns and *"the Indian consumers"* to consume green products/services as de facto in their lifestyle and hence encourage other citizens through word-of-mouth, social internet, and communities.

a) Importance

Green marketing touches every aspect of business "from packaging to process of public relation." It is essential for many reasons especially for India:

- It helps to avoid waste by creating biodegradable product packaging, cutting down on water consumption, reducing carbon emissions and reducing the amount of trash that goes into landfills.
- It modifies the product and service in such a way that they become safe for everyone and more environment-friendly.
- Business firms can offer/are offering green products and services with a profit motive by providing products at a bit more price.

It is essential for the corporates and businesses in India to educate the consumers about green initiatives and also, about the repercussions of not using green products/services. There should be proper and meaningful marketing campaigns, be open and transparent to "behind the scenes" in the making of an environmentally

ISSN 2394 - 7780

friendly product/service, instilling a thought of responsibility in a right way to level up the product/service credibility.

b) Challenges

The key factors challenging green marketing in India are– *the credibility*, whether the product or service has the green footprint, and *the supporting infrastructure*, to continuously enable consumerization of green products/services. There is a common belief that most of, the companies selling green products and services would label them as green and not do anything to contribute to the environment than just making the profit, the very business-driven approach. Hence, the consumer who is willing to pay more thinking/associating as a contributor/supporter of green environment would need shreds of evidence in the form of a more transparent and trustworthy process framework followed for supporting the green background. However, there are few Indian organizations to refer and are leaders supporting green marketing to the core like Wipro, Infosys, Tata, Reva (now Mahindra Electric), etc. producing energy-efficient computers, offices, natural fertilizers, sustainable transport, etc. These are marginally expensive due to which are not widely procured. The other factors are:

Convincing stakeholders: The business firms not only have to convince customers about their green products but also the other stakeholders like shareholders, suppliers, employees, etc., for the initial high expenditure that shall reap the long-term benefits.

Government pressure: The Indian government has laid down strict rules and regulations for the firms to prevent the production of hazardous goods and services, failing which can seriously affect growth and survival of the Indian firm. For example, the use of polythene bags has been recently banned again.

Competitive pressure for small firms: The firms that can overcome the mentioned key challenges may become successful in the adoption of the green concept earlier than those competitive and small firms who still face the cost issue.

c) Advantages

Let us accept the fact that such initiatives and the expected results take long to reap the benefits. We have observed general awareness in masses and also understand that green products/services would take few years to become mainstream. The main advantage is, no doubt, related to conserving earth and hence making our next generations to live with natural resources for a longer time. Green initiatives would soon become a heritage in India to pass to future generations. However, for the study performed, below are the key advantages of effective green marketing in India:

- Industries in India can set examples globally and be global leaders in most of the green initiatives supporting more prominent comprehensive programs like Global Warming.
- With India to become the youngest nation by 2022, laying the green foundation and instilling corporate social responsibility to every Indian will ensure the preservation of nature and avoid further ecological disturbances in India.
- This step will bring a paradigm shift in business models with green-credits and long-term growth with profitability.
- There will be a nature preserving green competition which can be self-sustainable and empowering individuals from entrepreneurs to farmers.

8. CASES / EXAMPLES: INDIA SPECIFIC

a) Green Buildings

- Definition: A green building uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants as compared to the conventional structure.
- Such offices and houses in India are building and architected with naturally made building blocks including rocks, wood, sand, with minimal use of steel, chemicals, colors and high usage of solar panels to produce electricity, green roofs, low emission of carbon-di-oxide, waste management, etc.
- Reference: In India, there are numerous bodies like Indian Green Building Council (IGBC), IGBC Green League (IGL), EDGE Program in India, etc. which are continuously promoting green buildings program.

ISSN 2394 - 7780

b) Green Transport

- Definition: Green transport, better known as sustainable transport, is mostly a means of transportation that is sustainable in the real sense of social, environmental and climatic impacts. Such a transport system should have the ability to supply the source of energy indefinitely.
- Promoting the use of electric vehicles in India, especially for commercial usage and public transport but not limited to the personal cars, which are capable of reproducing energy through braking, battery charging, solar panels, wind regeneration, etc.
- Reference: Major vehicle manufacturers of India today are investing heavily in sustainable vehicles (fully electric or hybrids) for commercial and personal use. These include Maruti, Mahindra, Tata, Eicher, Ashok Leyland, Kinetic, etc.

c) Green Agriculture

- Definition: In right means, it refers to organic agriculture, which offers clean and green production methods using natural fertilizers and pesticides, water management, PV solar cells, manure management, etc.
- This is a growing sector in India contributing to a stronger Indian bio-economy.
- Reference: India alone has 6,50,000 organic producers, which is more than any other country.

d) Green Appliances

- Definition: All such electric appliances which consume low electricity, produces lower CO2 and other harmful gases into the environment.
- Energy efficient appliances used across India in houses, offices, industries, factories, plants, hospitals, retail stores, shopping malls, schools, courts. Bureau of Energy Efficiency (BEE) in India has made such an effort to promote awareness and save electricity through mandatory and voluntary schemes to label all appliances efficiency across 1 to 5, by driving consumer to buy higher rated appliances to decrease carbon footprint and harmful gases affecting the ozone layer.
- Reference: BEE claims to have saved 111.68 BU since 2011. In 2011-2012, a total of 10.87 BU energy was conserved. Most recently in 2017-2018, BEE claims to have saved 12.87 BU. Further, the government of India is committed to reducing the emissions intensity of India’s gross domestic product (GDP) by 33-35% by 2030 from 2005 levels.

9. CONCLUSION

The study shows the impact of Green Marketing in India is quite severe and that it will take more time to adapt to the norms and acceptability of such products/services which support the environment in ways mentioned above. The Indian businesses will continue to promote green marketing based on business ethics, national and global standards, supporting larger causes like global warming, and profitability to the core. Also, the larger firms will continue to support initiatives for green products/services due to the corporate social responsibilities. However, it is the adaptability of the general public, the real consumers, to become more responsible and open to support such causes. We observed the Gen Z with a higher level of adaptability, and they are on the path to be "True Green" consumers. Based on the observations, it is suggested that all such programs, councils, and initiatives supporting green products/services should employ (full/part-time) the young taskforce. This generation has understood what environmental treasures they are missing since birth, the essential elements, like the green spaces, healthy breathable air, and natural non-contaminated water. Moreover, businesses also need to employ a generation before Gen Z, which is known as Gen Y or the millennials (born between 1980-1994), who observed the transformation of their lifestyle from early 1980 till now. We all are aware of numerous initiatives to support causes like pollution control, global warming, carbon emissions, ozone depletion, radioactive gases, contaminated water, soil erosion, etc. We all, irrespective of our generation, in some way or the other support or, are willing to support to save our earth, our environment, our nation and most importantly our next generation. We in our conscious minds are aware of the need of the hour and know how critical this has become. We all need to act now and now is the time.

BIBLIOGRAPHY

1. https://www.thebalance.com
2. https://www.wikipedia.org
3. https://www.livemint.com

ISSN 2394 - 7780

4. https://www.beestarlabel.com
5. http://www.makeinindia.com
6. https://scholar.google.co.in
7. Mishra etal./Vol. 3, 2010/9-14
8. Philipkotler2013.blogspot.in (philipkotler2011-12)
9. Neeraj Kumar, Bus Eco J 2015, 7:1
10. Bhattacharya, Sourabh/ Vol. 10, Iss. 4, (Nov 2011): 62-71
11. Jacob Cherian & Jolly Jacob, 2012, (http://dx.doi.org/10.5539/ass.v8n12p117)

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

IMPACT OF GAMMA IRRADIATION INDUCED MUTATION ON MORPHOLOGICAL AND YIELD CONTRIBUTING TRAITS OF TWO GENOTYPES IN M_3 GENERATION OF SOYBEAN (*GLYCINE MAX*. (L.) MERRILL)

P. Kumari[1], N. Verma[2], K. Prasad[3], C. S. Mahto[4], M. Chakraborty[5] T. Izhar[6] and J. G. Manjaya[7]
M.Sc. Student[1], Assistant Professor [2,3,4], Chief Scientist[5], SRF[6], Department of Genetics and Plant Breeding, BAU, Ranchi
Scientist[7], BARC, Mumbai

ABSTRACT
Three hundred Gamma rays treated alog with its checks were grown in the field (2 replication) in a Randomized Block design (RBD) in order to raise M3 generation of two genotypes of soybean, BSS-2& RKS-18 to observe their nine quantitative characters .Representative M_3 irradiated healthy seeds of each five treatment two recommended popular and well adapted varieties of soybean, BSS-2 and RKS-18 recieved from the Department of Genetics and Plant Breeding, BAU, Ranchi were grown during rainy season of 2017. Treated Seeds of both the varieties viz. BSS-2 and RKS-18 were exposed to five different doses of gamma rays (50 Gy, 100 Gy, 150 Gy, 200 Gy and 400 Gy) in the year 2014 using Cobalt 60 sources in Gamma chamber at Bhabha Atomic and Research Centre, Mumbai and their M_3 progenies were used as experimental materials. Three hundred representative seeds of each of the five treatments of both the varieties and their controls were sown in RBD design in two replications at research farm of Birsa Agriculture University, Kanke, Ranchi. The main objective of the present study is to determine the effect of different doses of gamma irradiation on different morpho-agronomic traitss. Data were recorded for germination%, survival% and lethality% after one week of sowing till physiological maturity. . The germination percentage was calculated in M_3 in each rows of the genotypes, BSS-2 and RKS-18 by counting. Germination percentage of both the varieties was lower as compared to checks.The result indicated that the survival percentage as well as germination percentage was inversely proportional to the increase in dose to gamma rays In the variety BSS-2 a higher survival percentage (91.69 %) was recorded at 50 Gy as compared to higher dose of 400 Gy (89.49) while in RKS-18 the lower dose of 50 Gy (93.17) showed less survival percentage in comparison to higher dose of 150 Gy.It can be concluded that lower dose of gamma rays(50 Gy) might be used to study the improvement programmes of soybean genotypes.

Keywords: Induced mutagenesis, Gamma rays, Mutagen, Germination percentage and survival percentage

I. INTRODUCTION

Soybean (Glycine max L.) is a species of legume native to East Asia and classed as an oilseed rather than a pulse. It is an annual plant that has been used in China for 5,000 years to primarily add nitrogen into the soil as part of crop rotation. Fat-free (defatted) soybean meal is a primary, relatively low cost, source of protein for animal feeds or rations; soy vegetable oil is another valuable product of processing the soybean,It is also called as miracle crop. Soybean products such as TVP (textured vegetable protein), for example, are important ingredients in many meat and dairy analogues. Induced mutations have been used to generate genetic variability and have been successfully utilized to improve yield and yield components of various crops.

Mutation breeding is a tool for plant breeder applied to altering specific character in otherwise good variety in a comparatively shorter time than conventional breeding method. Attempts to induce mutations through gamma rays it disturb the physiological as well as biochemical processes in soybean would be quite useful in creating genetic variability. Soybean is an important oil crop with the highest area production and export in the world. Being an autogamous crop the naturally existing genetic variability is insufficient for the improvement. Mutation breeding offers great scope and promises for generating useful variability for its improvement. Broad spectrum genetic variability is prerequisite for any successful breeding programme [8].

II. MATERIALS AND METHOD

II.1 Collection of seeds

Well developed Mature and healthy seeds of M_3 generation of two well adapted and recommended popular genotype of soybean BSS-2 and RKS-18 recieved from Department of Genetics and Plant Breeding, BAU, Ranchi were grown during rainy season in 2017.

II.2 Mutagenic treatment -Gamma irradiation treatment

The seeds were treated with five different dose of Gamma rays (50 Gy,100 Gy,150 Gy,200 Gy, 400 Gy) treated from Bhabha Atomic Research Centre in 2014, Mumbai.

ISSN 2394 - 7780

II.3 FIELD STUDIES

Three hundred Gamma rays treated along with its checks were grown in the field (2 replication) in a randomized Block design (RBD) in order to raise M3 generation of two varieties of soybean, BSS-2& RKS-18 to observe their nine quantitative characters (table-2), germination%, survival%, and lethality % (table-1).From this mutation breeding experiment it is revealed that Gamma-ray as mutagen can be used to induce genetic variability in self pollinated crops like rice, wheat, tomato etc.

III. RESULT AND DISCUSION

The finding showed Wide range of variation for most of the characters which revealed that mutation breeding have great scope for the improvement in soybean.The result showed that In M_3 in each progeny rows of the two varieties, BSS-2 and RKS-18 germination % was calculated by observing the number of plants germinated after one week of the date of sowing till physiological maturity of plants at different treatments. Emergence of coleoptiles is considerd as germination of seed. Soybean seed germination is referred to as "epigeal" because food storage structure(cotyledon) are pulled above the soil surface. In BSS-2 the germination % was maximum at control (87.33) and minimum germination % was observed at 100 Gy (82) while in RKS-18 germination percentage was recorded maximum at check (84.66) followed by 50 Gy and 400 Gy similar results obsereved by [2] in Pterocarpus santalinus, [3] in fenugreek, [5] in Trigonella foenum greacum,[10] in chickpea, [13] in soybean, [16] in fenugreek, [17] in redbean, [19] in tomato, [21] in grasspea, .The reduction in germination may be either due to genetic cause or inhibition of physiological process in cell by mutagen. Gamma rays induced inhibition of growth through restaining cell cycle during somatic cell and damaging entire genome. The data related to survival of plants in M_3 generation have been presented in table 1. In BSS-2 the percentage of plants that survived at maturity recorded was 93.51% in checks was highest. 91.69% in lower dose 50 Gy whereas lowest percentage (86.4) in 200 Gy similarly in RKS-18, percentage of survival was recorded highest in checks (94.09%) whereas lowest survival percentage was recorded in 150 Gy (89.71%). These results were in compliance with the others researchers who reported that survival percentage of plants decreased with higher doses of gamma radiation [4] in amaranthus,[6] in sominifera,[11] in rice,[12] in rice, [20] in rutaceae. Many scientist opinioned that chromosomal and extra chromosomal injury might had lead to disturbances at physiological and cytological level leading to decrease in survival percent. For lethality percent in both BSS-2 and RKS-18 highest lethality percentage were recorded in 150 Gy (7.60) and 100 Gy (4.65). In both BSS-2 and RKS-18, lower injury percentage was observed in lower doses while higher injury percentage was recorded in higher doses. Similar result was reported by [1] and [15] in soybean .

In this experiment study of nine quantitative characters viz. days to 50 % flowering, days to plant maturity, plant height, number of branches per plant, pod length, number of pods per plant, number of seeds per pod, 100 seed weight and seed yield per plant were observed and data were recorded for mean, range, coefficient of variance and standard deviation table (2).Mean values for the characters 50 percent flowering in the genotype , BSS-2 recorded in control was minimum value (39.37) while all the five doses have same value with little variation. Maximum range was recorded in 50 Gy (13) and minimum range were recorded in control (6) as well as in 400 Gy (6). In the genotype, RKS-18 for days to 50 percent flowering, mean values recorded were almost same for checks as well as for different treatments. The range was recorded maximum in 100 Gy (12) and minimum value was recorded in dose 50 Gy (4). For the character days to maturity in the variety BSS-2 maximum mean value was recorded in 400 Gy (118.58) whereas all the treatments and control which have same value with small changes .The range was recorded maximum in treatment 400 Gy (27) this showed that value of range increased with increase in treatments.

In the genotype, RKS-18 for the character, days to maturity maximum mean value was recorded in 150 Gy (117.49) while minimum mean value was recorded in 50 Gy (108.21). Maximum range was recorded in 100 Gy (23) and minimum range was recorded in control (9). For the character plant height in the variety BSS-2 minimum mean value was recorded in higher dose of irradiation 400 Gy (24.34). This revealed that higher dose of Gamma rays does not create more variability compare to lower dose. So lower dose of gamma rays can be used to obtained most favourable result. Maximum range was recorded in 150 Gy (28) while in dose 400 Gy and 100 Gy have equal values (18 and 18.5). In the genotype, RKS-18 maximum mean value was recorded in control (48.09) while maximum value was recorded in 400 Gy (24.43). It indicates that with the increase in dose inversely proportional to the values recorded .The maximum range of value was recorded in 100 Gy (22) whereas minimum value was recorded in control (6). For the character, number of branches per plant in the variety, BSS-2 maximum mean value was recorded in 150 Gy (4.05), 100 Gy (3.41), while minimum mean value was recorded in 200 Gy (2.78). The range was recorded maximum in 400 Gy (4), whereas all the treatment and control have recorded same value with small changes while in the variety, RKS-18 for the character number of branches per plant maximum mean value was recorded in higher dose of treatment 400 Gy

ISSN 2394 - 7780

(3.69) and minimum value recorded in 200 Gy (2.64). The maximum range of value recorded in highest dose of treatment 400 Gy (5) and rest of the treatment have almost equal value. For the character, pod length in the variety, BSS-2 there were same mean value recorded in both control as well as in treatments with little variation. The range of value was maximum in both 100 Gy (2) and 150 Gy (2.25) while minimum value of range was recorded in control (0.75). In the variety RKS-18, the maximum mean value was recorded in control (3.21) followed by 100 Gy while in 50 Gy (2.32),The range of value recorded in 50 Gy (2.75) was maximum and for both control and 50 Gy have equal value (1). For the character number of pods per plant in the variety, BSS-2 mean value recorded was same for 100 Gy, 150 Gy, 400 Gy, 200 Gy with little variation while in checks (19.45) have minimum mean value. The range of value was recorded maximum in 100 Gy (39.5) while in 200 Gy and 50 Gy have almost same value and 400 Gy (14) have minimum value recorded. In the variety, RKS-18 maximum mean value was recorded in 100 Gy (23.94) while mean value for control as well for treatments have equal value with little variation. The range of value highest in 50 Gy (24) while lowest value observed in control (14) while in rest of the treatments have equal values with little variation. For the character number of seed per pod In the variety BSS-2 mean value was almost same for both control as well as for treatments. The maximum range of value was recorded in control (2) while minimum range of value was recorded in 400 Gy (0.5) whereas in 50 Gy (1.5), 100 Gy (1.5), 150 Gy (1), 200 Gy (1) have almost equal range of value with little variation. In the variety RKS-18 in both control as well as in treatment have equal range of values with little variation. Maximum range of value was recorded in 200Gy (2) while in checks and all the treatments have equal values. For the character 100 seed weight in the variety BSS-2 the maximum mean value was recorded in control (10.03) while in all the five treatments dose have equal values with little variation. The range of value was maximum in checks while in 100 Gy (0.08) minimum range of value observed. In the genotype, RKS-18 highest mean value was observed at control (10.21) whereas for all five treatments 50 Gy (8.24),100 Gy (8.11), 150 Gy (8.72), 200 Gy (9.0),400 Gy (8.3) have almost equal value with small changes .The maximum range of value recorded in control (6.85) while at 50 Gy (10.46), 150 Gy (0.05), 200 Gy (0.05). For the character seed yield per plant in the variety, BSS-2 maximum mean value for control as well for all the doses same value recorded with small changes. In the variety, RKS-18 maximum mean value was recorded in 50 Gy (11.43) while minimum mean value was recorded in 400 Gy (9.45). The maximum range was observed in the control (4.4) while minimum range was recorded in 400 Gy (0.06). Similar result was obtained by [8] , [9] in soybean,[14] in phaseolus vulgaris,[22] in amaranthus, [18] in soybean.

IV. CONCLUSION

It was observed in this present study that the higher doses of gamma rays are usually inhibitor on seed germination percentage as well as in survival percentage. In the variety BSS-2 at 50 Gy, a maximum survival percentage (91.69) was recorded while in RKS-18 the maximum survival percentage was recorded at 150 Gy (94.87) whereas at 400 Gy (91.16). From this investigation it confirmed that induced mutation is highly effective in generating genetic variability with significant alteration in various quantitative traits well as in biological parameters. Mutation breeding has become increasingly popular in recent times as an effective tool for crop improvement and efficient means for supplementing existing germplasms for cultivar improvement in breeding programmes.

ACKNOWLEDGEMENT

The work has been carried out under the financial support of Board of Research in Nuclear Science, BARC, Mumbai.

V. REFRENCES

1. Aditya *et al.,* "Effect of Gamma Rays on seed Germination,Plant Survival And Quantitative Characters On Two Varieties Of Soybean(Glycine max.(L.)Merrill.) in M_2 Generation", Bull.Env.Pharmacol.Life Sci., Vol 6 Special issue [1], pp.136-142, 2017.
2. Akshata and chandrashekar., Effects of gamma radiation on germination and biochemical parameters of pterocarpus santalinus, an endangered species of eastern ghat, European Journal of Experimental Biology,3(2): 266-270,2013.
3. Ambavane A.R. *et. at*., Studies on mutagenic effectiveness and efficiency of finger millet(Eleucina Corcana(L.) Gaerta) in M1 generation and effect of gamma rays on its quantitative traits during M2 generation, Internation Journal of agricultural Sciences, 10(2):603-607,2014.
4. Amir and Khavar ., Effect of gamma irradiation on characters of amaranthus seeds, European Journal of Experimental Biology, 2(4):995-999,2012.

ISSN 2394 - 7780

5. Anjali and Arun., Effect of sodium chloride salinity on seed germination and early seedling growth of trigonella foenum Graecum L. Var. Peb, Oct. Jour. Env. Res. 1(14):304-309-2013.
6. Bhosale and More., Effect of gamma radiation on seed Germination, seedling height and seedling Injury in withania Somnifera,(L.) Dunal. Int. J. of life Sciences, 2(3):226-228,2014.
7. F Kusmiyati *et. al.*, Mutagenic effectcs of gamma rays on soybean(glycine max L.) germination and seedlings.IOP Conf. ser.:Earth environ. Sci. **102** 012059,2018.
8. Gopinath P and Pavadai p., world scientific news 23,1-12.2015.
9. Geeta P Patil and C.T. Sharma., Induction of genetic variability in soybean in M_3 generation for quantitative traits by using mutagens,Int. J. Life. Sci. Res.,m 2(3):-297-302.2016.
10. Hameed A *et.at..*, Gamma irradiation effects on seed germination and growth, protein content, Peroxidase in desi and kabuli chickpea, Pak.J. Bot., 40(3):1033-1041,2008.
11. Harding S. S. *et al.*, Effect of gamma rays on seed germination seedling height,survival percentage and tiller production in some rice varieties cultivated in sierra leone, American Journal of Experimental Agriculture 2(2):247-255,2012.
12. Karthika and Laxshmi., Fixation of lethal Dose50 and the performance of M1 population in two soybean varieties, Legume Res., 30(1):49-52,2007.
13. Mahalle A.M *et. at..*, Combined Mutagenesis in soybean(Glycine max L.) International Corr. Microbial. App. Sci., 7(5):1777-1780,2018.
14. Mosisa, Muthuswamy and Petros., Effects of chemical mutation through Hydoxylyamine Hydrochloride on quantitative traits variation in Phaseolus Vulgaris L., International Journal of Scentific and Technology Research 3(2),2277-8618,2014.
15. N. Verma *et. al* Mutation study of gamma ray in M3 generation of soybean (Glycine max.(L.) Merril) journal of pharmacology and phytochemistry 7(2): 3543-3543,2018
16. Patel A. *et.al..*, Lethal Dose(LD50) fixation of sensitivity of fenugreek (Trigonella foenum- graccum L.) to gamma radiation for induction of mutation JouRNAL OF Agrisearch 4(4):237-241.2017.
17. Peykarestan and Seify., Uv irradiation effects on seed germination growth, protein content. Peroxidaes and protease activity in redbean, International Research Journal of Applied and Basic Sciences. 3(1),92-102,2012.
18. Pavadai, P. Studies on quantitative characters for gamma rays treatment in soybean(*Glycine max* (L.) Merr.) var. Co-1. International Journal of Modern Cellular and MolecularBiology 4(1): 1-10, 2015.
19. Rajapandian and More., Seed germination in tomato:A focus on interaction between phytochromes and gibberellins or Abscisic acid, American Journal of P lant Sciences,5, 2163-2169,2014.
20. Ramdas *et.al.*, Seed germination and survival percentage of control and colchicines induced plants of Zanthoxylum Armatum Roxb(Rutace , ARPN Journal of science and Technology, 2(1),2012
21. Ramezani and More., Study of Biological Damage in grasspea(Lathyrus sativus Linn.) in M1 generation,An International Peer Reviewed Journal,2(2):2319-4731,2013.
22. V.S. Rawat *et. al.*, Influence of continuous gamma irradiation on morpho-agronomic characterstics of Amaranthus Caudatus in M1 and M2 generation, American JOURNAL of Agriculture and forestry,5(4):130-136,2017.

ISSN 2394 - 7780

LIST OF PHOTO

A. Increase in number of pods

B. Increase in size of pod length

Table-1: Effect of gamma rays on germination and survival in M_3 generation (2016-17)

Variety	DOSE	Total seeds sown	Total plant stand in M_3	Plant stand at maturity (pm)	Germination (G%)	Survival (S%)	Reduction percentage over control (L%)
BSS – 2	Control	300	262	245	87.33	93.51	
	50 Gy	300	253	232	84.33	91.69	1.94
	100 Gy	300	246	224	82	91.05	2.63
	150 Gy	300	250	216	83.33	86.4	7.60
	200 Gy	300	248	225	82.66	90.7	3.00
	400 Gy	300	257	230	85.66	89.49	4.29
RKS – 18	Control	300	254	239	84.66	94.09	
	50 Gy	300	249	232	83	93.17	0.97
	100 Gy	300	243	218	81	89.71	4.65
	150 Gy	300	234	225	78	96.15	-2.18
	200 Gy	300	244	225	81.33	92.21	1.99
	400 Gy	300	249	227	83	91.16	3.11

Table-2: Mean, Standard deviation, Coefficient of variability and Range of two varieties, BSS- 2 and RKS-18 of Soybean in M_3 generation

Table - 2.1: Days to 50% flowering

	BSS – 2							RKS-18					
DOSE	Control	50 Gy	100Gy	150 Gy	200 Gy	400 Gy		Control	50 Gy	100Gy	150 Gy	200 Gy	400 Gy
Mean	39.37	46.33	44.76	45.14	44.77	45.10		43.47	44.39	45.58	44.96	45.47	45.42
SD	1.57	2.72	0.74	1.47	0.74	1.18		2.65	0.97	2.0	1.17	1.41	1.86
CV	3.63	7.43	0.55	2.18	0.55	1.44		6.19	0.95	4.24	1.38	2.014	3.49
RANGE	40-46 (6)	39.5-52.5 (13)	38-47 (9)	37-48 (11)	35-46 (11)	39-45 (6)		39-46 (7)	42-46 (4)	39-52 (12)	43-49 (6)	43-51.5 (8.5)	42-51.5 (9.5)

ISSN 2394 - 7780

Table – 2.2: Days to maturity

	BSS –2							RKS-18					
DOSE	**Control**	**50 Gy**	**100Gy**	**150 Gy**	**200 Gy**	**400 Gy**		**Control**	**50 Gy**	**100Gy**	**150 Gy**	**200 Gy**	**400 Gy**
Mean	113.05	112.69	111.85	112.61	112.82	118.58		113.12	108.21	115.55	117.49	117.21	117.13
SD	2.01	3.39	4.0	3.46	4.02	5.73		2.02	3.83	4.77	5.28	4.18	5.91
CV	1.83	11.52	16.05	12.03	16.22	32.86		1.79	14.74	22.77	27.0	17.51	34.98
RANGE	105-115 (10)	103.5-117.5 (14)	103-120 (17)	118.5-101 (17.5)	119-102 (17)	105-132 (27)		105-114 (9)	101-116.5 (15.50)	105-128 (23)	106-126 (20)	108-124 (16)	106.50-128 (21.50)

Table – 2.3: Plant height

	BSS - 2							RKS-18					
DOSE	**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**		**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**
Mean	48.58	36.57	36.61	34.32	24.68	24.34		48.09	39.45	34.56	33.89	27.5	24.43
SD	1.46	3.5	9.51	5.55	3.00	4.62		1.52	11.2	5.8	6.78	8.9	2.25
CV	2.65	20.7	22.86	30.8	9.0	21.42		2.84	24	23.1	19.4	22.68	5.2
RANGE	44-52 (8)	22-39 (17)	38-56.5 (18.5)	24.5-52.5 (28)	16.0-32.5 (16.5)	16.5-34.5 (18)		44-50 (6)	20-40 (20)	23-45 (22)	18-34 (16)	12-35 (21)	17-30 (13)

Table – 2.4: Number of branches per plant

	BSS-2							RKS -18					
DOSE	**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**		**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**
Mean	3.1	3.39	3.41	4.05	2.78	3.01		3.20	2.96	3.45	2.85	2.64	3.69
SD	1.02	0.78	0.87	0.541	0.54	0.89		0.70	0.79	0.73	0.68	0.48	1.13
CV	22.25	0.62	0.76	0.29	0.29	0.79		21.06	0.63	0.53	0.46	0.23	1.27
RANGE	2.0-5.0 (3)	1.5-4.5 (3)	1.5-5 (3.5)	2.5-5.0 (2.5)	2.0-4.0 (2)	1.5-5.5 (4)		1.0-5.0 (4)	1.5-5 (3.5)	2.0-5.0 (3)	1.5-4.5 (3)	1.5-4 (2.5)	1.0-6.0 (5)

Table–2.5: Pod length

DOSE	**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**		**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**
Mean	2.86	2.42	2.52	2.69	2.67	2.59		3.21	2.32	3.0	2.61	2.75	2.62
SD	0.55	0.51	0.47	0.60	0.43	0.39		0.62	0.34	0.20	0.25	0.28	0.24
CV	14.28	0.26	0.22	0.36	0.19	0.15		18.48	0.11	0.030	0.066	0.079	0.061
RANGE	2.25-3.5 (0.75)	1.6-3.5 (1.9)	1.5-3.5 (2)	1.5-3.37 (2.25)	1.7-3.5 (1.8)	3.37-16 (1.6)		2.65-3.75 (1.1)	1.62-2.9 (2.75)	2.5-3.5 (1)	2-3.25 (1.25)	2.0-3.25 (1.25)	2.0-3.25 (1.25)

Table–2.6: Number of pods per plant

	BSS-2							RKS-18					
DOSE	**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**		**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**
Mean	19.45	25.66	27.64	27.63	26.41	27.61		20.97	22.17	23.94	22.77	20.82	21.49
SD	6.24	5.21	10.62	4.53	4.77	4.21		9.74	4.59	3.68	3.61	3.95	3.80
CV	29.79	27.19	12.90	20.56	22.77	11.4		22	25	13.56	13.08	15.62	12.3
RANGE	10-29.5 (18.5)	15-38 (23)	12.5-52 (39.5)	39-21 (18)	18.5-42 (23.50)	16-30 (14)		30-44 (14)	18-42 (24)	16-33 (17)	13.5-29 (16)	11-29 (18)	12-28 (16)

Table–2.7: Number of seeds per pod

	BSS - 2							RKS -18					
DOSE	**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**		**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**
Mean	2.97	2.77	2.99	2.97	2.98	2.96		2.78	2.61	2.65	2.61	2.78	2.87
SD	0.75	0.39	0.23	0.15	0.26	0.13		0.40	0.40	0.30	0.36	0.46	0.27
CV	20.26	0.15	0.05	0.024	0.070	0.018		13.76	0.16	0.09	0.133	0.21	0.07
RANGE	2.0-4.0 (2)	2-3.5 (1.5)	4-2.5 (1.5)	3.5-2.5 (1)	3.5-2.5 (1)	3.0-2.5 (0.5)		2.0-3.0 (1)	1.9-3.5 (1.5)	2-3 (1)	2-3 (1)	2-4 (2)	2-3 (1)

Table–2.8: 100 seed weight

	BSS - 2							RKS -18					
DOSE	**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**		**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**
Mean	10.03	7.96	8.57	7.98	8.27	8.44		10.21	8.24	8.11	8.72	9.0	8.3
SD	0.80	0.76	1.13	0.69	1.05	0.68		1.39	0.86	0.62	0.77	0.94	0.51
CV	6.89	0.58	1.29	0.48	1.11	0.47		13.61	0.75	0.38	0.60	0.89	0.26
RANGE	9.85-13 (3.15)	6.37-9.4 (3.03)	9.94-10.02 (0.08)	6.37-9.2 (2.83)	9.49-10 (0.5)	9.7-10 (0.35)		8.65-15.5 (6.85)	10-9.54 (0.46)	6.4-9.2 (2.72)	9.95-10 (0.05)	9.95-10 (0.045)	7.0-9.4 (2.36)

Table–2.9: Seed yield per plant

	BSS-2							RKS-18					
DOSE	**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**		**Control**	**50Gy**	**100Gy**	**150Gy**	**200Gy**	**400Gy**
Mean	10.64	11.37	11.21	11.31	11.20	8.12		11.27	11.43	10.39	11.25	10.42	9.45
SD	0.80	2.3	3.1	3.1	2.2	2.3		1.30	1.3	1.04	1.02	0.58	0.60
CV	6.89	4.6	5.3	5.3	4.6	4.6		11.59	1.7	1.09	1.02	0.58	0.60
RANGE	10.2-13 (2.8)	10-11.5 (1.5)	12-14 (2)	13-15 (2)	12-13.5 (1.5)	13-14.5 (1.5)		8.6-13 (4.4)	9.95-10.10 (0.15)	9.95-10.0 (0.07)	9.95-10.35 (0.40)	9.95-10 (0.05)	9.95-10.0 (0.06)

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

ROLE OF TRIBAL WOMEN IN GUARDING AGRICULTURAL BIODIVERSITY WITH SPECIAL REFERENCE TO MILLETS IN JHARKHAND

Pronomita Ghosh[1], Dr. Pallavi Praveen[2] and Dr. Mamta Kumari[3]
Research Scholar[1], Jharkhand Rai University, Ranchi
Department of Botany[2], B. S. City College, Bokaro
Department of Agriculture[3], Bihar, KVK

ABSTRACT
This paper shows the significant contribution of tribal women towards the conservation of agriculture biodiversity in Jharkhand. Women help in the in situ conservation of many traditional cultivars thus helping preserve them. There always is an equal and simultaneous partnership in the household economy of tribal people. We all agree that, women are capable of multitasking at home front and also at work front including agricultural scenario. Usually it is seen that, tribal women enjoy higher respect and supreme acknowledgement in their respective communities. This paper has been written to depict the work participation of tribal women in agricultural development emphasizing millets production in Jharkhand.

Keywords: Agro biodiversity, Sustainable, Conservation, Millets, Drought.

I. INTRODUCTION

Jharkhand, which literally means, "Bush land" was edged out from the southern Bihar in 2000. The total area is approximately 75,000 Km^2. The population of the state is around 27 million. The entire state has a pre-dominant population of tribal (28%), schedule caste (12%) and others (60%). The female to male sex ratio is 941 to1000.

The state of Jharkhand is located in the Chotanagpur plateau having Damodar, Subarnarekha and Koyel as primary rivers. The climate is semi arid to arid with summers ranging between 18^o Celsius to 43^o Celsius and winters ranging between 5^o Celsius to 12^o Celsius. It receives an annual rainfall of 1550 mm. The composition of soil in this state differs from Red soil (found in the Damodar region), soil rich in mica (District of Koderma), Black---soil (Rajamahal area), Lateritic soil (Singhbhum District).

Jharkhand has been home to tribal communities since time immemorial. Prof. L.P Vidyarthi classified the tribes of Jharkhand as:

- Hunter – Gather type – Birhor, Korwar.
- Shifting Agriculture – Suria Paharia
- Simple artisans - Mahli, Lohar, Karmali, Chick Bariak.
- Settled Agricultures – Santhal, Munda, Oraon, Ho, Bhumij.

All the various components of biological diversity with relevance to food horticulture and agriculture etc are incorporated into the broader term of Agricultural biodiversity. Biological world is quite diversified and is also dependable upon the kind of agricultural crops that can be grown there. The climatic change brings changes in biological diversity and even loss of diversity. This loss in diversity can be countered as a threat to fuel, fiber, edible crops and fodder for cattle. The contribution of agriculture in the sustainable use of bio diversity is immeasurable.

A. IMPORTANCE OF AGRICULTURAL BIODIVERSITY

Biodiversity is necessary to:

1. Guarantee the product of crop field, fodder, fuel and wood – fiber.
2. To maintain the conservation of natural resources.
3. Adaptation of crops and millets to the slow climate change round the year.
4. Sustaining the livelihood of rural people.

In tribal communities especially around the world, women are the driving force behind maintaining the bio-diversity. Women in every field, with special mention to tribal rural women have much more knowledge of the biological world (crops and cattle). All these accumulated knowledge throughout decades have been used for the proper methodical cultivation, collection, development and inheritance.

ISSN 2394 - 7780

In the state of Jharkhand, tribal communities are pre-dominant. Tribal men and women go hand in hand in a whole lot of basic activities like farming, harvesting, separating fodder and fuel from the lush green forest areas to marketing techniques of their produce to the local weekly markets. Tribal communities in this state are quite liberal and believe in equal division of labour among men and women. They have clear knowledge of seasonal crops, medicinal herbs and edible plants and the procurements of the food items from the wild with respect to the season are really acknowledgeable.

They consider many detailed criteria other than high yield and market price e.g. taste, cooking time, crop yield, ease of processing, resistance to pates etc, on the basis of their experience. Men prefer single crop production at a time but on the other hand women exhibit diversity in practicing gardens at home, pisci-culture, and home orchards for seasonal fruits. These diversifications can also be referred as "Living Genebanks", which is a good way of preserving capital In-situ conservation and a productive use of wide variety of plant genetic resources.

Women play very significant role in

- *Food Production*- in addition to farming and household work, women are the custodians of the families food basket. Medicinal herbs like lemon grass, *Tulsi,* ginger, mint, coriander, lime, lemon are also grown in their home kitchen gardens.
- *Seed Selection*- the older women in a tribal household are generally bestowed upon seed selection and seed storage.

  Tribal people are up for traditional methods of cultivating crops that are resistant to drought, pest and diseases. They do well when given domestic refuse and green manure. Millets and cash crops as well as fiber crops are protected in a preserved manner because of their (tribal communities) habits and lifestyle.

  Seed Storage- after harvesting their crops, the women set aside a considerable quantity as sowing material. This seed is not used for consumption as food. Instead the women substitute them by other edible resources from the forest. Their traditional way of storing grains in indigenous granaries has helped indirectly in maintaining their viability. These granaries keep off rodents and pests. They also use the leaves of some plants (e.g. *Azadirachta indica*) to repel storage pests.
- *Harvesting*
- *Food Processing*
- *Maintaining Soil fertility*- Tribal women play an important role in maintaining as well as restoring the fertility of soil. They apply bio-fertilizers such as cattle dung, or domestic refuse to the land when required. Thus, they are "Invisible" partners from grassroots to policy level.

PLANT SPECIES USED BY THE TRIBAL COMMUNITIES OF JHARKHAND

Cereals

These tribal communities also collect many useful forest products.

1. *Diosphyrous melanoxylon* (Kendu leaf) -- The leaves are used for making "bidi wraps.
2. *Bambusa p*. (Bamboo) -- used for a variety of purposes. As construction material, making articles of daily uses. Making the traditional bow and arrow.
3. *Shorea robusta* (Sal seed)-- Are edible.
4. *Thysanolaena maxima*-- Broom grass, as commonly called, used for making soft brooms.
5. *Tamarindus indica* (Tamarind) -- Used in curries, for making beverages.
6. *Buchanania latifolia*-- Commonly known as, chironji, has got medicinal properties and also used for making deserts.
7. *Strychnos nux-vomica*-- Medicinally its very important herb. Many uses are recognized.
8. *Butea monosperma* (Palash/Dhak) -- Flowers; being used for making orange red dye. Juice is used as astringent.
9. Honey
10. Lac- Resinous substance used to make varnish.
11. Mushrooms (*Khukri*)-- Eaten as cooked vegetable.

ISSN 2394 - 7780

12. *Madhuka indica* (Mahua/Kachra) -- Flowers stored and used as vegetable and has medicinal value. Seed is used to prepare liquor also fed to cattle as a tonic.
13. *Curcumis melo L.*-- Commonly known as Kachari or Gurmi and consumed as raw fruit and also has some medicinal values.
14. Coarse grains-Ragi (*Madua*) and Jowar (*Sorghum*)- Used as staple food.



However, it is observed over the years that, due to industrialization, mining activities and other ways of livelihood, tribal men are migrating to cities and towns for their source of living. Since the traditional practice of growing millets like ragi, jowar, bajra are not giving good returns to the traditional cultivars, these tribal farmers are replacing the traditional crops with the genetically modified variance of rice and wheat.



Table-1: Different varieties of Millets

Millet grain	Scientific name
Jowar	Sorghum vulgare
Madua	Eleusine coracona
Gundli	Panicum sumatense
Kodo	Pasphalum scrobiculatum
Cheena	Panicum miliaceum

Women with the sound knowledge of respect, tradition, culture and also bagful knowledge of important agricultural practices for growing millets and cash crops has to be highly appreciated. It is essential to:

- Keep a check on local agricultural practices without much delay.
- Establishment of a link between premiere agricultural institutes and tribal women farmers.
- Tribal women can be encouraged for making decisions and following conservation strategies.

B. WOMEN AND MILLET PRODUCTION

Minor grains such as Madua (Ragi) and Jawar form a medium source of income in many tribal communities. These crops are pest-resistant, drought resistant and need very less amount of water as well. Since, Jharkhand occupies most of the Chota-nagpur plateau region, it witnesses less amount of rain, arid region and also drastic changes in the weather condition which lead to the production of these small millets along with dominance of rice and wheat.

These grains are not only nutritionally rich but also count for the losses caused due to the crippling environment tal situations like drought consecutively to the production of “cash crop” like rice, maize, wheat etc. The Government of Jharkhand has declared it as a drought affected state. The report of State Agriculture department says that, 64 blocks of the state have suffered 50% loss in crops. Also due to poor monsoon, wheat and rice cultivation is being disturbed every year more or less.

ISSN 2394 - 7780

Table-2: Working Tribal Women in India

	Work participation rate for women in (%)
1981	19.67
1991	22.27
2001	25.63
2011	32.71

Source: Annual Report 2012-13; Ministry of Labour and Employment, New Delhi.

The tribal women population therefore, has to depend on these millets farming in order to compensate and earn a livelihood. These crops enable these women to stick to mono cropping technique. These grains are not only nutritionally rich but also are easily digestible. Agriculture in Jharkhand is mostly dependent on rain and in most of the places drought has led to alarming situation for food security in the rural areas of the state. Most of the tribal men population migrate to bigger cities to earn a livelihood and therefore, Jharkhand that is crippled with drought, women population are employed into agricultural activities.

II. CONCLUSION

Development of self-reliant and self-respect tribal society, especially women, by strengthening, providing opportunities for promotion and expansion with development initiatives for these marginalized communities of our society.The Government should focus on educating tribal women about multi cropping and allocating separate funds for the mass production of millets in the state of Jharkhand. Health benefits of millets and their inclusion into a balanced diet should be the key focus area for their nourishment and replenishment of necessary minerals needed for their good health and livelihood. The tribal women workers, who are engaged in agriculture, use of pesticides etc. are For the betterment of these tribal women workers, one should also understand that, they should also be entitled to different labour rights. Farmers should be provided with high yielding varieties of seeds and the knowledge of soil and water development process.

III. REFERENCES

1. Annual Report 2012-13; Ministry of Labour and Employment, Shram Shakti Bhavan, Rafi Marg, New Delhi.
2. Pannala Ramaiah “Issues in Tribal Development” (Chugh Publications, 1988)
3. Natrajan L., and M. Samale (2006) “Community Seed System and Biodiversity of Millet Crops in Southern India”. Ed. M. Smale Wallingford, Oxon, U.K: CABI.
4. Natrajan L., Pandey and M. Smale (2007) “ Seed systems and millet crops in marginal environments of India: Industrial and policy perspectives. Quarterly Journal of International Agriculture 46(3): 263-288.
5. Grivere G., L. Natrajan and E.D.I Oliver King (2008) “The Role of collective action in the marketing of underutilized plant species: Lessons from a case study on minor millets in South India”. Food policy 34 (1): 39-45

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

SIMULATION OF FRICTION STIR WELDING PROCESS USING ANSYS

J. Abhilash[1], Apeksha[2], V.Sudheer Kumar[3], Bappa Acherjee[4], S. K. Jha[5] and S. Deepak Kumar[6]
Department of Production Engineering, Birla Institute of Technology, Mesra, Ranchi, Jharkhand

ABSTRACT
The present research work investigates the application of Finite element analysis ANSYS software in Friction Stir Welding Process (FSP) to predict temperature distributions in the welded steel plates during the welding process. It is noted that during Friction stir welding (FSW) an additional heat is generated due to plastic deformation caused between the work piece materials. The process involved in welding without using any filler metal is simulated using ANSYS Parametric Design Language (APDL) by modeling the moving heat source and applied boundary conditions. Further, a thermo-mechanical coupled model was developed to analyze the welding stresses generated and heat (temperature) distributions in the work piece during the welding process. The results were analyzed to determine the mechanical properties based on temperature and thermal strains developed. The method of direct coupling is applied by using SOLID 226 thermo-mechanical coupled element. Thus, the current investigation has demonstrated ANSYS's ability to predict the temperature profiles of Heat Affected Zone (HAZ) over the weld regions of the steel plates.

Keywords : Friction Stir Welding (FSW); ANSYS; Simulation; Steel plates; Thermal Analysis

I. INTRODUCTION
Friction Stir Welding (FSW) is an emerging solid-state metal joining process in which heat is generated due to relative motion between the tool and work-piece interface, which makes two metal sheets joined by plastic diffusion by virtue of frictional heat[1]. FSW is basically a hot-shear joining process, where a non-consumable rotating tool moves along the joint to be welded and plunges into a rigidly clamped work piece to be welded. Thus, FSW joints are quiet energy efficient, versatile and eco-environment friendly in nature. In particular, as compared to conventional fusion welding processes, FSW can be used to join high-strength aerospace Al alloys and other metallic alloy. Over the past two decades, FSW is considered to be the most significant developments in metal joining industry. Recently, friction stir processing (FSP) has been emerged as a technique for microstructural refinement of metallic materials [2]. Compared to conventional welding techniques, FSW offers manufacturers many benefits which includes lower levels of defects, improved aesthetics in the appearance of the weld and lower set-up and operational costs. Several researchers have worked on the friction stir welding of metallalic sheets to investigate the effect of various frictional stir welding process parameters. Since its inception in 1991, continuous efforts have been made by researchers inorder to understand and improve FSW process [3]. In FSW process a cylindrical rotating tool having a threaded profile or unthreaded probe of length less than the weld depth, extruding from the tool shoulder is used.

Finite Element Analysis (FEA) is one of the important engineering application tool used to assist in approximating and verifying how a component will react under various external and internal loading conditions [4]. Koc *et al.* [5] has employed FEA based simulation tool to predict the material flow and defects in the semi-solid forging of A356 aluminum alloys. Similar works were reported by Kang *et al.* [6] studied the upsetting process of semi-solid alloys and stated that the numerical simulation results approach the experimental results.

Today, even the simplest of products rely on FEA for design evaluation and the researchers and engineers are using FEA as an approximation tool for analysis by validating the simulation results with theoretical calculations [7-8]. Thus, FEA is a computing technique which is used to predict an approximate solutions to boundary value problems. In addition, application of FEA has gained importance in simulation of welded joints [9-10]. Thus in the present work, the application of Finite element analysis ANSYS software in Friction Stir Welding Process (FSP) to obtain the temperature distributions in the weld steel plates has been analyzed for specific results, such as stress, deformation, deflections and temperature distributions. The principle of operation of FSW process is depicted in "Figure 1".

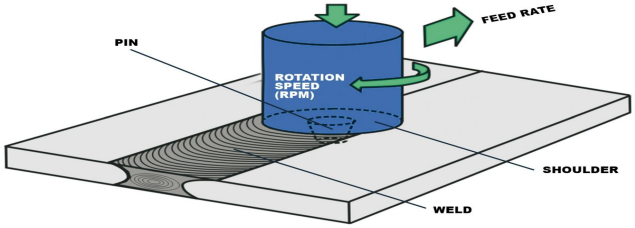


Figure-1: Friction Stir welding

ISSN 2394 - 7780

II. METHODOLOGY

The steel metal sheets were joined by a non-consumable tool consisting of a pin and a shoulder. The function of the non-consumable tool is that it firstly, heats the workpiece. When sufficient temperature is reached such that it is not molten completely, but plastically melted. Secondly, the non-consumable tool moves along the edges of the workpiece, such that a weld or a joint is formed. The heat is achieved due to friction between tool and workpiece. Plastic deformation is caused between the workpieces. Thus, the material flow is caused due to the heat generated due to friction between tool shoulder and the weld plates. Thus, this leads to a strong solid state welded joint. In the ANSYS simulation, modeling is a three-part task and is described in the following steps:

A. Tool modelling and Work piece; B. Contact Modelling; C. Boundary Conditions

2.1 Tool modelling and Work piece

The work pieces consist of two rectangular shaped steel plates. Two work pieces of sizes 76.2 x 31.75 x 3.18 mm is used for the modeling in the ANSYS software. The tool shoulder diameter is taken as 15.24 mm and the tool height is taken as 15mm. A hexahedral mesh is employed in the ANSYS meshing mode having a mid-side dropping node. In order to avoid mesh mis-orientation, a hexahedral mesh was used instead of a tetrahedral mesh. Further to generate more accurate results, a finer mesh was employed at the weld-line region. The following Figure 2 shows the geometry of Friction Stir Welding components; and the Figure 3 shows Hexahedral meshing in ANSYS software.

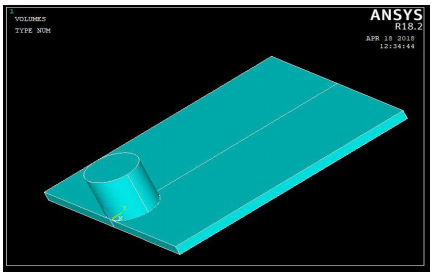


Figure-2: Geometry of Friction Stir welded components in ANSYS

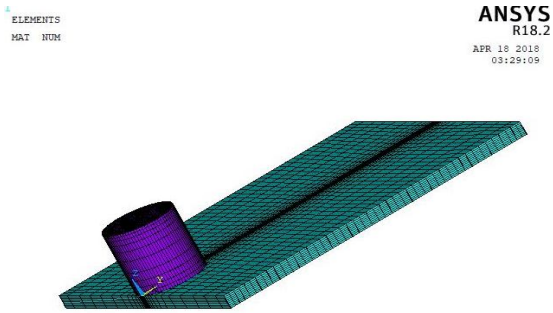


Figure-3: Hexagonal meshing in ANSYS software

2.2 Contact Modelling

In the FSW simulation, three contact surfaces were modeled as follows: Contact pair between the work plates, Contact Pair between Tool and work piece, Rigid Surface Constraint (between tool and pilot node). In the simulation, a frictional coefficient of 0.2 is used to simulate the two plates and between tool bottom and top surface of the plates. A rigid contact is applied between the tool top surfaces and the top surface master node, where load was applied. A high thermal contact conductance of 2E06 W/m^2 °C was defined to ensure bonding and simulate a perfect thermal contact between the plates. CONTA174 elements were specified as a real constant for the conductance.

2.3 Boundary Conditions

The problem involves two types of boundary condition, mechanical and thermal. Thermal ones include heat transfer through convection at an initial temperature of 25° C. A convection coefficient of 30 W/m^2°C was specified between the work piece and the tool, for all the external surfaces, excluding the bottom surface. An overall heat transfer coefficient of 300 W/m2 °C, which is nearly 10 times higher than the convective coefficient, is applied in the simulation model for conductive heat loss at the bottom surface of workpiece. In the ANSYS model an initial temperature of 25 °C was applied.

Mechanical boundary conditions comprises of the loads and DOF constraint. Clamping is done to hold the workpiece and the movement along z is strictly abandoned. The loads along with the time being applied is presented in "*Table 1*".

ISSN 2394 - 7780

Table-1: Temperature profile after Load step-1

Load Step	Position	Time	Loadings	DOF involved
1.	Plunge	1 sec	Displacement on Pilot node	UZ
2.	Dwell	5.5 sec	Rotation of tool	Rot Z
3.	Travelling	29 sec	Displacement and rotation	Uy and Rot Z

III. RESULTS AND DISCUSSION

3.1. Deformation and Stresses

During the FSW process, it is interesting to observe the changes in various quantities around the weld zone. The deflection caused in the weld plates due to the plunging of the tool is depicted in Figure 4. The deflection presented here was at load step 1. It is noted that the temperature remains unchanged at 25°C, at the load step 1, although the deflection causes high stresses in the work plates beneath the tool, and is presented in Figure 5.

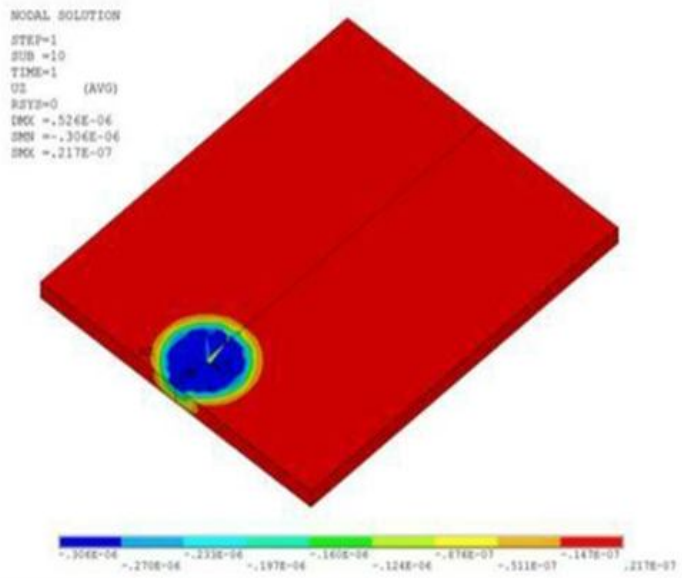


Figure-4: Deflection in the work piece after Load step-1

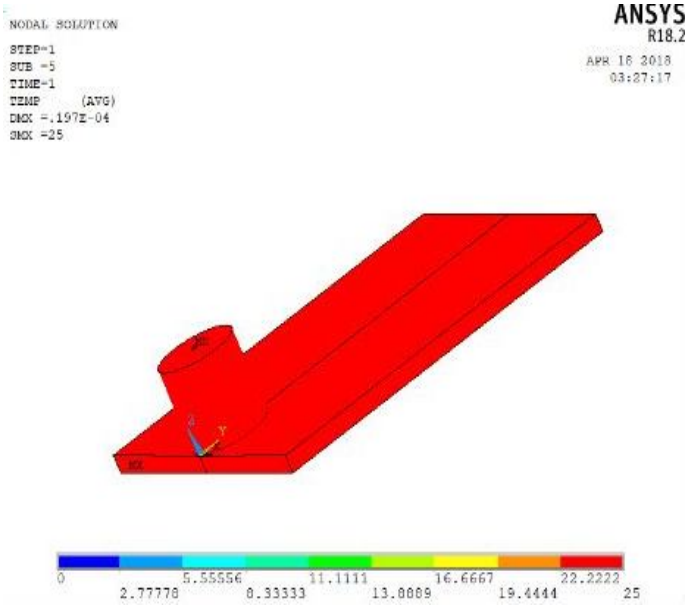


Figure-5: Temperature profile after Load step-1

Further, it is noted that the frictional stresses develop and increase rapidly, as the tool begins to rotate at this location. The frictional stresses developed and increment in contact frictional stresses from load step 1 to load step 2, is presented in Figure 6 and Figure 7 respectively. It was observed that heat is generated at work piece and tool interface, and the total frictional dissipated energy is converted into heat during the load step 2. Moreover, the heat is transferred to the work piece, and as a result, the temperature of work piece increases rapidly compared to the tool. The frictional coefficients FWGT are specified to be 0.95.

ISSN 2394 - 7780

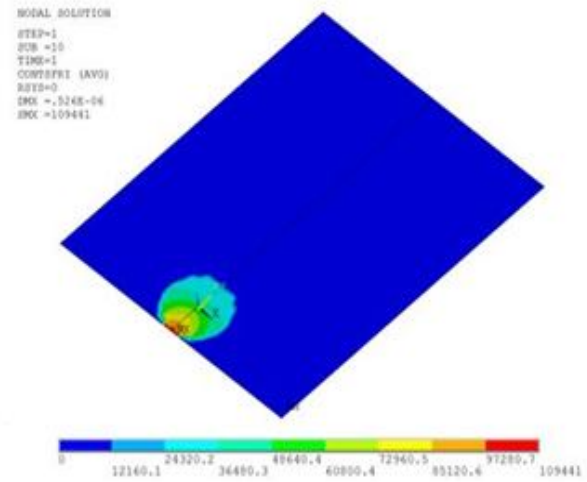


Figure-6: Frictional Stress after Load step-1

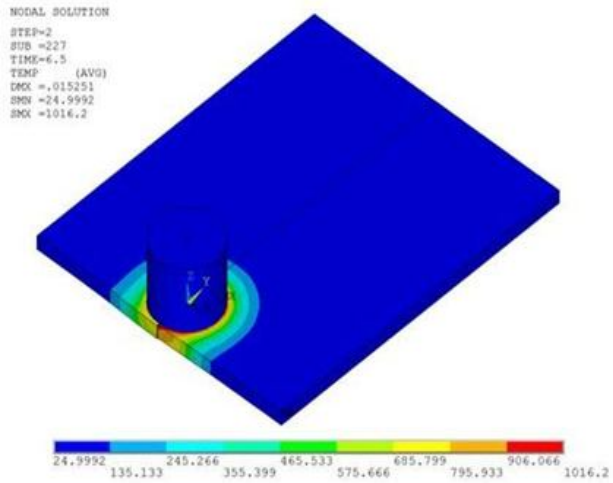


Figure-7: Frictional Stress after Load step-2

3.2. Temperature Profiles

It is noted during the last two load steps, that the work piece attains a maximum temperatures, which is beneath the tool. This heat generation is attributed due to the mechanical loads, while no external heat sources were used. Thus, with the increase in the temperature, the material softens and consecutively, the friction coefficient decreased. Thus, temperature-dependent coefficient of friction in the range between 0.4 to 0.2 helps to prevent temperature, from exceeding material melting point. The rise in temperature due to heat generation in the load steps 2 and 3 is shown in Figure 8 and Figure 9 respectively.

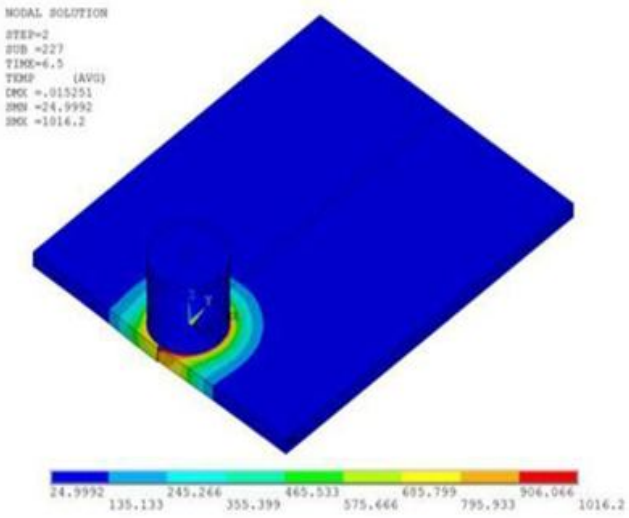


Figure-8: Temperature profile at Load step-2

ISSN 2394 - 7780

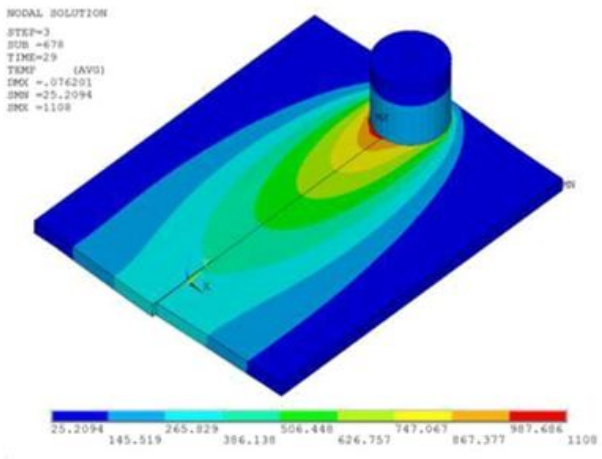


Figure-9: Temperature profile at Load step-3

IV. CONCLUSIONS

In the present research work, a novel heat transfer model was developed. The heat generated and the conduction in the FSW process was presented. The following conclusions can be drawn:

- The thermo-mechanical model developed has predicted and analyzed the welding stresses generated and heat (temperature) distributions in the work piece during the FSW process.
- All the FSW process parameters have significant influence on temperature during the process.
- Thus, the current investigation has demonstrated ANSYS's ability to predict the temperature profiles of Heat Affected Zone over the weld zones of the steel plates.

REFERENCES

Y. S. Sato Y. Nagahama, S. Mironov, H. Kokawa, S. H. C. Park, S. Hirano, "Microstructural studies of friction stir welded zircaloy", Scripta Mater, vol. 67, pp. 241-244, 2012.

[1] H. Fujii, Y. Sun, H. Kato, "Microstructure and mechanical properties of friction stir welded pure Mo joints, Scripta Mater, vol. 64, pp.657-660, 2011.

[2] B. Ashok Kumar, N. Murugan, "Optimization of friction stir welding process parameters to maximize tensile strength of stir cast AA6061-T6-AlNp composite" , Materials & Design, vol. 57, pp.383-393, 2014.

[3] S. Tickoo, V. Singh V, Ansys 14.0 for Engineers and Designers Pub. Dream Tech press, CADCIM Technologies, USA, 2012.

[4] M. Koc, V. Vazquez, T. Witulski, T. Altan, "Application of the finite element method to predict material flow and defects in the semi-solid forging of A356 Aluminum alloys", J Mater. Proc. Tech., vol. 59, pp.106-112, 1996.

[5] C. G. Kang, J. H.Yoon, "A finite element analysis on the upsetting process of semi-solid aluminum material", J Mater. Proc. Tech., vol. 66, pp.76-84, 1997.

[6] Binnur Goren Kıral, Mustafa Tabanoglu, "Finite Element Modelling of Friction Stir Welding in aluminum alloys joint", Mathematical and Computational Applications, vol. 18(2), pp. 122-131, 2013.

[7] S. Deepak kumar, D. Karthik, A. Mandal A, J.S.R. Pavan Kumar, "Finite Element Analysis of Tensile behavior of Semi-solid A356 alloy", Proc. of ICMSC-2015, IJAER, vol. 10(84), pp. 406-410, 2015.

[8] S. Deepak kumar, A. Mandal, J.S.R. Pavan Kumar, "Optimization of Thixoforging process parameters of A356 alloy using Taguchi's experimental design and DEFORM Simulation", Proc. ICEMS-2016, Jaipur National University, Jaipur, Materials Today: Proceedings, vol. 4, pp. 9987-9991, 2017.

[9] M. Noelle, A. Fenoel, A. Simar, "A Review about Friction Stir Welding of Metal Matrix Composites", Materials Characterization, pp. 1-56, 2016.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018

ISSN 2394 - 7780

EFFECT OF CARBON DOPING ON NORMAL AND SUPERCONDUCTING STATE OF MAGNESIUM DIBORIDE: A SPECIFIC HEAT STUDY

Namita Singh, Roopam Sharma and Dinesh Varshney

ABSTRACT

In this paper, a theoretical analysis of the experimental data on specific heat C(T) of Mg(B1-x Cx)2, (0<x<0.2) in the temperature range 0 ≤ T ≤ 300 K is given. Calculations of C(T) have been made on the basis of two component scheme, phononic contribution and Electronic contribution. Phonon contribution of specific heat is determined from the Debye and Einstein temperature for Mg(B1-x Cx)2 obtained using a Rigid Ion Model (RIM) overlap repulsive potential. The interatomic potential of this model includes contributions from the long-range Coulomb attraction and the short-range overlap repulsion and the van der Waals attraction. Using a suitable trial function the expression for electronic specific heat is derived and it is studied at temperature above and below its transition temperature. At the critical temperature the discontinuity in specific heat is higher than that of other samples; the transition is sharper than for most samples. The results obtained from calculations of bosonic and fermionic terms are then analyzed.

Keywords: magnesium diboride, specific heat, phonons, carrier diffusion, electron correlations.

I. INTRODUCTION

The binary compound MgB_2 is an unusual superconductor exhibiting a very high transition temperature (T_c =39 K). [1]. This compound shows two bands crossing the Fermi level. At the Fermi level, MgB_2 shows a relatively small electronic density of states $N(0)$ = 0.71 states/(eV·unit cell). So it is difficult to expect a notable transition temperature. The high-energy vibrations have an important role in the superconductivity. Superconducting state of MgB_2 is characterized by two gaps in the electronic excitation spectrum. [2-4]. The larger energy gap Δ_σ develops on quasi-two-dimensional (2D) sheets of the Fermi surface, often denoted as σ band. A distinctly smaller gap Δ_π is formed on three-dimensional (3D) parts of the Fermi surface that are related with the so-called π band [5-6]. Due to high superconducting transition temperature, well separated values of energy gaps and almost equal partial Sommerfeld constants associated with σ and π bands, the two band superconductivity can be easy to explain [5-6].

The two-gap model is an important model to study specific heat (C) of MgB_2. The large excess specific heat at $T << T_c$ is the signature of the smaller gap Δ_π on the π-band. The reduced jump at T_c is associated with the larger gap Δ_σ on the σ-band. Excellent fit is given by the two-gap model with $\Delta_\sigma/\Delta_\pi \approx 3$. The low-temperature specific heat of MgB_2 single crystal with the field parallel and perpendicular to the boron planes shows that the extreme nonlinearity of γ (H) was first observed in polycrystals [7]. It is an intrinsic property of MgB_2, related to the existence of two superconducting gaps. Moreover, these measurements reveal a dramatic variation of the effective anisotropy with the field, from 1 to ~ 5. It is seen that there is a relatively low interband coupling within MgB_2. So to discuss its superconducting state a slightly different approach is used. In this approach the model uses the condition of entropy conservation between $0<T<T_c$ and explains the jump height of the specific heat at its transition temperature [8]. The remaining electronic specific heat in the superconducting state is attributed to the phase transition of the second band. In the present investigation, the model is introduced and formalism is sketched. Standard electron–phonon mediated superconducting mechanism in MgB_2 has been explored since early decades [4]. Debye and Einstein method are followed to estimate the specific heat contributions of phonons. Developing this scheme for phonons and electrons specific heat, the low temperature specific heat of MgB_2 is computed.

II. PHONON SPECIFIC HEAT

The Rigid Ion Model (RIM) is formulated by including the effects of the long-range Coulomb attraction, the short-range Hafemeister–Flygare (HF) type overlap repulsion and the van der Waals (vdW) interactions. Its model potential ϕ (r) consists of the following interatomic interactions:

$$\Phi = \Phi_{kk'}^{C}(r) + \Phi_{kk'}^{R}(r) + \Phi_{kk'}^{vdW}(r) \quad (1)$$

The Coulomb contribution ϕ (r) is given by

$$\Phi_{kk'}^{C}(r) = \frac{-e^2}{2} \sum_{kk'} Z_k Z_{k'} r_{kk'}^{-1} \quad (2)$$

ISSN 2394 - 7780

Here $r_{kk'}$ is the separation between the two atoms k and k'. The overlap repulsive energy $\phi^{R}_{kk'}(r)$ according to Hafe-meister–Flygare type interaction extended up to the second neighbour ions, is expressed as follows [9].

$$\Phi^{R}_{kk'}(r) = nb_1\beta_{kk'}\exp\left(\frac{r_k + r_{k'} - r_{kk'}}{\rho_1}\right) + \frac{n'}{2}b_2\left(\beta_{kk}\exp\left(\frac{2r_k - r_{kk}}{\rho_2}\right)\right) + \left(\beta_{kk'}\exp\left(\frac{2r_k - r_{kk'}}{\rho_2}\right)\right) \quad (3)$$

Here $r_{kk'}$ and r_{kk} (= $r_{k'k'}$) are the nearest and second neighbour separation, respectively. r_k (= $r_{k'}$) are the ionic radii of k (k') ions. n (n') is the number of nearest (next nearest) ions (b_1, b_2) and (ρ_1, ρ_2) are the hardness and range parameters, respectively. The Pauling coefficients are expressed as follows [10].

$$\beta_{kk'} = 1 + \left(\frac{Z_k}{N_k}\right) + \left(\frac{Z_{k'}}{N_{k'}}\right) \quad (4)$$

Z_k ($Z_{k'}$) and N_k ($N_{k'}$) are the valence and number of electrons in the outermost orbit.

The contributions from the van der Waals (vdW) attractions $\phi^{vdw}_{kk'}(r)$ due to the dipole–dipole (d–d) and dipole– quadrupole (d–q) interactions are written as

$$\Phi^{vdW}_{kk'} = -\sum_{kk'} c_{kk'} r^{-6}_{kk'} - \sum_{kk'} c_{kk'} r^{-8}_{kk'} \quad (5)$$

Where $c_{kk'}$ and $d_{kk'}$ are the vdW coefficients due to dipole–dipole and dipole –quadrupole interactions, respectively. Their values are determined using the Slater–Kirkwood variational method [11].

$$c_{kk'} = \frac{3e\eta}{3m}\alpha_k\alpha_{k'}\left[\left(\frac{\alpha_k}{N_k}\right)^{1/2} + \left(\frac{\alpha_{k'}}{N_k'}\right)^{1/2}\right]^{-1} \quad (6)$$

$$d_{kk'} = \frac{27e\eta^2}{8m}\alpha_k\alpha_{k'}\left[\left(\frac{\alpha_k}{N_k}\right)^{1/2} + \left(\frac{\alpha_{k'}}{N_k'}\right)^{1/2}\right]^{2}\left[\left(\frac{\alpha_k}{N_k}\right)^{1/2} + \frac{20}{3}\left(\frac{\alpha_k\alpha_{k'}}{N_kN_{k'}}\right) + \left(\frac{\alpha_{k'}}{N_k'}\right)\right]^{-1} \quad (7)$$

Where, e and m are the charge and mass of the electron, respectively. α_k ($\alpha_{k'}$) are the polarizabilities of k (k') atoms. N_k ($N_{k'}$) are the effective number of electrons responsible for polarization of k (k') ions.

The model parameters, hardness (b) and range (ρ) parameters are determined from the equilibrium condition

$$\left[\frac{d\phi}{dr}\right]_{r=r_0} = 0 \quad (8)$$

And the Bulk modulus is given by

$$B = \frac{1}{9Kr_0}\left[\frac{d^2\phi}{dr^2}\right], \quad (9)$$

In above equation K is the crystal constant (dependent on crystal structure) and r_0 is the equilibrium interatomic separation.

The other thermo physical properties are calculated using the expressions given below. The Bulk modulus is given by

ISSN 2394 - 7780

$$B_T = \frac{f}{(3Kr_0)} \tag{10}$$

Where, K is the crystal constant and f is molecular force constant given by

$$f = \frac{1}{3}\left[\phi_{kk}^{''R}(r) + \frac{2}{r}\phi_{kk}^{'R}\right] \tag{11}$$

With $\phi_{kk'}^{R}(r)$ as defined in Equation (3).

Then we use, acoustic mass M' = (Mg_+ +2(1–x) B_-+ 2 x C) [Mg (B) is symbolised by $M_+(M_-)$], f^* = 2 f for each directional oscillation mode to get the acoustic phonon frequency as

$$\omega_D = \sqrt{\frac{2f^*}{M'}} \tag{12}$$

Furthermore, when the phonons belong to optic modes, their frequency is determined by the reduced mass as $\mu^{-1} = M(Mg)^{-1} + M(B)^{-1}$ [12]. The longitudinal (transverse) optical phonon frequency ω_{LO} (ω_{TO}) are given by

$$\omega_{LO}^2 = \frac{f+\eta}{2\mu(M)} \tag{13}$$

and

$$\omega_{TO}^2 = \frac{f-\eta}{2\mu(M)} \tag{14}$$

Where η is the force constant, given as

$$\eta = \frac{4\pi}{3}\frac{(Ze)^2}{\Omega} \tag{15}$$

and Ω is the volume of the hexagonal unit cell $(\sqrt{3}/2)a^2c$.

The specific heat from vibrational intermolecular acoustic modes, in terms of the Debye approximation is given as follows. [13].

$$C_{Dv} = \frac{9nDvR}{x^3}\int_0^x \frac{x^4 e^x}{\left(e^x - 1\right)^2} d\lambda \tag{16}$$

Here, R is the gas constant, $x = \theta_D / T$ with θ_D as the Debye temperature and the number of oscillators per formula unit is nDv.

The optical vibration mode with Einstein term is:

$$C_{Ev} = 3nEvR\frac{y^2 e^y}{\left(e^y - 1\right)^2} \tag{17}$$

Here, $y = \theta_E/T$ with θ_E as the Einstein temperature and the number of Einstein oscillators per formula unit is nEv. Using the developed expression for phononic and electronic specific heat, the expression for specific heat is estimated in MgB_2.

ISSN 2394 - 7780

I. ELECTRONIC SPECIFIC HEAT

The electronic specific heat is estimated in the normal state of MgB_2 where the holes are within the spherical Fermi surface. The internal energy of a normal metal is given as

$$U = U_0 + \frac{m^* k_F}{6\eta^2}(k_B T)^2 \tag{18}$$

Where, m^* the effective mass of the holes and k_F is Fermi wave vector. The specific heat is given by the temperature derivative of the internal energy. It is given as

$$C_{el} = \frac{m^* k_F k_B}{6\eta^2} T = \gamma T \tag{19}$$

From Eq (19) it can be concluded that the electronic specific heat depends on following two factors (i) the effective mass of the carriers and (ii) the carrier concentration. From the specific heat measurements in various experiments, it is seen that there is a discontinuity in specific heat near the transition temperature. To understand the occurrence of anomaly at $T \sim T_c$ of electronic specific heat, a trial function is used for temperature above and below T_c as given below.

$$C_{el} = \gamma T \qquad \text{for } T > T_c$$

$$= \frac{3\gamma T^3}{T^2{}_c} \qquad \text{for } T < T_c \tag{20}$$

Using the all above details the total specific heat given as

$$C_{total} = C_{Dv} + C_{Ev} + C_{el} \tag{21}$$

Using the developed expression for phononic and electronic specific heat, the specific heat in MgB_2 superconductors have been estimated.

II. DISCUSSION AND ANALYSIS OF RESULTS

The input data (r_0,B) for MgB_2 and $Mg(B_{0.8}C_{0.2})_2$ at room temperature are obtained. [13-15]. Using these input data and the van der-Waals coefficients ($c_{kk'}$ and $d_{kk'}$) evaluated from the Slater and Kirkwood method [11] for pure and Carbon doped MgB_2, the model parameters (b_1, b_2, b_3, ρ_1, ρ_2 and ρ_3) have been obtained using the equilibrium condition and Bulk modulus relation [Eqs. (8) and (9)]. The calculated values are listed in Table 1.

Table-1: The calculated values of different parameters

	Model parameters						Force constant		Debye Temperature	Einstein Temperature
	B-B		Mg-B		Mg-Mg					
	b_1 (10^{-12}erg)	ρ_1 (Å)	b_2 (10^{-12}erg)	ρ_2(Å)	b_3 (10^{-12}erg)	ρ_3 (Å)	f (N/m)	η (N/m)	θ_D (K)	θ_E (K)
x=0.0	4.5	0.99	1.2	0.56	5.73	0.23	178	132.5	594	715
x=0.2	4.1	0.96	1.057	0.55	2.931	0.12	171	130	582	678

While calculating the Debye and Einstein temperature, a = 3.085 nm, c = 0.3524 nm are taken yielding f = 178 N/m and η =132.8 N/m for x = 0.0 [1-2]. Force constant changes f = 171 N/m and η = 130 N/m for x = 0.2. With these parameters the Debye frequency is estimated at 594 K [582K] for MgB_2 [$Mg(B_{0.8}C_{0.2})_2$] which is consistent with the inelastic neutron scattering result [16-21]. But it differs as obtained from the low temperature specific heat. Usually, the Debye temperature depends on temperature and varies with change in sample. Its average value with standard deviation is $\theta_D = \theta_D \pm 15$ K. [22]. Further the optical phonon mode is obtained for MgB_2 [$Mg(B_{0.8}C_{0.2})_2$]. The calculated values of the optical phonon mode frequency are 715K [678K] consistent with the measured values of the E_{2g} optical phonons from the Raman spectra, lattice dynamical computational techniques and the inelastic neutron scattering spectroscopy of MgB_2 superconductors [16-21].

ISSN 2394 - 7780

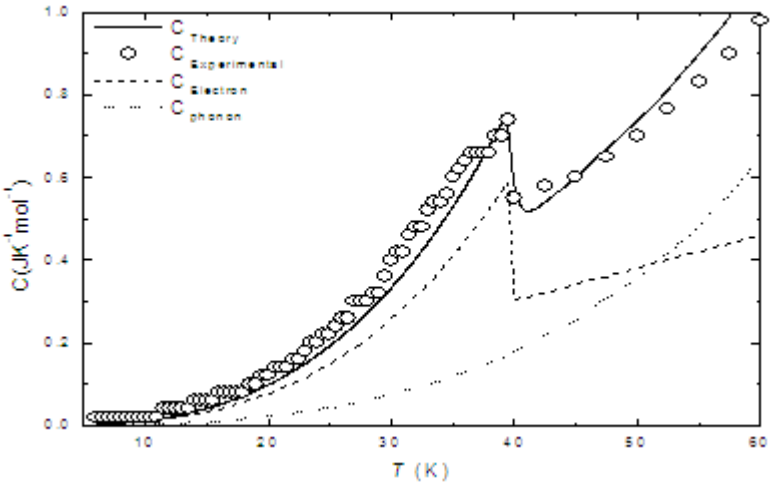


Figure-1: Variation of specific heat with temperature. Open circles are experimental data. Walte et. al 2006 [8]

The variation of the phonon contribution to the specific heat has computed in temperature range 5 K − 60 K for MgB_2 and in temperature range 5 K − 40 K for $Mg(B_{0.8}C_{0.2})_2$. The values of the specific heat for MgB_2 and $Mg(B_{0.8}C_{0.2})_2$ at different temperatures are depicted in Figures 1 and 2, They are compared with the available experimental data [8, 25]. It is clear from the figure that the calculated values of specific heat for MgB_2 [$Mg(B_{0.8}C_{0.2})_2$] is closer to the experimental values.

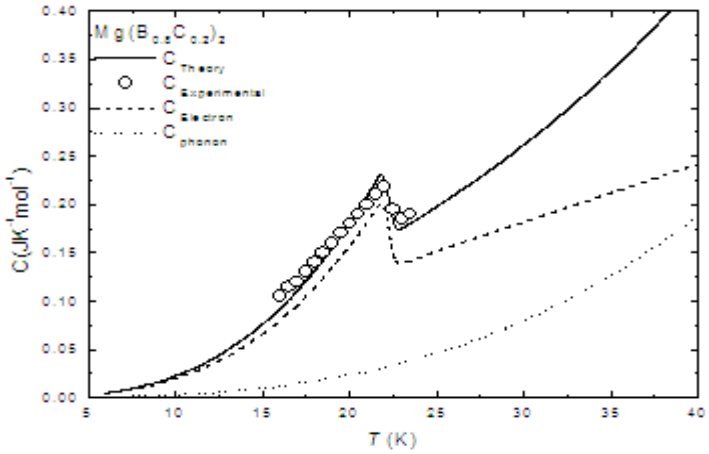


Figure-2: Variation of specific heat with temperature of Mg $(B_{0.8}C_{0.2})_2$. Open circles are experimental data at low temperature (T_c = 22 K) Ribeiro et. al [25].

The most interesting part of heat capacity C (T) in MgB_2 [$Mg(B_{0.8}C_{0.2})_2$], is the electronic specific heat C_e (T). In order to reliably separate this contribution from the total, measured specific heat, the contribution due to phonon excitations, C_p (T), has to be known quite accurately. As may be seen in Figures 1 and 2, the phonon provides the dominant contribution the total, measured specific heat above 20 K. Well below the Debye temperature θ_D, the specific heat in the normal state of a common metal is usually approximated by $C_p(T) = \gamma T + \beta T^3$ [23], where the first term represents the electronic and the second term the phononic specific heat. It was shown that this approximation for evaluating both, the electronic and the phononic specific heat, is not applicable for MgB_2 at $T > T_c$. Even at temperatures only slightly above T_c, the phonon specific heat may not simply be described by assuming a linear dispersion of the acoustic modes.

The results on electronic specific heat of MgB_2 superconductors are obtained from Eq (20) and the results are plotted with temperature for the temperature range $5 < T < 60$ K in Figure 1 with T_c = 40 K. [1-2]. For temperature $T < T_c$, It is complicated to represent specific heat correctly therefore a trial form has been used here. At temperature $T > T_c$, the electron specific heat shows linear relationship with temperature. The above form of C_e allows a sharp decrease in electronic specific heat at $T = T_c$. This is also verified by several experiments. This trial form gives a sharp discontinuity near the transition temperature. The specific heat of a material has two major contributions the first one is the phonon contribution and the second is the electronic contribution. During the normal and superconducting transition, the lattice contribution remains the same but the electronic contribution undergoes a sudden change and as a result the C–T curve shows an anomalous jump at T_c followed by a rapid decrease with the temperature [8].

ISSN 2394 - 7780

The theoretical results on electronic specific heat of [$Mg(B_{0.8}C_{0.2})_2$] has been also determined using Eq (20) and a graph is plotted between these values of specific heat and temperature for the temperature range $5 < T < 40$ K. It shown in Figure 2 with T_c = 22 K [3, 24]. In this case also for temperature $T < T_c$, it is complicated to represent specific heat correctly so here also this trial form is used. At the temperature $T > T_c$, the electron specific heat varies linearly with temperature and it has also a sharp decrease at $T = T_c$,. During the normal and superconducting transition, the lattice contribution remains the same but the electronic contribution undergoes a sudden change and as a result the C–T curve shows an anomalous jump at T_c followed by a rapid decrease with the temperature [25].

In Figure 3 the $C_e(T)$ to the specific heat in the temperature range between 5 K and 300 K is given. The unusual excess specific heat at about one fourth of T_c, which denotes the presence of excitations within the multi energy gap, is a consistent feature that is common to different samples and different techniques. However, detailed results, such as the height and the width of the jump ΔC at T_c, are sample dependent. Although the low-T behaviour of the specific-heat data in the earlier studies definitely pointed to the presence of excitations with a characteristic energy smaller than the BCS gap, it was not clear whether this was due to a continuous, but extreme, distribution of the gap resulting from anisotropy, or two discrete values of the gap closing at the same temperature T_c, with possible anomalous temperature dependence at some intermediate temperature. Furthermore, it was not clear whether these models could account for the specific heat over the whole range of temperature to T_c. One of the striking predictions of *BCS* is on the electronic specific heat jump at T_c. It is further noted that in combination with the T-dependence of C_{es} in the region just below T_c, this discrepancy is one manifestation of the gap nature of MgB_2. The quantity $\gamma = 0.66\ \pi 2k_B N(\varepsilon_F)$ is related to the electronic specific heat of a normal metal through the relation $C_e = \gamma T$ (N (ε_F)) is the density of states at the Fermi level and k_B the Boltzman constant) [26]. A typical *BCS* value for γ is about 3.83 mJ/molK^2 [1-2]. Moreover, low temperature specific heat measurements have been extensively used to analyze the bulk properties of these superconductors near the critical transition temperature as well as for small temperatures. On the theoretical side the two first principles calculations of the specific heat have shown the two of the features of the Specific heat that indicate the presence of the second gap, the excess specific heat at low T and the diminished discontinuity at T_c [27].

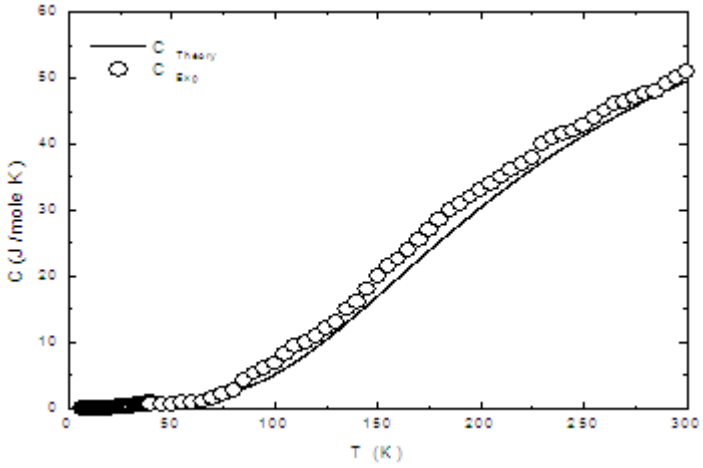


Figure-3: Variation of specific heat with temperature. Open circles are experimental data at low temperature

III. CONCLUSION

The theory is outlined to explain the temperature dependence of specific heat in magnesium diboride and the available experimental data is analyzed by assuming three channels to heat capacity: phonon and electron. Debye model within RIM is modified to include the vdW potential gives a satisfactory interpretation of the thermodynamic properties of MgB_2. It is noticed that the contribution of short-range overlap repulsion is, generally, less than 10% of the total cohesive energy in low temperature regime.

The proposed analysis reveals an independent estimation of lattice specific heat within the harmonic approximation by proper utilization of the Mg-Band B-B distance. With the above-deduced values of θ_D, a reduction of the lattice stiffness or increase of T^3-term in the specific heat is seen. The appropriateness of the present analysis depends on the understanding of band-structure estimation of density of state. The electronic specific heat coefficient is deduced following the density of state from electronic energy band-structure calculation. The Coulomb correlations and electron-phonon coupling strength have been incorporated while estimating the electronic specific heat and it is believed that both of these have important implication($T < T_c <$

ISSN 2394 - 7780

T) in describing the electronic heat capacity in MgB_2. The electron scattering rate at low temperature is inversely proportional to Fermi energy ($E_F \approx 0.6$ eV) and value of E_F is low in MgB_2 as compared to conventional metals, which implies that Coulomb correlations may dominate over other excitations in the low temperature domain ($T \leq 10$ K). Moreover, mass enhancement in the electronic channel may consistently retrace the experimental results for the specific heat at low temperature (mass of carriers is enhanced by a factor of 4 to that of bare mass of electron). It is inferred from the above analysis that, in the low temperature domain, electronic specific heat varies linearly with temperature [28]..

To an end, the retraces of the heat capacity experimental curve in MgB_2 is attributed to the assumption that the phonons in the temperature range $5 \leq T \leq 40$ K are thermally mobile in the MgB_2 and are usually the major component of specific heat. As θ_D is about 257K in magnesium diboride, it is believed that the proper incorporation of the realistic physical parameters based on experimental observation will lead to a clear picture of the low temperature transport properties in MgB_2.

REFERENCES

[1] J. Nagamatsu, N. Nakagawa, T. Muranaka, Y. Zenitani and J.Akimitsu, "Superconductivity at 39 K in magnesium diboride" Nature, **410,** pp 63-64, 2001.

[2] D. Mou, R. Jiang, V. Taufour, R. Flint, S. L. Bud'ko, P. C. Canfield, J. S. Wen, Z. J. Xu, G. Gu and A. Kaminski, "Strong interaction between electrons and collective excitations in the multiband superconductor MgB_2" Phys. Rev. B., **91**, pp- 140502, 2015.

[3] M. Putti, C. Ferdeghini, M. Monni, I. Pallecchi, C. Tarantini, P. Manfrinetti, A. Palenzona, D. Daghero, R. S. Gonnelli, and V. A. Stepanov, "Critical field of Al-doped MgB_2 samples: Correlation with the suppression of the σ-band gap" Phys. Rev. **B**, **71,** pp 144505, 2005.

[4] R. Sharma, N. Singh, K. Akhtar, R. Khenata and D. Varshney, "Phonon drag and carrier diffusion contribution to heat transport of superconductor MgB_2" International Journal of Computational Materials Science and Engineering, Vol. 6, No. 1, pp 1750008, 2017.

[5] N. Singh, R. Sharma, R. Khenata and D. Varshney "Multiband and mid-infrared optical conductivity in the normal state of $Mg(B_{1-x}C_x)_2$ superconductors" International Journal of Materials Science, Volume 12, Number 2, pp- 162-164, 2017.

[6] S. L. Bud'ko, P. C. Canfield, "Superconductivity of magnesium diboride" Physica C, **514**, pp 142-151, 2015.

[7] Y. Wang, T. Plackowski, and A. Junod, "Specific heat in the superconducting and normal state (2-300 K, 0-16T), and magnetic susceptibility of the 38 K superconductor MgB_2: evidence for a multicomponent gap" Physica C, **355,** pp 179-193, 2001.

[8] A. Wälte, S. L. Drechsler, G. Fuchs, K. H. Müller, K. Nenkov, D. Hinz, and L. Schultz, "Weak interband coupling in $Mg^{10}B_2$: A specific-heat analysis" Phys. Rev. B. **73,** pp 064501, 2006.

[9] D. W. Hafemiester, W. H. Flygare, "Outer Shell Overlap Integrals as a Function of Distance for Halogen—Halogen, Halogen—Alkali, and Alkali—Alkali Ions in the Alkali Halide Lattices" J. Chem. Phys., **43,** pp 795-800, 1965.

[10] L. Pauling, "The sizes of ions and their influence on the properties of salt like compounds" Z. Kristallogr., **67,** pp 377-404, 1928.

[11] J. C. Slater, K. G. Kirkwood, "The vander waals forces in gases" Phys. Rev. **37,** pp 682-697, 1931.

[12] D. Varshney, and M. P. Tosi, "Pairing mechanism and superconducting state parameters of cubic perovskite $Ba_{0.6}K_{0.4}BiO_3$" J. Phys. Chem. Solids, **61**, pp 683- 688, 2000.

[13] L. Vegard, "The constitution of the mixed crystals and the space filling of the atoms" Z. Phys. **5,** pp 17-26, 1921.

[14] M. E. Jones, R. E. Marsh, "The preparation and structure of Magnesium boride" J. Am. Chem.soc., **76,** pp 1434- 1436, 1954.

[15] T. V. Ignatova, G. A. Zryagina, I. G. Kolobor, E. A. Masalitin, V. D. Fil, "MgB_2 : Synthesis, sound velocity and dynamics of the vortex phase Low. Temperature Physics **28,** pp 190, 2002..

ISSN 2394 - 7780

[16] P. Postorino, A. Congeduti, P. Dore, A. Nucara, A. Bianconi, D. D. Castro, S. D. Negri, and A. Saccone, "Effect of the Al content on the optical phonon spectrum in $Mg_{1-x}Al_xB_2$" Phys. Rev. **B. 65,** pp 020507, 2001.

[17] B. Renker, K. B. Bohnen, R. Heid, D. Ernst, H. Schober, M. Koza, P. Adelmann, P. Schweiss, and T. Wolf, "Strong renormalization of phonon frequencies in $Mg_{1-x}Al_xB_2$" Phys. Rev. Lett**., 88,** pp 067001, 2002.

[18] J. M. An and W. E. Pickett, "Superconductivity of MgB_2: Covalent Bonds Driven Metallic" Phys. Rev. Lett. **86** pp 4366-4369, 2001.

[19] Y. Kong, O. V. Dolgov, O. Jepsen, and O. K. Andersen, "Electron-phonon interaction in the normal and superconducting states of MgB_2" Phys. Rev. B. **64** pp 020501, 2001.

[20] T. Yildirim, O. Gulseren, J. W. Lynn, C. M. Brown, T. J. Udovic, Q. Huang, N. Rogado, K. A. Regan, M. A. Hayward, J. S. Slusky, T. He, M. K. Haas, P. Khalifan, K. Inumaru and R. J. Cava, "Giant Anharmonicity and Nonlinear Electron-Phonon Coupling in MgB_2: A Combined First-Principles Calculation and Neutron Scattering Study" Phys. Rev. Lett. **87,** pp 037001, 2001.

[21] R. Osborn, E. A. Goremychkin, A. I. Kolesnikov and D. G. Hinks, "Phonon Density of States in MgB_2" Phys. Rev. Lett. **87,** pp 017005, 2001.

[22] D. Varshney, S. Bhatnagar, M. Varshney and N. Singh, "Thermal conductivity of $Mg(B_{0.94}C_{0.06})_2$ superconductors: role of carrier and lattice–impurity scattering" Molecular simulation, **41**, pp 1466-1475, 2015.

[23] D. Sharma, J. Kumar, A. Vajpayee, R. Kumar, P. K. Ahluwalia, V. P. S. Awana, "Comparative Experimental and Density Functional Theory (DFT) Study of the Physical Properties of MgB_2 and AlB_2" J. Supercond. Nov. Magn. **24**, pp 1925-1931, 2011.

[24] J. Kortus, I. I. Mazin, K. D. Bellashchenko, V. P. Antropov and L. L. Boyer, "Superconductivity of Metallic Boron in MgB_2" Phys. Rev. Lett. **86,** pp 4656-4659, 2001.

[25] R. A. Ribeiro, S. L. Budko, C. Petrovic, P. C. Canfield, "Carbon doping of superconducting magnesium diboride" Physica C, **384,** pp 227-236, 2003.

[26] B. Fisher, K. B. Chashka, L. Patlagan and G. M. Reisner, "Electronic transport in MgB_2, AlB_2 and ZrB_2– –a comparative study" Physica C **384,** pp 1-10, 2003.

[27] D. Varshney, S. Shah and R. K. Singh, "Specific heat studies in Ho-Ba-CuO superconductors: Fermionic and bosonic contributions" Bull. Mater. Sci. **23,** pp 267-272, 2000.

[28] A. Nuwal, S. L. Kakani, "Theoretical Study of Specific Heat and Density of States of MgB_2 Superconductor in Two Band Models" World Journal of Condensed Matter Physis. **3**, pp 33-42, 2013.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

HYDROGRAPH ANALYSIS FOR GROUND WATER RECHARGE POTENTIAL OF RANCHI TOWNSHIP AREA

Dr. P. N. Singh and K. K. Keshri
Civil Engineering Department, Cambridge Institute of Technology, Ranchi

ABSTRACT
Ground water is the major source for drinking and domestic purposes both in rural and urban area besides it is important sources for both agriculture and industrial sector. In the last few decades there had been tremendous increase in demand for fresh water due to rapid growth of population. So, accurate estimation of ground water recharge is extremely important for proper management of ground water and reliable prediction of surface run off. Many different approaches exist for estimation of water recharge. These methods includes single ring and double ring infiltrometer, disc permeameter, rainfall simulator and run off-on pounding etc but the double ring infiltrometer method is a well-recognized and document technique for directly measurement of soil infiltration rates. Ranchi township area is underlain by chota Nagpur gnesis and granite complex of Precambrian age. Above this strata shallow and deeper layer of soil exists which are more permeable than the nearby underlying layers.

The infiltration test has been carried out at 9 (nine) selected places between 23o15' to 23o30'N latitude and 85o15' to 85o30'E longitude, of Ranchi township area and the rate of water filtration pattern is predicated. It was observed that minimum and maximum infiltration rate is 7.9 mm/hour and 31.7 mm/hour respectively.

Keywords: Ground water; Infiltration; Rate of Infiltration; double ring infiltrometer ;Ranchi township area.

I. INTRODUCTION
Infiltration is the process by which water arriving at the soil surface enters the soil. This process affects surface runoff, soil erosion, and groundwater recharge. Being able to measure the surface infiltration rate is necessary in many disciplines. Infiltration is one of the major components of the hydrological cycle [1]. Water that falls as precipitation may run over land eventually reaching streams, lakes, rivers and oceans or infiltrate through the soil surface, into the soil profile. Infiltration is the movement of water into the soil from the ground surface. The water is driven into the porous soil by force of gravity. First the water saturate soil pores between particles and then extra water moves down due to resulting attraction of gravitational force. The actual rate at which water enters into the soil at given time is termed as the infiltration rate, this rate describes the capacity of soil to absorb water on it and the rate decreases as the soil becomes saturated. Infiltration rate depends on soil characteristics such as soil texture, hydraulic conductivity, soil structure, vegetation types, soil temperature, water content of soil, rainfall intensity etc.

Simplified approaches include empirical models such as Kostiakov, Horton, Holtan, and approximate physically based models like those of Green and Ampt and Philip. Empirical models tend to be less restricted by assumptions of soil surface and soil profile conditions, but more restricted by the conditions for which they were calibrated, since their parameters are determined on actual field-measured infiltration data. Equations that are physically based approximations use parameters that can be obtained from soil water properties and do not depend upon measured infiltration data.

It has been noted that different approximate equations for infiltration result in different predictions for infiltration rate, time of ponding and time of runoff even when measurements from the same soil samples are used to derive parameter values. Also, different equations for infiltration require different parameters to be used. There are many factors that contribute to the infiltration rate including time from onset of rain or irrigation, initial water content of the soil, hydraulic conductivity, surface conditions, and profile depth and layering [2].

The goal of this study is to compare predictions of infiltration rates by four models with measured values at six different locations under the specific conditions. Hence, keeping in view finding the better predictions of infiltration for different types of soil at different locations the present study was planned with the following specific objectives.

1. To determine the Water Percolations by Double Ring Infiltrometer of Ranchi Township.

2. To prepare infiltration curve using double ring infiltrometer for different locations.

ISSN 2394 - 7780

II. MATERIALS AND METHOD

Description of study area

Geographical area of Jharkhand state is 79.72 lakh hectares. The most of the population of the state is depending on agriculture, only 23% cover for agriculture in the state after partition of Bihar (15 November, 2000), total geographical area of state is situated on the latitude (210 58' to 250 18' N) and Longitude (830 22' to 870 57' E). The average annual rainfall is 1200-1300 mm and total population of state is 26.91 million (2.65% of the country).

Ranchi lies at 23°15′N and 85°30′E. Its municipal area is 175.12 Km2 and its average elevation is 651 m above sea level. Ranchi is located in the southern part of the Chota Nagpur plateau, which is the eastern section of the Deccan plateau. Ranchi has a hilly topography and its dense tropical forests a combination that produces a relatively moderate climate compared to the rest of the state.

The present study was conducted on following nine locations of Ranchi district of Jharkhand.

INFILTRATION BEHAVIOR IN THE STUDY AREA

The phenomenon of infiltration has been variously defined; it entails a process of water movement from surface soil into the ground. This water is said to have the potentials of penetrating into the lower soil profile, it carries with it some amount of nutrients. The rate of infiltration determines the time at which superficial water appears on the soil surface. If the rate of infiltration is limiting, the entire water balance in the root zone will be affected. It separates water into two major hydrologic components - surface runoff and subsurface recharge. The assessment of runoff risk has assumed an increased importance because of concerns about the associated pollution hazards. For planning purposes it is essential to know the stability of infiltration data for the infiltration capacity of individual soils is adequate to cope with the anticipated hydrologic loads. A high infiltration rate is generally desirable for plant growth and the environment. In some cases, soils that have unrestricted water movement through their profile can contribute to environmental concerns if misapplied nutrients and chemicals reach groundwater and surface water resources via subsurface flow.

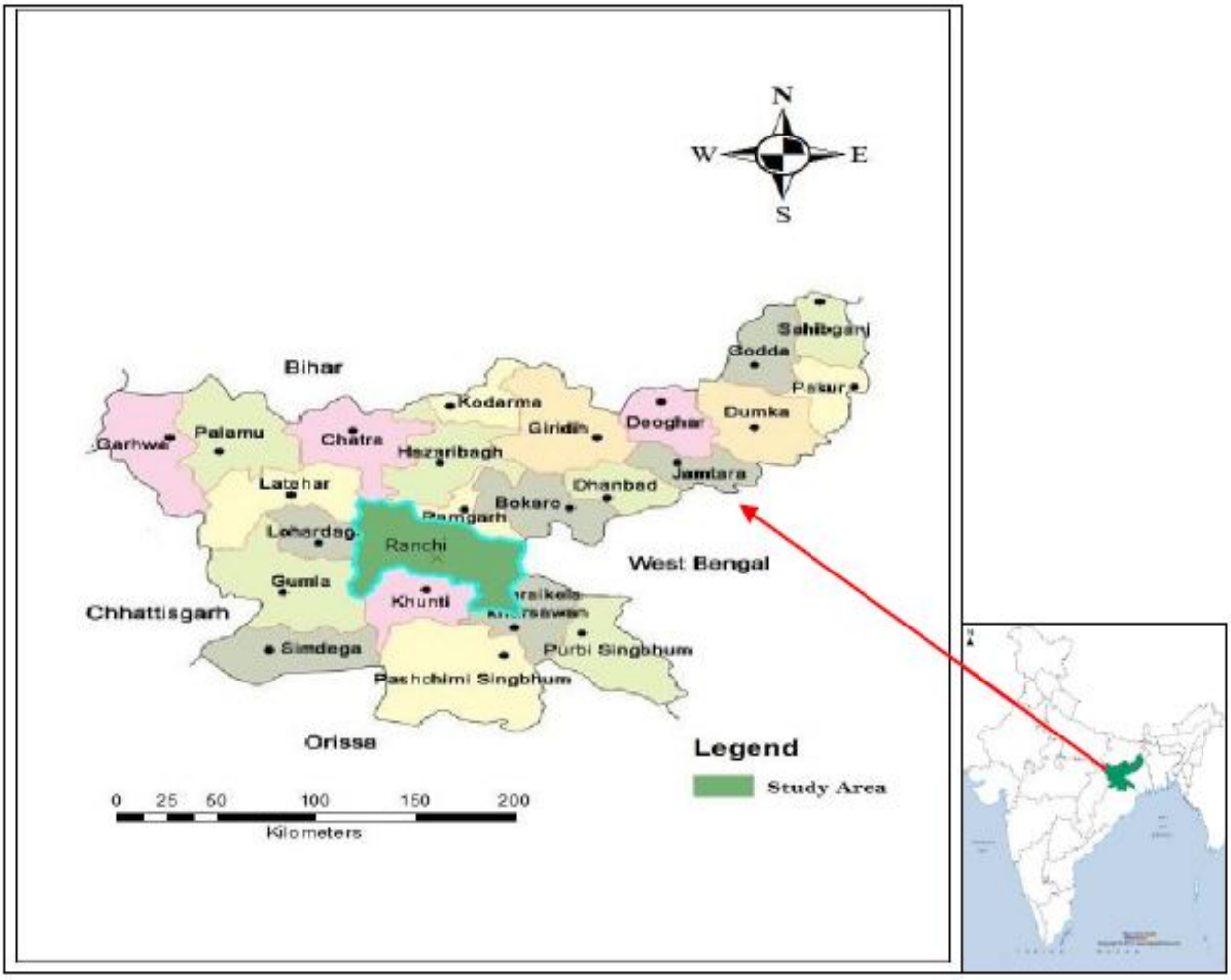


Figure 1. Location map of experimental site (Ranchi district in Jharkhand, INDIA)

ISSN 2394 - 7780

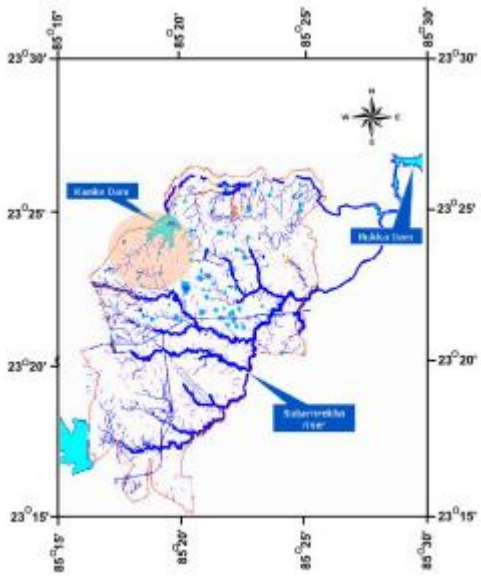


Figure 2: Drainage map of the study area

METHODS FOR MEASURING INFILTRATION RATE

There are several suggestions to be found in the literature on methods for measuring infiltration rate. Infiltration rings were chosen since they are relatively cheap and easy to transport [3]. Most importantly, they are providing reliable data if used in a correct way. There are however no consistent recommendations on the exact setup and should be adjusted as suggested by [3] for each specific case.

The two principal considerations to make are: (a) whether to use a single or double ring and (b) the ring sizes argued that double ring infiltrometers improve the measurements by avoiding lateral flow. This would be proven by faster infiltration rate in the outer ring. Conversely, argued that a double ring does not give better results for uniform soil [4] and it was also criticized to the double ring infiltrometer and argued that lateral flow can only be avoided by increasing ring diameter to at least 1 m. The ring size is the other important consideration to make prior to measuring infiltration rate [4] argued that ring diameters that were too small could show overly high infiltration rates. Several studies proposed double rings with an inner ring size of 15 cm in diameter and the outer of 30 cm to perform measurements of sufficient quality. This is an important advantage considering the limitations in this study to transport and carry large amounts of water. The material restrictions and the field conditions for this study, excluded the possibility of ring sizes larger than 60 cm in diameter. The experiment thus focused on a double ring (30 cm and 60 cm). The time frame and measurement conditions allowed for two sets of double rings. The inner and outer ring sizes were 30 cm and 60 cm in diameter respectively .The lower edge of the cylinders was sharpened to minimize disturbance to the soil [4]. Additional equipment comprised two rulers for measurements, a cloth to protect the soil surface at first water application, two buckets to fetch the water and a plastic film to avoid evaporation during measurements. Finally, it should be considered that infiltration rate is highest when the soil surface is ponded [5], as in the case of ring infiltrometers.

Horton's model

The measurements were tested using Horton's Infiltration model. Despite being one of the earliest infiltration models, Horton's infiltration model [6] remains widely used. The equation is empirical and is calculated as:

$$f_t = f_c + (f_o - f_c)e^{-kt} \quad \text{.....} \quad (1)$$

Where

f_t is the infiltration rate at time t,

f_o is the initial infiltration rate or maximum infiltration rate,

f_c is the constant or equilibrium infiltration rate after the soil has been saturated or minimum infiltration rate,

e^{-kt} is exponential decrease of rate f_o with the decay constant k.

Green and Ampt Model

Named for two men; Green and Ampt. The Green-Ampt model of infiltration estimation accounts for many variables that other models, such as Darcy's law, do not. The Green Ampt model has been modified in this application to calculate water infiltration into non-uniform soils by several researchers [4]. Specifically, the model could be used for the determination of water infiltration over time in vertically heterogeneous soils.
It is a function of the soil suction head, porosity, hydraulic conductivity and time.

ISSN 2394 - 7780

$$\int_0^{F(t)} \frac{F}{F+\Psi\,\Delta\theta}\,dF = \int_0^t K_s\,dt \quad \ldots\ldots\ldots \quad (2)$$

Where
Ψ is wetting front soil suction head [cm],
Δθ is difference between initial and final water content of soil,
K_s is saturated hydraulic conductivity [cm/hr], and
F is the total volume already infiltrated [cm].

Once integrated, one can easily choose to solve for either volume of infiltration or instantaneous infiltration rate:

$$F(t) = Kt + \Psi\Delta\theta \ln[1 + \frac{F(t)}{\Psi\,\Delta\theta}] \quad \ldots\ldots\ldots \quad (3)$$

Using this model one can find the volume easily by solving for F(t). However the variable being solved for is in the equation itself so when solving for this one must set the variable in question to converge on zero, or another appropriate constant. A good first guess for F is the larger value of either Kt or $\sqrt{2\Psi\Delta\theta Kt}$. The only note on using this formula is that one must assume that h_0, the water head or the depth of ponded water above the surface, is negligible. Using the infiltration volume from this equation one may then substitute F into the corresponding infiltration rate equation given below to find the instantaneous infiltration rate at the time (t), F was measured. Different parameters value of Green-Ampt model as given in Table 1

Table 1. Green-Ampt parameters (Bouwer et al., 1986)

Texture	Porosity	Residual Porosity, θr	Effective Porosity, θe	Suction head(cm)	Conductivity, K(cm/h)
Sand	0.437	0.02	0.417	4.95	11.78
Loamy Sand	0.437	0.036	0.401	6.13	2.99
Sandy Loam	0.453	0.041	0.412	11.01	1.09
Loam	0.463	0.029	0.434	8.89	0.34
Silt Loam	0.501	0.015	0.486	16.68	0.65
SandyClay Loam	0.398	0.068	0.33	21.85	0.15
Clay Loam	0.464	0.155	0.309	20.88	0.1
Silty Clay Loam	0.471	0.039	0.432	27.3	0.1
Sandy Clay	0.43	0.109	0.321	23.9	0.06
Silty Clay	0.47	0.047	0.423	29.22	0.05
Clay	0.475	0.09	0.385	31.63	0.03

Modified Green and Ampt

$$f = A + \frac{B}{S} \quad \ldots\ldots\ldots\ldots \quad (4)$$

Where f = infiltration rate (mm/s)
A = steady infiltration rate due to gravity
S = total infiltrated so far into suction store
B = constant so B/S is suction component

Kostiakov's model

Despite the availability of a large number of infiltration models, some of the available empirical models have been quite popular and frequently used in various water resource applications world over [7] proposed the empirical model based on curve fitting for estimating infiltration rate over a decline period of time. Some time it is more convenient to present the infiltration data in form of cumulative curve than the rate curve, may be called as mass infiltration curve. This model suggested a formula which assumes that at time t = 0, the infiltration rate is infinite and at time t = 1, the rate approaches zero [8]. The equation is given below-

$$f_p = at^b \quad \ldots\ldots\ldots \quad (5)$$

Where
f_p = cumulative infiltration capacity [cm/hr],
t = time after infiltration starts [min], and
a and b are empirical constant that depend on the soil conditions.
Parameter a and b are empirical constants that are site specific and depend on soil conditions such as soil texture, moisture content, bulk density and other soil properties . The parameter 'a' is site specific since it depends on the soil conditions and properties.

Infiltrometer

Infiltrometer is a device used to measure the rate of water infiltration into soil or other porous media. Commonly used infiltrometers are single ring or double ring infiltrometer, and also Disc parameters. The single ring involves driving a ring into the soil and supplying water in the ring either at constant head or falling head

ISSN 2394 - 7780

condition. Constant head refers to condition where the amount of water in the ring is always held constant. Because infiltration capacity is the maximum infiltration rate, and if infiltration rate exceeds the infiltration capacity, runoff will be the consequence, therefore maintaining constant head means the rate of water supplied corresponds to the infiltration capacity. The supplying of water is done with a Mariotte's bottle. Falling head refers to condition where water is supplied in the ring, and the water is allowed to drop with time. The operator records how much water goes into the soil for a given time period. The rate of which water goes into the soil is related to the soil's hydraulic conductivity.

The double-ring infiltrometer is a well-established field method for measuring infiltration and it uses an outer ring creates an annular space between the two rings to promote one-dimensional, vertical flow from the inner ring by minimizing edge and divergence effects. Double-ring infiltrometer requires two rings: an inner and outer ring. The purpose is to create a one-dimensional flow of water from the inner ring, as the analysis of data is simplified. If water is flowing in one-dimension at steady state condition, and a unit gradient is present in the underlying soil, the infiltration rate is approximately equal to the saturated hydraulic conductivity. An inner ring is driven into the ground and a second bigger ring around that to help control the flow of water through the first ring. Water is supplied either with a constant or falling head condition, and the operator records how much water infiltrates from the inner ring into the soil over a given time period.

Infiltration measurement

A double ring infiltrometer was used to measure the infiltration rate of soil at different locations. Method for measuring infiltration from double ring infiltrometer is explaining in below paragraphs.

Hammer 30 cm diameter ring at least 15 cm into the soil. Use the timber to protect the ring from damage during hammering. Keep the side of the ring vertical and drive the measuring rod into the soil so that approximately 12 cm is left above the ground.

Hammer the 60 cm ring into the soil or construct an earth bund around the 30 cm ring to the same height as the ring and place the hessian inside the infiltrometer to protect the soil surface when pouring in the water

Start the test by pouring water into the ring upto 80 mm water column. At the same time, add water to the space between the two rings to the same depth. Do this quickly. The water within the two rings is to prevent a lateral spread of water from the infiltrometer.

Record the clock time when the test begins and note the water level on the measuring rod. After 1-2 minutes, record the drop in water level in the inner ring on the measuring rod and add water to bring the level back to approximately the original level at the start of the test. Record the water level. Maintain the water level outside the ring similar to that inside.

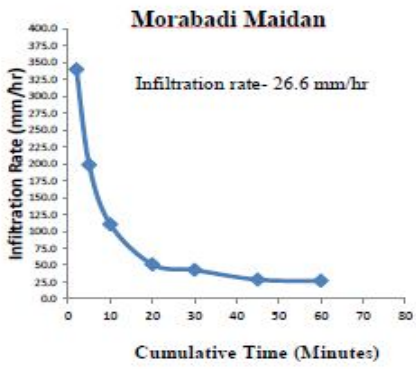
Continue the test until the drop in water level is the same over the same time interval. Take readings frequently (e.g. every 1-2 minutes) at the beginning of the test, but extend the interval between readings as the time goes on (e.g. every 20-30 minutes). Note that at least two infiltration tests should be carried out at a site to make sure that the correct results are obtained. The different steps in the installation of the double ring are illustrated in Figure 3.

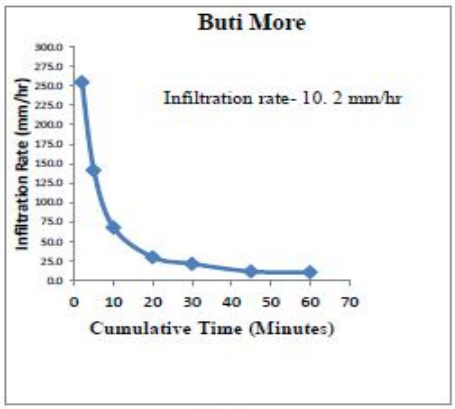
Figure 3: Installing and reading off the double ring infiltrometer.

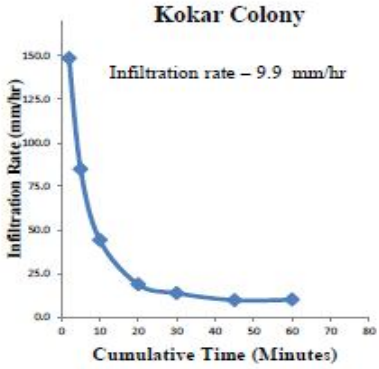
ISSN 2394 - 7780

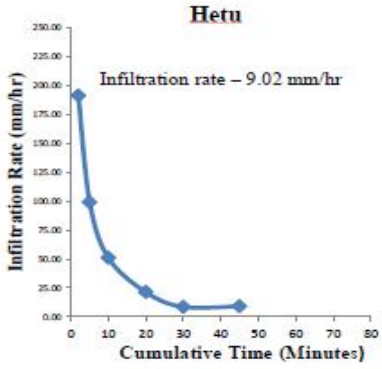
III. RESULTS AND DISCUSSION

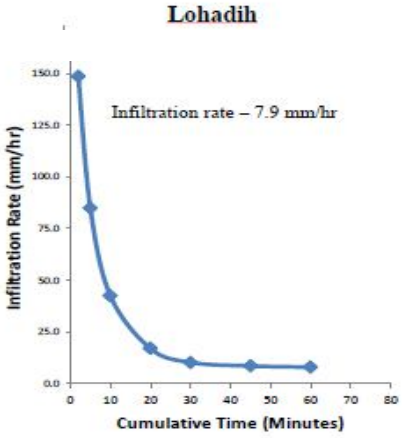
The determination of infiltration characteristics of major soil series of different sites in Ranchi was done by various processes and modelling methods and the results obtained was discussed. The graphs were made which provided a concrete support to the experimental work done during the project. The average infiltration rate of the study area is 14.8 mm/hr.

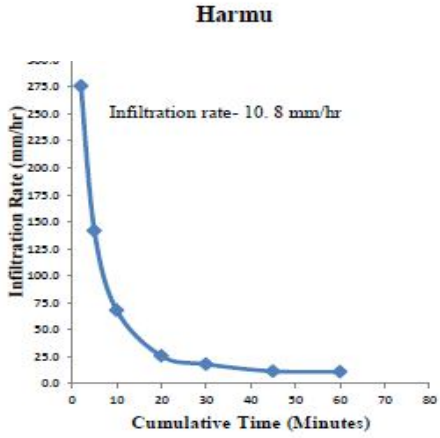


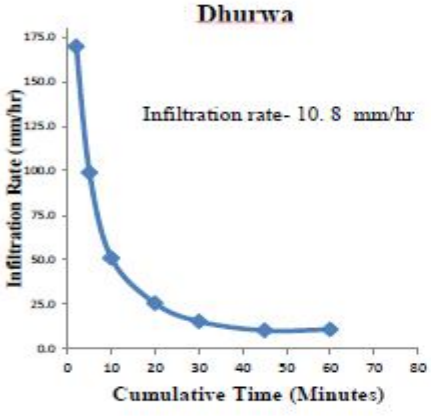


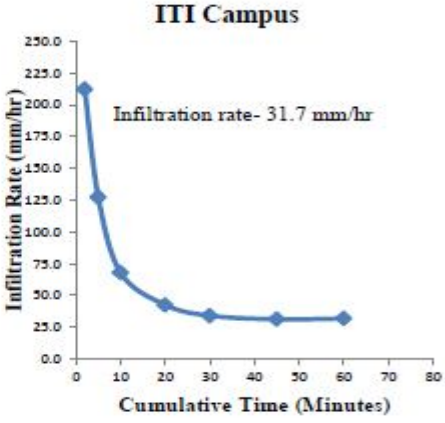




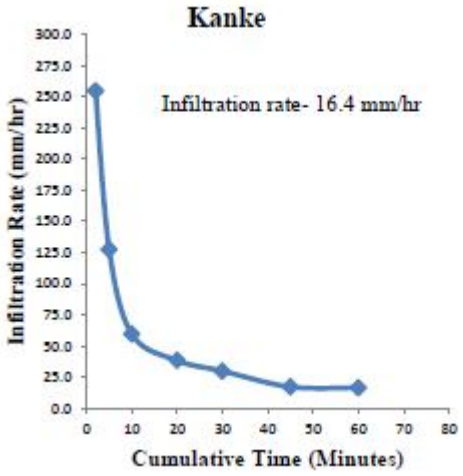








ISSN 2394 - 7780



CONCLUSIONS

The paper reveals that at in Kokar colony, Dhruwa, Hetu and Lohadih during first application of water, the infiltration is high but as the upper soil layer set saturated the infiltration rate decreases and take lesser time to complete the test. It shows that deeper layer is less permeable than the shallow layer and infiltration is controlled by less permeable sediment at greater depth.

At ITI Campus, Booti More, Morhabadi Maidan, Harmu, Dhruwa and Kanke, the shallow and deeper layers of soils are more permeable than the near surface layer which shows high infiltration. The average infiltration rate of the study area is found to be 14.8 mm/hr.

REFERENCES

[1] Brouwer, C., Kay, M. and Heibloem, M,. Irrigation Water Management: Irrigation Methods. Food and Agricultural Organization of the United Nations. Rome, pp. 24-34, 1988.

[2] Hillel, Daniel. Environmental soil physics: Fundamentals, applications, and environmental considerations. Elsevier, 1998.

[3] Johnson, Lyndon B. Public papers of the presidents of the United States: Lyndon B. Johnson, 1963-1964. Best Books on, 1965.

[4] Bouwer, Herman. "Intake rate: cylinder infiltrometer." Methods of Soil Analysis: Part 1—Physical and Mineralogical Methods of soil, pp. 825-844, 1986.

[5] Youngs, David L. "Three-dimensional numerical simulation of turbulent mixing by Rayleigh–Taylor instability." Physics of Fluids A: Fluid Dynamics 3.5, p.p.1312-1320, 1991.

[6] Horton, Robert E. "Analysis of runoff-plat experiments with varying infiltration-capacity." Eos, Transactions American Geophysical Union 20.4,pp. 693-711, 1939.

[7] Kostiakov, An N. "On the dynamics of the coefficient of water percolation in soils and the necessity of studying it from the dynamic point of view for the purposes of amelioration." Trans. Sixth Comm. Int. Soc. Soil Sci. 1,pp.7-21, 1932.

[8] Uloma, Adindu Ruth, Akoma Chigozie Samuel, and Igbokwe Kelechi Kingsley"Estimation of Kostiakov's infiltration model parameters of some sandy loam soils of Ikwuano-Umuahia, Nigeria." Open Trans. Geosci vol. 1.1, pp. 34-38, 2014.

International Journal of Advance and Innovative Research
Volume 5, Issue 2 (I): April - June, 2018
ISSN 2394 - 7780

HYBRID SOLAR DESALINATION SYSTEM INTEGRATED SPV PUMP FOR PURIFICATION OF WATER IN DISASTER AFFECTED AREA

Anita Sagar
Assistant Professor, Department of Physics, College of Commerce Arts & Science, Patna

ABSTRACT
In disaster affected area where source of drinking water is contaminated the pure drinking became most difficult to get and most necessary things to have. Making availability of safe drinking water is always a serious concern for every house hold. in case of non availability of energy sources the situation become more difficult. The proposed In this study, a focus is made to develop and test a single basin solar desalination system for a system in this paper is an effective solution of the problem. In test condition eight to ten litre of water per day can be created.

This system consist of a solar still, a condenser, water pump ,vacuum pump and flat plat solar collector. Under the standard input parameters this system output drinking water is evaluated. Under the input of 350 to 950 W/m^2 the average yield of 8.5 litre with 1M2 still size. This system running using on external electrical source may produce purified water at the cost of Rs. 0.25 per litre. The purified water profile is tested and found safe for drinking and non required substance well below the permissible limit.

Keyword: Solar Energy, Desalination, Efficiency, Vacuum Pressure, Hybrid Single basin solar desalination System.

INTRODUCTION
Production and supplying of drinking water is one of the major problem is disaster's flood affected areas in the different part of the world. Proposed Hybrid Solar Desalination can solve the part of this problem of the flood affected area. Hybrid Solar Desalination System can solve the part of this problem in the flood affected areas. Basin type solar still is simple in design and it has low cost production technology. Enhancing the efficiency of basin type solar stills has been investigated by several investigators and suggesting various approaches. Enhancement of efficiency and yield per day through: - Proper still use of thermal insulating material [5.]; minimising vapour leak from still[2] minimum heat transfer due to convection in the still using vacuum technology[3].The concept of solar still coupled with flat plate solar collector was first introduced by Zaki et al. in the year 1983[2.]. They studies an active Solar Desalination system of single basin solar still integrated with a flat plate solar collector under the thermo siphon mode of operation. They found that the yield of the system is very high when the inlet water is passed through a heat exchanger.

Desalination of brackish water using solar thermal energy can be accomplished by two methods. The first method utilises the green house effect to evaporate brackish water in single basin solar still [5]. A typical single basin solar still basin is mounted sloping downward fresh water collection with inclination of 15^o [6]. This has low collection efficiency in order of 10-15%.

The second method often involves more than one sub system, i.e. for collection and another for energy storage and third system for energy utilization in the desalination process.

EXPERIMENTAL SETUP
The aim of this study is to develop and test a single basin solar desalination system with Condenser and vacuum pump that could be used i n remote disaster affected area The experimental setup fig. 1 consist of a overhead tank for flood water feed(01), condenser dipped in overhead tank(08), flat plat solar collector (04), a solar still(05), a condenser(09) , solar photovoltaic water pump(03) and vacuum pump(07). Flat plate collector of 1m^2 are used as heat plate exchanger which circulate the brackish water through absorber pipes made of copper. The absorber on a flat and have a transparent protective surface in order to minimise heat loss [7]. The flood water passes through solar collector tubes and absorbs the from it as shown point number (04) in figure 1. The hot water leaves the flat plate solar collector enters the single basin solar still (05) , which is used as evaporator, where the pressure is maintained well below atmospheric pressure this is obtained by using solar photovoltaic vacuum pump(07). The pressure inside the single basin solar still is maintained below the saturation pressure of hot water. Hot water entering the evaporator boils due to reduces pressure due to the reduced boiling point of water and generates vapour or steam. The vapour is generated at point (06). The air sucked by vacuum pump holds the vapour which is sent to condenser. In condenser the vapour condensed to water .This drinking water which is generated, is collected to a pan at point no (09). Some amount of water is also generated inside the still and that is collected at point (10) inside the still and drained out by tap. Vacuum

ISSN 2394 - 7780

pump continuously creating low pressure and pumping vapour to condenser and thus generation drinkable water. The forced evaporation and condensation below boiling point leads to good yield of water. Heat loss in condensation process is captured by overhead tank and thus optimises the result. Flow of water is shown by arrow.

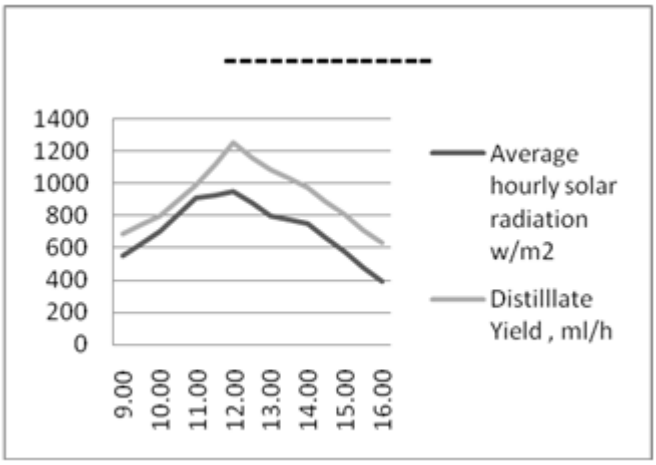


Fig. 1

3. EQUATIONS USED

The exergy analysis is done for individual components like the solar flat plate collector, the flash evaporator and the condenser [7]. The changes in pressures and concentration across the components were assumed to be negligible. The relevant equations used are given below [6].

$$Є_{in} = Φ_t \cdot Ă_c \cdot 0.933 \quad (1)$$

$$Є_{out} = Ψ_1 Ç_{pf} [(Θ_2 - Θ_1)] \quad (2)$$

Single Basin solar still cum Flash Evaporator-

$$Є_{in} = Ψ_3[Ç(Θ_3 - Θ_0) - Ç_p Θ_0 \ln(Θ_3/Θ_0)] - Ψ_2 [Ç_p(Θ_2 - Θ_0) - Ç_p Θ_0 \ln(Θ_2/Θ_0)] \quad (3)$$

$$Є_{out} = Ψ_5\{ ℓ_{v(Θsat)} [1-(Θ_0 / Θ_{sat})] + Ç_{pf}(Θ_{sat}-Θ_0) - Θ_0 \ln(Θ_{sat}) \quad (4)$$

Condenser

$$Є_{in} = Ψ_7 Ç_{pwc}[(Θ_8-Θ_7) - Θ_0 \ln(Θ_8/Θ_7)] \quad (5)$$

$$Є_{out} = Ψ_5[ℓ_{v(Θsat)}\{1-(Θ_0/Θ_{sat})\} + Ç_{pf}(Θ_6-Θ_5) - Θ_0 \ln(Θ_6/Θ_5)] \quad (6)$$

Exergetic efficiency

$$ŋ = Є_{out}/Є_{in} \quad (7)$$

$$\text{Electrical cost} = P \cdot Θ \cdot Ç_ℓ \quad (8)$$

$$Ç_t = \text{electrical cost + fixed cost} \quad (9)$$

$$Ç_w = Ç_t/D \quad (10)$$

4. RESULTS AND DISCUSSION

In this experiment we studied the efficiency of system's desalination process under the effect of solar radiation and low pressure.

The variation of solar radiation is measured across the day. The observed variation ranges from 350 W/m^2 to 950W/m^2 and vacuum pressure is varied from 0.05 to 1 bar. The variation in temperature of the system for different time intervals is shown in Fig. 2.0

ISSN 2394 - 7780

Table: Water Output in different Condition

Time	Water inlet to Collector	Water Outlet from collector	Condensing Temperature	Blow down temperature	Ambient Temperature
9.00	23.00	27.00	39.00	43.00	72.00
9.30	24.50	27.50	42.25	48.00	74.00
10.00	26.00	28.00	45.00	53.00	76.00
10.30	26.50	29.50	47.00	58.50	83.00
11.00	27.00	30.00	50.00	64.00	90.00
11.30	28.80	31.50	54.00	68.50	92.50
12.00	29.00	33.00	58.00	73.00	95.00
12.30	29.50	32.50	56.50	71.00	95.50
1.00	28.00	32.00	55.00	69.50	94.00
1.30	27.50	32.00	52.25	68.50	93.50
2.00	27.50	32.00	50.00	68.00	93.00
2.30	27.50	32.50	49.00	68.50	91.50
3.00	27.50	31.00	48.00	67.00	88.00
3.30	26.75	31.50	47.00	63.50	78.50
4.00	26.00	30.00	46.00	61.00	69.00

Table 2.0 Temperature profile of the system for different time intervals

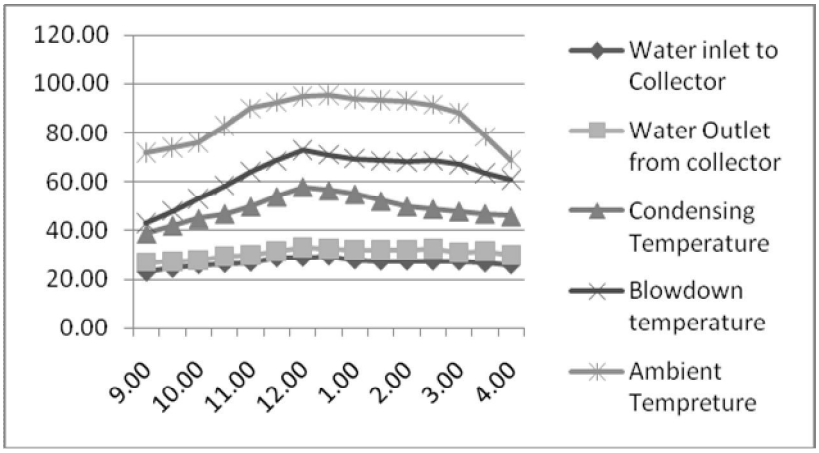


Fig 2.0 Temperature profile of the system for different time intervals

It is obvious and also found in experiment (table 2) that temperature is highest at 12 noon. The temperature of water outlet from collector is more at noon due to higher solar irradiance. Table 3.0 shows the variation in average hourly solar radiation, solar desalination efficiency and distillate yield for different time intervals. This figure clearly shows that the hourly distillate yield and solar desalination efficiency is high at noon. It is inferred that the distillate yield increases with increase in solar irradiance.

Table 3.0

Time	Average hourly solar radiation w/m^2 (X)	Distillate Yield, ml/h (Y)	Solar Desalination Efficiency %
9.00	550	690	10.75
9.30	625	745	12.25
10.00	700	800	13.75
10.30	805	895	15.45
11.00	910	990	17.15
11.30	930	1120	19.65
12.00	950	1250	22.25
12.30	875	1155	20.75
13.00	800	1090	19.25
13.30	775	1030	18.25
14.00	750	975	17.25
14.30	660	890	16.25
15.00	575	810	15.25

ISSN 2394 - 7780

15.30	483	710	13.5
16.00	390	630	12.75

The variation in daily distillate yield and solar desalination efficiency for corresponding days of experiment is shown in Table. 4. A maximum distillate yield of 8.5 l/d is obtained. The result of beam solar radiation on solar desalination efficiency and the energy efficiency of individual components is shown in table 3.1 and fig 3.1. The figure clearly shows the energy efficiency of collector, condenser and the system increases with increase In solar irradiance. In the case of

Table-4

Date in Sep	Distillate yield per day	solar desalination efficiency
15	6.65	21
16	6.62	19.21
17	8.51	20.14
18	7	20.25
19	6.85	20.45
20	7	20.38

COST

If photovoltaic cell is used to provide power to this system to run Vacuum pump and Motor then there will be no running cost of system. In case using electricity power the cost of electricity for running pump shows operation of vacuum pump is less at lower vacuum pressure.

It is inferred that the average cost of potable water is found minimum to be 0.25 Rs/l and can be minimise to 0.07Rs/l. In case of using photovoltaic cell the running cost is nil.

Table-5

Vacuum pressure (bar)	Electricity Cost in Paisa /l
0.20	65
0.30	35
0.40	25
0.50	20
0.60	15
0.70	10
0.80	7.5

Average = 25 Paisa /l Lit

Taking care of fixed cost and the operating cost. The desalinated water is tested in the Research lab of Bihar Engineering foundation the laboratory results shows the Quality of water is as per water standards.

Table-6

		Quality in desalinated water	Quality of brikish water	Desirable limit
1	Electrical conductivity, µS/cm	51	1345	75
2	Sodium, mg/l	4.3	667	100
3	Carbonate, mg/l	0	1368	30
4	Chloride, mg/l	9.99	1,349	250
5	Bicarbonate, mg/l	10.9	1145	120
6	Total alkalinity as $CaCO_3$, mg/l	11.2	2556	200
7	Sulphate, mg/l	0	2709	200
8	Nitrate mg/l,	1.99	128	50
9	pH	6.2	8	6.5–8.5
10	Dissolved oxygen, mg/l	7.4	12.1	
11	Magnesium, mg/l	0.9	589	30
12	Sodium, mg/l	4.3	667	100
13	Total dissolved solids, ppm	33.1	74.987	500
14	Total hardness as $CaCO_3$, mg/l	13.8	4689	300
15	Potassium, mg/l	0.99	432	15

ISSN 2394 - 7780

Notation

Ăc — Collector area, m2

Çp — Specific heat capacity, kJ/kgK

Çw — Cost of water, ¢/l

Çe — Cost of electricity, $/kWh

Çt — Total cost, $/d

Çpf — Heat capacity at constant pressure offeed

D — Distillate yield per day, l/d

Є — Exergy power, W

h — Enthalpy, kJ/kg

ℓv — Enthalpy of phase change

ϕt — Solar radiation on a titled surface, W/m2

Ψ — Mass flow rate, kg/s

Θ — Temperature, K

P — Vacuum pump capacity, kW

t — Time of operation of vacuum pump, h/d

η — Exergy efficiency, %

Subscripts

1–8 — State points in Fig. 1

cw — Cooling water

0 — Dead state

d — Distillate

f — Feed water

REFERENCE

1. A. Frankel, Flash Evaporators for Distillation of Sea Water , Proceeding of Institute of Mechanical Engineering , 174(1960) :312-324.
2. G.M. Zaki, T.E. Dali and H.E. Shafi, Improved Performance of Solar Still; Proceeding of First Arab International Solar Energy Conference, Kuwait(1983):331-335.
3. H.Al.Hussain and I.K. Smith, Energy Conversion and Management.36(1965):1047.
4. H.M. Qiblawey and Fawzi Banat, Solar Thermal Desalination Technologies, Desalination,220 (2008), 633-644.
5. H.P. Garg and H.S. Mann, Solar Energy,18(1976):159.
6. L. Garcia-Rodriguez and C. Gomez-Camacho, Exergy Analysis of SOL-14 Plant, Desalination, 137(2001):251-258.
7. P.A.Dzhubaliena, Applied Solar Energy ,1(1965):37.
8. S. Kumar, G.N. Tiwari & H.N. Singh, Annual Performance of an active Solar Distillation System.(1999):82-88.

MANUSCRIPT SUBMISSION

GUIDELINES FOR CONTRIBUTORS

1. Manuscripts should be submitted preferably through email and the research article / paper should preferably not exceed 8 – 10 pages in all.
2. Book review must contain the name of the author and the book reviewed, the place of publication and publisher, date of publication, number of pages and price.
3. Manuscripts should be typed in 12 font-size, Times New Roman, single spaced with 1" margin on a standard A4 size paper. Manuscripts should be organized in the following order: title, name(s) of author(s) and his/her (their) complete affiliation(s) including zip code(s), Abstract (not exceeding 350 words), Introduction, Main body of paper, Conclusion and References.
4. The title of the paper should be in capital letters, bold, size 16" and centered at the top of the first page. The author(s) and affiliations(s) should be centered, bold, size 14" and single-spaced, beginning from the second line below the title.

First Author Name1, Second Author Name2, Third Author Name3

1Author Designation, Department, Organization, City, email id

2Author Designation, Department, Organization, City, email id

3Author Designation, Department, Organization, City, email id

5. The abstract should summarize the context, content and conclusions of the paper in less than 350 words in 12 points italic Times New Roman. The abstract should have about five key words in alphabetical order separated by comma of 12 points italic Times New Roman.
6. Figures and tables should be centered, separately numbered, self explained. Please note that table titles must be above the table and sources of data should be mentioned below the table. The authors should ensure that tables and figures are referred to from the main text.

EXAMPLES OF REFERENCES

All references must be arranged first alphabetically and then it may be further sorted chronologically also.

- **Single author journal article:**

Fox, S. (1984). Empowerment as a catalyst for change: an example for the food industry. *Supply Chain Management*, *2*(3), 29–33.

Bateson, C. D.,(2006), 'Doing Business after the Fall: The Virtue of Moral Hypocrisy', Journal of Business Ethics, 66: 321 – 335

- **Multiple author journal article:**

Khan, M. R., Islam, A. F. M. M., & Das, D. (1886). A Factor Analytic Study on the Validity of a Union Commitment Scale. *Journal of Applied Psychology*, *12*(1), 129-136.

Liu, W.B, Wongcha A, & Peng, K.C. (2012), "Adopting Super-Efficiency And Tobit Model On Analyzing the Efficiency of Teacher's Colleges In Thailand", International Journal on New Trends In Education and Their Implications, Vol.3.3, 108 – 114.

- **Text Book:**

Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (2007). *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies* (3rd ed.). New York: McGraw-Hill.

S. Neelamegham," Marketing in India, Cases and Reading, Vikas Publishing House Pvt. Ltd, III Edition, 2000.

- **Edited book having one editor:**

Raine, A. (Ed.). (2006). *Crime and schizophrenia: Causes and cures.* New York: Nova Science.

- **Edited book having more than one editor:**

Greenspan, E. L., & Rosenberg, M. (Eds.). (2009). *Martin's annual criminal code:Student edition 2010.* Aurora, ON: Canada Law Book.

- **Chapter in edited book having one editor:**

Bessley, M., & Wilson, P. (1984). Public policy and small firms in Britain. In Levicki, C. (Ed.), *Small Business Theory and Policy* (pp. 111–126). London: Croom Helm.

- **Chapter in edited book having more than one editor:**

Young, M. E., & Wasserman, E. A. (2005). Theories of learning. In K. Lamberts, & R. L. Goldstone (Eds.), *Handbook of cognition* (pp. 161-182). Thousand Oaks, CA: Sage.

- **Electronic sources should include the URL of the website at which they may be found, as shown:**

Sillick, T. J., & Schutte, N. S. (2006). Emotional intelligence and self-esteem mediate between perceived early parental love and adult happiness. *E-Journal of Applied Psychology, 2*(2), 38-48. Retrieved from http://ojs.lib.swin.edu.au/index.php/ejap

- **Unpublished dissertation/ paper:**

Uddin, K. (2000). A Study of Corporate Governance in a Developing Country: A Case of Bangladesh (Unpublished Dissertation). Lingnan University, Hong Kong.

- **Article in newspaper:**

Yunus, M. (2005, March 23). Micro Credit and Poverty Alleviation in Bangladesh. *The Bangladesh Observer*, p. 9.

- **Article in magazine:**

Holloway, M. (2005, August 6). When extinct isn't. *Scientific American, 293*, 22-23.

- **Website of any institution:**

Central Bank of India (2005). *Income Recognition Norms Definition of NPA.* Retrieved August 10, 2005, from http://www.centralbankofindia.co.in/ home/index1.htm, viewed on

7. The submission implies that the work has not been published earlier elsewhere and is not under consideration to be published anywhere else if selected for publication in the journal of Indian Academicians and Researchers Association.

8. Decision of the Editorial Board regarding selection/rejection of the articles will be final.

PUBLICATION FEE

The International Journal of Advance & Innovative Research is an online open access journals, which provides free instant, worldwide and barrier-free access to the full-text of all published manuscripts to all interested readers in the best interests of the research community. Open access allows the research community to view, any manuscript without a subscription, enabling far greater distribution of an author's work than the traditional subscription based publishing model. The review and publication fee of a manuscript is paid from an author's research budget, or by their supporting institutions.

As costs are involved in every stage of the publication process, like manuscript handling form submission to publication, peer-review, copy-editing, typesetting, tagging and indexing of articles, Electronic composition and production, hosting the final article on dedicated servers, electronic archiving, server and website update and maintenance and administrative overheads, each author is asked to pay certain fee as follows.

- The publication fee for the Online journal is Rs 1000. If the author wants a printed copy of the journal, then additional Rs.500/- have to be pay (which includes printing charges of the journal, hard copy of publication certificate for all authors, packaging and courier charges).

- The publication fee for the Online journal is Rs $50. If the author wants a printed copy of the journal, then additional $50 have to be pay (which includes printing charges of the journal, hard copy of publication certificate for all authors, packaging and courier charges).

The principal author will get one complimentary copy of journal (online / print) based on fee paid along with publication certificate (e copy / hard copy) after publication of the paper.

The publication fee, you can be deposited directly or can be transferred online in favour of "**Empyreal"** , **Current Account no 125505000329**, SWIFT No : ICICINBBCTS, IFS code : ICIC0001255, MICR No : 110229116, Branch code : 001255, Address: ICICI Bank, Plot No C-7, Sector-13, Opp. Jaipuria School, Vasundhara, Ghaziabad – 201012, Uttar Pradesh, India. You can also transfer the publication fee through Paytm at Mobile no : 9999817591

If anybody do not have funds to pay publication fee, he/she will have an opportunity to request the Editor for fee waiver through the Head of his/her Institution/Department/University with the reasons, because IARA does not want fee to prevent the publication of worthy work, however fee waivers is granted on a case-to-case basis to authors who lack funds. To apply for a waiver author/s must request during the submission process. Any request received thereafter will not be considered.