Volume 9, Issue 2 (X)
April - June 2022

ISSN: 2394 – 7780

International Journal of
Advance and Innovative Research

Indian Academicians and Researchers Association
www.iaraedu.com

International Journal of Advance and Innovative Research

Volume 9, Issue 2 (X) April - June 2022

SJIFactor

Scientific Journal Impact Factor

CERTIFICATE OF INDEXING (SJIF 2018)

This certificate is awarded to

International Journal of Advance & Innovative Research
(ISSN: 2394-7780)

The Journal has been positively evaluated in the SJIF Journals Master List evaluation process
SJIF 2018 = 7.363

SJIF (A division of InnoSpace)

SJIFactor Project Manager
International Advisory Services
INNOSPACE INTERNATIONAL

SJIFactor Project

International Journal of Advance and Innovative Research

Volume 9, Issue 2 (X) April - June 2022

CONTENTS

Research Papers

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

OUTCOME OF LAPAROSCOPIC CHOLECYSTECTOMY IN PATIENT WITH GALLSTONE DISEASES IN BAQUBA TEACHING HOSPITAL

Mohammed Mohammud Habash[1], Ahmed Modher Khalaf[2], Muqdad Fuad Abd. Alkareem[3] and Nabaa Thair Ahmed[4]
[1]M.B.Ch,B - F.I.C.M.S, Assistant Professor, General Surgery, Head of Department of Surgery, Diyala University / College of Medicine
[2]Department of Surgery, College of Medicine, University of Diyala, Baqubah, Iraq
[3]Assistant Professor, Department of Surgery, College of Medicine, University of Diyala, Baqubah, Iraq

ABSTRACT
Background: Laparoscopic cholecystectomy is considered the gold standard for the surgical treatment of gallstone disease .This procedure results in less postoperative pain , and more safety ,and shorter hospital stays and disability from work than open cholecystectomy[(1-2)] ,but still such method of surgery ,that followed in the last recent decades , it needs more studying to understand and study the outcome ,side effects and disadvantage of such operations other than advantage .[(3-4)]

Aim: To evaluate the outcome of it regarding age, gender, chronic disease, length of hospital stay, complication, morbidity and mortality.

Material and Method: Data of 80 patients who underwent laparoscopic cholecystectomy were retrospectively reviewed .Age , gender , comorbidity disease , diabetes mellitus , hypertension , previous abdominal surgery and indication of surgery.

Results: Out of 80 patients, 64 (80%) were female and 16 (20%) male.The age range between 17 and 76 years . Two cases(2.5%) were converted to open surgery ,one due to empyemia of gall bladder(1.25%) ,one due to difficult of odemautous gall bladder(1.25%). One (1.25%) case had biliary leakage. Four (5%) developed wound infection. Port site hernia was detected in two (2.5%) patients .There was no cases of bowel injury or spilled gallstones .There was no mortality recorded in this series.

Conclusion: Laparoscopic cholecystectomy is a safe and effective line for management of gallstone disease that can be performed with acceptable morbidity .

Keywords: Laparoscopy, Gallstone, Cholecystectomy, Type of gallstone, Anatomy of gallbladder

INTRODUCTION
Anatomy of gallbladder and common bile duct

The gallbladder is a pear-shaped sac lying on the undersurface of the liver. It has a capacity of 30 to 50 mL and stores bile, which it concentrates by absorbing water. The gallbladder is divided into the fundus, body, and neck. The fundus is rounded and projects below the inferior margin of the liver, where it comes in contact with the anterior abdominal wall at the level of the tip of the 9th right costal cartilage. The body lies in contact with the visceral surface of the liver and is directed upward, backward, and to the left. The neck becomes continuous with the cystic duct, which turns into the lesser omentum to join the common hepatic duct, to form the bile duct. The peritoneum completely surrounds the fundus of the gallbladder and binds the body and neck to the visceral surface of the liver.[(5)]

The bile duct (common bile duct) is about 3 in. (8 cm) long. In the first part of its course, it lies in the right free margin of the lesser omentum in front of the opening into the lesser sac. Here, it lies in front of the right margin of the portal vein and on the right of the hepatic artery. In the second part of its course, it is situated behind the first part of the duodenum to the right of the gastroduodenal artery. In the third part of its course, it lies in a groove on the posterior surface of the head of thepancreas. Here, the bile duct comes into contact with the main pancreatic duct. The bile duct ends below by piercing the medial wall of the second part of the duodenum about halfway down its length. It is usually joined by the main pancreatic duct, and together they open into a small ampulla in the duodenal wall, called the hepatopancreatic ampulla (ampulla of Vater). The ampulla opens into the lumen of the duodenum by means of a small papilla, the major duodenal papilla. The terminal parts of both ducts and the ampulla are surrounded by circular muscle, known as the sphincter of the hepatopancreatic ampulla (sphincter of Oddi). Occasionally, the bile and pancreatic ducts open separately into the duodenum.[(5)] .

Cholecystitis and Gallstone

ISSN 2394 - 7780

Cholecystitis is inflammation of the gallbladder. In most cases cholecystitis is caused by gallstones that are blocking the tubes that lead out of the gallbladder into the small intestines. This causes the build-up of bile in the gallbladder, which in turn can cause inflammation. There are other causes of cholecystitis such as bile duct problems and tumours. Untreated cholecystitis can cause serious or life-threatening complications such as gall bladder ruptures. Cholecystitis can be acute or a chronic disease[6-7].

Gallstones or choleliths, are solid masses formed from bile precipitates. These "stones"[8] may occur in the gallbladder or the biliary tract (ducts leading from the liver to the small intestine). There are two types of gallstones: cholesterol and pigment stonesBoth types have their own unique epidemiology and risk factors. Cholesterol stones are yellow-green and are primarily made of hardened cholesterol. Cholesterol stones, predominantly found in women and obese people, are associated with bile supersaturated with cholesterol[9]. They account for 80% of gallstones and are more commonly involved in obstruction and inflammatory. Pigment stones may be black or brown stones. Black pigment stones are made of pure calcium bilirubinate or complexes of calcium, copper, and mucin glycoproteins. These gallstones typically form in conditions of stasis (e.g., parenteral nutrition) or excess unconjugated bilirubin (e.g., hemolysis or cirrhosis). Black pigment stones are more likely to remain in the gallbladder. Brown pigment stones are composed of calcium salts of unconjugated bilirubin with small amounts of cholesterol and protein. These stones are often located in bile ducts causing obstruction and are usually found in conditions where there is infected bile .[9]

Symptoms of gallstones and cholecystitis [6-7]

Gallstones are present in approximately 8% of the population and many people have small gallstones without experiencing any symptoms. Only 10 – 20% of these people will develop symptoms. The most common symptoms of gallstones and cholecystitis include:

• Sudden severe pain in the upper part of your right abdomen (biliary colic) just below the ribcage

• Pain that radiates to your right shoulder or back

• Pain that prevents you from breathing deeply

• Tenderness of your abdomen when it is touched (palpitated)

• Pain that lasts 15 minutes to 24 hours. Pain that is continuous for 1 to 5 hours is a common occurrence; and/or

• Pain that start after meals, especially fatty meals, or that begin during the night and is so severe that it wakes you up.

In cases where there is already inflammation of the gall bladder (cholecystitis) these additional symptoms might occur:

• Nausea; • Vomiting; and/or • Fever

In cases where the bile duct is blocked these additional symptoms might occur:

• Jaundice (yellowing of the skin and the white part of your eyes)

• Dark coloured urine

• Light-coloured stools

Laparoscopy

Laparoscopy is a type of surgical procedure in which a small cut is made through the navel (tummy button) through which a viewing tube (laparoscope) is inserted. The laparoscope has a small camera on the eyepiece which allows the doctor to examine the abdominal and pelvic organs on a video monitor. Other small cuts can be made to insert instruments to perform procedures (keyhole surgery). Laparoscopy can be carried out to diagnose conditions or to perform certain types of operations.[10]

Method

During laparoscopy the common bile duct (CBD) and hepatic artery are identified together with the gallbladder neck which is retracted with a grasper . The operation is carried out in three stages. (I) The initial dissection is undertaken in an anatomical space flush with the gallbladder wall. The posterior gallbladder peritoneum is divided first, beginning on the gallbladder neck, which is then retracted dawnwards. The anterior gallbladder peritoneum is now divided, again beginning on the gallblader neck at a distance from the liver. The gallbladder neck is then retracted upwards and downwards to facilitate section of fibrous tissue flush with the gallbladder

ISSN 2394 - 7780

wall, at a distance from both the liver and the cystic duct and artery, until Calot's triangle is opened.(2) The cystic duct and artery are pulled perpendicular to the CBD and are dissected safely at a distance from the CBD. The cystic artery is clipped, and cholangiography is undertaken before clipping the cystic duct. (3) The fundus and body of the gallbladder are detached from the liver.[11]

Risks

Laparoscopy is a relatively safe procedure. However, it does carry a slight risk, as does any abdominal operation, of serious complications. Open surgery may be required to correct any problems that do occur. Serious complications include: damage to the bowel, bladder, ureters, or major blood vessels. The overall risk of serious complications is approximately 3 in 1000 .[11]

Advantages of Laparoscopic Surgery[20]

1-Since the overall trauma to the skin and muscles is reduced,

2-Less post-operative pain and disability,

3-shorter hospital stay,

4-quicker recovery period are major advantages that laparoscopic surgery offers when compared to traditional operations.

5-Another advantage is a reduced infection rate. This is because delicate tissues are not exposed to the air of the operating room over long periods of time.

6-Video magnification also offers surgeons better exposure of the diseased organ and its surrounding vessels and nerves. As a result, delicate maneuvers can be performed to protect these structures during the surgery.

Disadvantages of Laparoscopic Surgery

1-The disadvantages of laparoscopy include the expensive equipment involved in performing it. Not all hospital operating rooms can afford to offer it because of cost containment.

2-The other major issue is the need for surgeons to take special training in performing the many operations that are available by this means.The need for additional training is because laparoscopic surgeons leave the familiar territory of a three-dimensional operating field to working on a two-dimensional flat video display. The shift is a critical one, and requires some degree of practice moving around long laparoscopic instruments while handling delicate tissues. Despite these temporary disadvantages, with the proper training, surgeons are able to adapt to this means of operating.

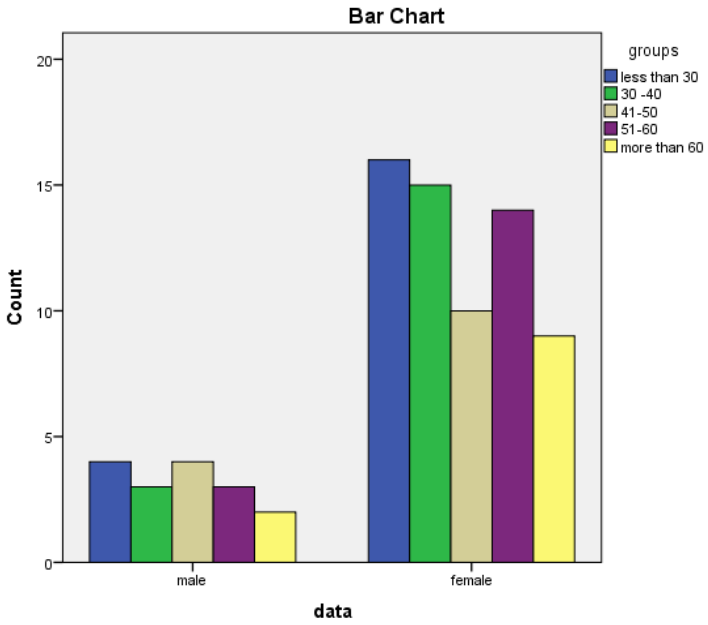
3-Finally, laparoscopy cannot always be performed on everyone. Some patients with many prior operations may have so much scar tissue within the body that a safe operation cannot be done. In time, what disadvantages exist may be overcome with continued laparoscopic research and development.

Result

A total of 80 patients underwent LC during this study period ; out of them 64(80%) were female and 16(20%) male (female/male ratio of 4:1) . Table 1

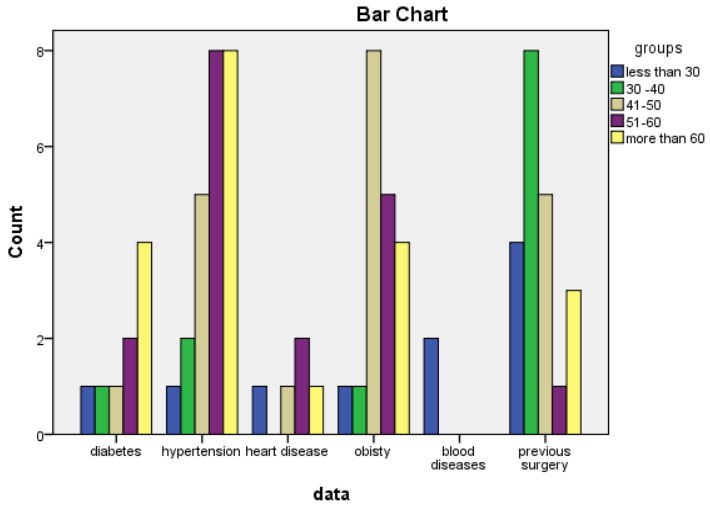
			Groups					Total
			less than 30	30 -40	41-50	51-60	more than 60	
Data	male		4_a (25%)	3_a (18.8%)	4_a (25%)	3_a (18.8%)	2_a (12.5%)	16(100%)
	female		16_a(25%)	15_a(23.4 %)	10_a(15.6 %)	14_a(21.9 %)	9_a(14.1%)	64(100%)
Total			20(25%)	18(22.5 %)	14(17.5 %)	17(21.3 %)	11(13.8%)	80(100%)
Each subscript letter denotes a subset of groups categories whose column proportions do not differ significantly from each other at the .05 level. Table 1								

ISSN 2394 - 7780



History of hypertension was found in 24(30%) patients, diabetes mellitus in 9(11.25%), heart diseases 5(6.25%), blood diseases 2(2.5%), obesity 21(26.25%), previous surgery in 21(26.25%) patients ,17(21.25%)of cases as caesarean section,2(2.5%)of cases as para umblical hernia,1(1.25%)of cases as appendectomy ,1(1.25%)of cases as hystroectomy .comorbidity (table 2).

			Groups					Total
			less than 30	30 -40	41-50	51-60	more than 60	
Data	diabetes		1_a (11.1%)	1_a (11.1%)	1_a (11.1%)	2_a(22.2%)	4_a(44.4%)	9(100.0%)
	hypertension		1_a(4.2%)	2_a(8.3%)	5_a(20.8%)	8_a(33.3%)	8_a(33.3%)	24(100.0%)
	heart disease		1_a(20.0%)	0_a(0.0%)	1_a(20.0%)	2_a(40.0%)	1_a(20.0%)	5(100.0%)
	Obisty		1_a(5.3%)	1_a(5.3%)	8_a(42.1%)	5_a(26.3%)	4_a(21.1%)	19(100.0%)
	blood diseases		2_a(100.0%)	0_a(0.0%)	0_a(0.0%)	0_a(0.0%)	0_a(0.0%)	2(100.0%)
	previous surgery		$4_{a,b}$(19.0%)	8_b(38.1%)	$5_{a,b}$(23.8%)	1_a(4.8%)	3_a(14.3%)	21(100.0%)
Total			10(12.5%)	12(15.0%)	20(25.0%)	18(22.5%)	20(25.0%)	80(100.0%)
Each subscript letter denotes a subset of groups categories whose column proportions do not differ significantly from each other at the .05 level. Table 2								



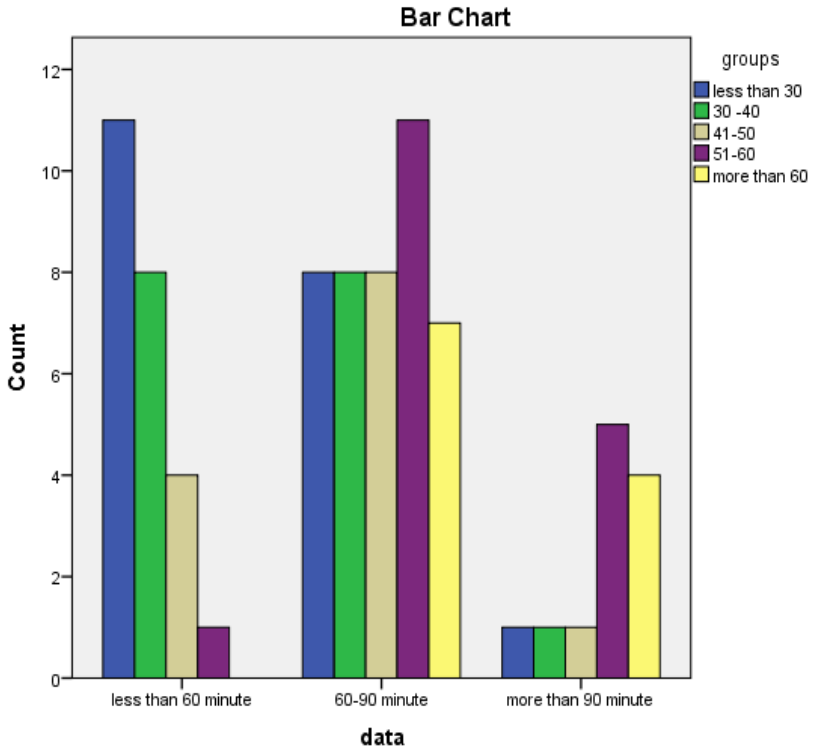
According to per operative data ,the operative time, less than 60 minute was 24(30%)patients, between 60-90 minute was 42(52.5%)patients, more than 90 minute was 14(17.5%) patient. Table 3 .

ISSN 2394 - 7780

Hospital staying, 1 day 66(82.5%), 2 day (15%), 3 day and more 2(2.5%) . Table 4

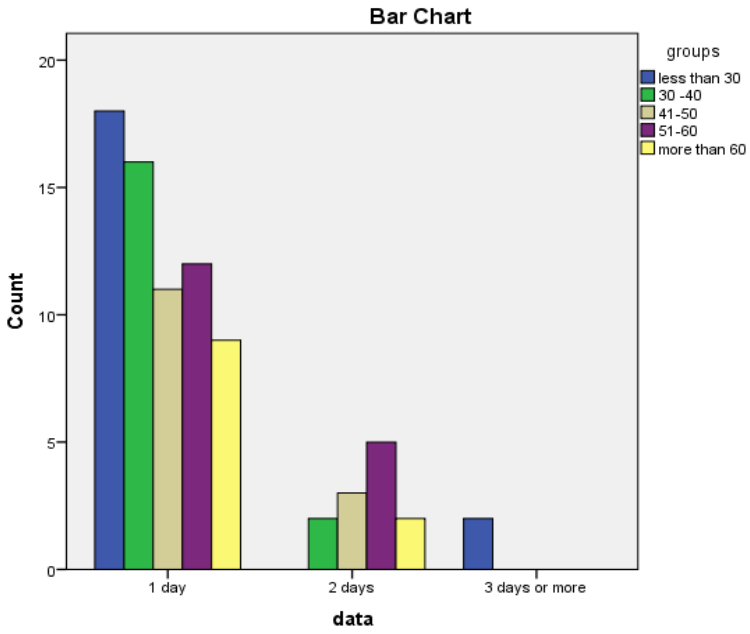
Conversion from laparoscopic to open cholecystectomy was performed in 2(2.5%) cases, 1(1.25%) due to empyema of gall bladder, 1(1.25%) due to difficult edematous gall bladder.

(operative time)							
		Groups					Total
		less than 30	30 -40	41-50	51-60	more than 60	
Data	less than 60 minute	$11_{a(45.8\%)}$	$8_{a,\ b(33.3\%)}$	$4_{a,\ b(16.7\%)}$	$1_{b(4.2\%)}$	$0_{b(0.0\%)}$	24(100.0%)
	60-90 minute	$8_{a\ (19.0\%)}$	$8_{a\ (19.0\%)}$	$8_{a(19.0\%)}$	$11_{a(26.2\%)}$	$7_{a(16.7\%)}$	42(100.0%)
	more than 90 minute	1_{a}(8.3%)	$1_{a(8.3\%)}$	$1_{a(8.3\%)}$	$5_{a(41.7\%)}$	$4_{a(33.3\%)}$	12(100.0%)
Total		20(25.6%)	17(21.8%)	13(16.7%)	17(21.8%)	11(14.1%)	78(100.0%)
Each subscript letter denotes a subset of groups categories whose column proportions do not differ significantly from each other at the .05 level. Table 3							



(hospital stay)							
		Groups					Total
		less than 30	30 -40	41-50	51-60	more than 60	
Data	1 day	18_{a}(27.3%)	16_{a}(24.2%)	11_{a}(16.7%)	12_{a}(18.2%)	9_{a}(13.6%)	66(100%)
	2 days	0_{a}(0.0%)	2_{a}(16.7%)	3_{a}(25.0%)	5_{a}(41.7%)	2_{a}(16.7%)	12(100%)
	3 days or more	2_{a}(100.0%)	0_{a}(0.0%)	0_{a}(0.0%)	0_{a}(0.0%)	0_{a}(0.0%)	2(100%)
Total		20(25.0%)	18(22.5%)	14(17.5%)	17(21.3%)	11(13.8%)	80(100%)
Each subscript letter denotes a subset of groups categories whose column proportions do not differ significantly from each other at the .05 level. Table 4							

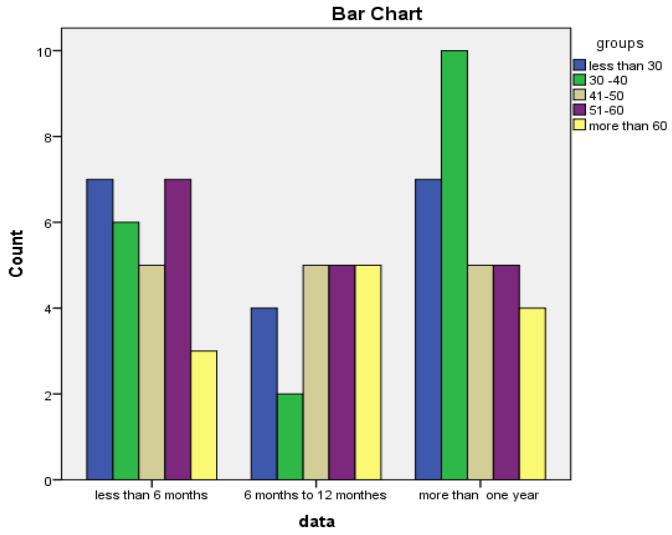
ISSN 2394 - 7780



According to duration of inflammation less than 2 months was 10 (12.5%) patients , less than 6 months 18(22.5%)patients, more than 6 months 21 (26.25%)patients, more than 1 year 30(37.5%) patients.Table 5

		Groups					
		less than 30	30 -40	41-50	51-60	more than 60	Total
Data	less than 6 months	7_a(25.0%)	6_a(21.4%)	5_a(17.9 %)	7_a(25.0%)	3_a(10.7%)	28(100%)
	6 months to 12 months	4_a(19.0%)	2_a(9.5%)	5_a(23.8 %)	5_a(23.8%)	5_a(23.8%)	21(100%)
	more than one year	7_a(22.6%)	10_a(32.3%)	5_a(16.1 %)	5_a(16.1%)	4_a(12.9%)	31(100%
Total		18(22.5%)	18(22.5%)	15(18.8 %)	17(21.3%)	12(15.0%)	80(100%)

Each subscript letter denotes a subset of groups categories whose column proportions do not differ significantly from each other at the .05 level.Table 5



Postoperative complication was in 9(11.25%) patients, wound infection 5 (6.25%) of cases that was treated by drainage and antibiotic, 2(2.5%) of cases had port site hernia and mesh repair was performed electively, 1(1.25%) patient was re-explored due to postoperative bleeding, 1(1.25%) of cases had biliary leakage treated conservatively return the drain after 18 day.

ISSN 2394 - 7780

During the period of follow up, there was no mortality recorded in this series.

DISCUSSION

Gallstone disease is a global health problem. The incidence is 10-20% of the whole adult population, LC has now replaced open cholecystectomy as the first choice of treatment for gallstones, LC is performed in over 90% of elective cholecystectomies and 70% of emergency cholecystectomies making LC one of the most frequently performed operations in the world[12].

Predictive factors of conversion to open cholecystectomy include male gender, previous abdominal surgery, acute cholecystitis, dense adhesions and fibrosis in Callot triangle, anatomical variations, advanced age, comorbidity, obesity, suspicion of common bile duct stones, jaundice, and decreased surgeon experience[13].

In the literature, the rate of conversion from LC to open cholecystectomy varies from 2.6 to 7.7% [14 -15] . Conversion results in a significant change in the outcome of the patients due to higher incidence of postoperative complications and longer hospital stay. In this study, the conversion rate was 2.5%, the main causes being empyema of gall bladder and difficult edematous gall bladder.

The reported incidence of uncontrollable bleeding in LC can be up to 2% (0.03-10%). Operative bleeding results from major vascular injuries, liver injury, rough dissection at Callot's triangle, or slipped clip from the cystic artery. The incidence of major vascular injuries is 0.03-0.06%. Major vascular injuries are the second most common cause of death in patients undergoing LC after anesthesia related complications [16].

In this study, was one cases of postoperative bleeding which were managed successfully by laparotomy.

Surgical site infection is significantly lower after laparoscopic surgery compared to open surgery and patients treated with laparoscopy were 72% less likely to experience an surgical site infection [17,-18] . Were encountered 5 cases of wound infection (6.25%), which is consistent with the incidence in this study.

Port site hernia is considered as a rare complication after LC; however, there is a wide range of incidence reported in the literature between 0.14% and 22%[19]. It can lead to serious complications like irreducibility, intestinal obstruction, strangulation and perforation. In this study it was detected in two (2.5%) patients who were managed by mesh repair.

CONCLUSION

LC has proven to be a safe and effective procedure for the treatment of symptomatic gallstone . It has several advantages compared with open cholecystectomy..

REFERENCES

1. Soper NJ, Stockmann PT, Dunnegan DL, Ashley SW. Laparoscopic cholecystectomy. The new 'gold standard'? Arch Surg 1992; 127:91.
2. Yamashita Y, Takada T, Kawarada Y, et al. Surgical treatment of patients with acute cholecystitis: Tokyo Guidelines. J Hepatobiliary Pancreat Surg 2007; 14:91.
3. Lo CM, Liu CL, Lai EC, Fan ST, Wong J. Early versus delayed laparoscopic cholecystectomy for treatment of acute cholecystitis. Ann Surg. 1996 Jan;223(1):37–42. [PMC free article] [PubMed] [Google Scholar]
4. Lee VS, Chari RS, Cucchiaro G, Meyers WC. Complications of laparoscopic cholecystectomy. Am J Surg. 1993 Apr;165(4):527–532. [PubMed] [Google Scholar]
5. Richard . Snell ,CHAPTER 5 The Abdomen: Part II—The Abdominal Cavity page 199
6. Mayoclinic.org, (2015). Cholecystitis - Mayo Clinic. [online] Available at: http://www.mayoclinicw.org/diseases-conditions/cholecystitis/basics/definition/con-20034277 [Accessed 30 Oct. 2015]
7. WebMD, (2015). Learn More About Gallstones. [online] Available at: http://www.webmd.com/digestive-disorders/gallstones [Accessed 30 Oct. 2015]
8. "Gallstones". NIDDK. November 2013. Archived from the original on 28 July 2016. Retrieved 27 July 2016.
9. Kim IS, Myung SJ, Lee SS, Lee SK, Kim MH (2003). "Classification and nomenclature of gallstones revisited" (PDF). Yonsei Medical Journal. 44 (4): 561–70. doi:10.3349/ymj.2003.44.4.561. ISSN 0513-5796. PMID 12950109. Retrieved 2010-11-06 .

ISSN 2394 - 7780

10. Mr V Rai, Consultant Gynaecologist Mr J Nicholls, Consultant Obstetrics & Gynaecology Caroline Owens, Matron, Gynaecology Version 1, January 2010 Review, January 2013
11. Habib E, Elhadad A, Mekkaoui M. Cout de la cholecystectomie pour lithiase de la vesicule: coelioscopie vs laparotomie. Etude retrospective de deux series de 75 patients. Chir Endosc 1997;3:12-1.
12. Sheffield KM, Ramos KE, Djukom CD, Jimenez CJ, Mileski WJ, Kimbrough TD, CM Townsend, Jr., Riall TS. Implementation of a critical pathway for complicated gallstone disease: translation of population-based data into clinical practice. J Am Coll Surg. 2011;212:835–843. [PMC free article] [PubMed] [Google Scholar]
13. Duncan C, Riall T.S. Evidence-Based Current Surgical Practice: Calculous Gallbladder Disease. J Gastrointest Surg. 2012;16:2011–2025. [PMC free article] [PubMed] [Google Scholar]
14. Ballal M, David G, Willmott S, Corless DJ, Deakin M, Slavin JP. Conversion after laparoscopic cholecystectomy in England. Surg Endosc. 2009;23:2338–2344. [PubMed] [Google Scholar]
15. Zhang WJ, Li JM, Wu GZ, Luo KL, Dong ZT. Risk factors affecting conversion in patients undergoing laparoscopic cholecystectomy. Anz J Surg. 2008;78:973–976. [PubMed] [Google Scholar]
16. Schäfer M, Lauper M, Krähenbühl L. A nation's experience of bleeding complications during laparoscopy. Am J Surg. 2000;180:73–77. [PubMed] [Google Scholar]
17. Passos MA, Portari-Filho PE. Antibiotic prophylaxis in laparoscopic cholecistectomy: is it worth doing. Arq Bras Cir Dig. 2016;29(3):170–172. [PMC free article] [PubMed] [Google Scholar]
18. Varela JE, Wilson SE, Nguyen NT. Laparoscopic surgery significantly reduces surgical-site infections compared with open surgery. Surg Endosc. 2010;24(2):270–276. [PubMed] [Google Scholar]
19. Hussain A, Mahmood H, Singhal T, Balakrishnan S, Nicholls J, El-Hasani S. Long-term study of port-site incisional hernia after laparoscopic procedures. JSLS. 2009;13:346–349. [PMC free article] [PubMed] [Google Scholar]
20. Tiwari MM, Reynoso JF, High R, Tsang AW, Oleynikov D. Safety, efficacy, and cost-effectiveness of common laparoscopic procedures. Surg Endosc. 2011;25:1127–1135. [PubMed] [Google Scholar]

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

ASSESSMENT OF ABEBEYUN-EREGU OWENA BASIN FOR SUITABILITY FOR RICE PRODUCTION IN NIGERIA

Halimah Adebimpe Agbaje[1] and Liu Yalan[2]
[1]Beijing School of Aeronautics and Astronautics, Beihang University, Beijing, China
[2]China Aerospace Information Research Institute, Chinese Academy of Science, China
ORCID-ID: 0000-0003-2010-4299

ABSTRACT
This study aims to investigate the suitability of rice production with the combination of remote sensing and Geographic Information System (GIS) in order to support the decision-making for self-sufficiency for future production optimization and sustainable development of land resources. This study explored the land suitability for rice production via the analysis of the physical and chemical parameters of soil properties, and land spatial distribution attributes by GIS. Considering the major requirements for rice cultivation are climate, topography, soil physical characteristics and chemical characteristics, this study constructed a weighted suitability model for suitability of rice production according to the classification by Food and Agricultural Organization (FAO), and integrated Analytical Hierarchy Process (AHP) and Multi-Criteria Evaluation (MCE). The results shows that the highly suitable areas are prominently distributed most of the basin about 52770km^2; the moderately suitable areas are sparse, mainly in the southern part of the basin, the areas is about 1536km^2; the marginally suitable areas is very small with 371km^2, mainly distributed in the southwest side of the basin; and the not suitable areas are in the north central and west of the basin, occupied by built-up areas for settlements (1938km^2). The proportions of highly, moderately, marginally and not suitable zones respectively are 93.2%, 2.71%, 0.66% and 3.42%. Therefore, most of the areas are potential for rice production.

Keywords: Rice production, Suitability, Mapping, AHP, MCE, GIS, Remote sensing

INTRODUCTION
Rice is the most important cereal in the developing world and had taken a new dimension in Nigeria due to the ban imposed by government on rice importation. The demand for rice was reported to have increased due to the substantial increase in population growth (Akinwale *et al.*, 2011).Although government policies at different times in Nigeria had frowned against importation of rice to the country but the continuous increase in demand for rice for consumption always outstripped the local production (Ayanwale and Amusan, 2012; Ojoehemon *et al.* 2009; Oyinbo *et al.*, 2013). Although FAOSTAT (2018) reported increased production in rice and areas harvested but even with this, there was little or no know changes in the yield compared to the previous years when rice was produced in smaller quantities. This might be due in part to climate as there were reported losses in farms due to excessive rain that resulted in flooding of farmlands. PDNA (2013) reported 481,528.9M damages and losses in agriculture due to excessive flood in the year 2012 and this had been a continuous occurrence. Of paramount importance however is the suitability of the lands that were cultivated for rice production. Soils help greatly in ensuring food security in the production of crops for which the country expends a huge amount on its importation. The quality of the soils does not solely depend on its ability to supply adequate nutrients but the nutrients must be in the right proportion as needed by the plants (Ayeni and Adeleye, 2011; Umeri, 2015). A soil that supplies adequate nutrients needed by the plants with favourable soil pH will produce better crops quality and yield if other conditions of growth such as biological and physical properties of the soil are favourable (Olueh, 2014).

Land mapping is one of the most important uses of remote sensing as it allows for decision on the best soils for particular crops, and various needs of the soil. Land use suitability analysis is the process of determining the suitability of a given land area for a certain type of use (agriculture, forest, recreation, etc.) and the level of suitability. Different reports had shown various suitability classes at different locations (Naz and Rasheed 2017; Maddahi *et al*. 2014; Dengiz 2013; Ayehu and Besufekad 2015; Samanta *et al.*, 2011; Kihoro *et al.*, 2013). Ayoade (2016) and Ujoh *et al*. (2019) also reported suitability analysis for some locations in Nigeria. This study aimed to investigate the suitability of Abebeyun-Eregu Owena Basin of Osun state for rice production.

MATERIALS AND METHODS
The study covered the Abebeyun- Eregu Owena Basin which is a sub basin of Ogun-Osun River in South west Nigeria. Figure 1 showed the map of Southwest Nigeria (black) overlaid with the water basins (red) within the region and the study area selected (green). The land use map showed classes for settlements, vegetal cover and cultivation (Figure 2). The area of study was chosen because it contains more of vegetal cover unlike other

ISSN 2394 - 7780

basins that have large concentration of settlements and this area covers mostly Osun state. Osun state with estimated population of 4,923,834people (NBS, 2018) lies between latitude 7° 30′ 0″ N and longitude 4° 30′ 0″ E and covers 902, 600 ha of land (NBS, 2011). The state falls within the tropical rainforest and the major occupation is civil service and farming. The mean rainfall for Osun state is 1241mm with mean temperature of 21.6ºC (climate data.org). There are two major seasons in the state which are the rainy and dry season (Umeri *et al.,* 2016). The rainy season starts from the (end of March – end of October) and the dry season from (November to February). The rainfall regime shows a double maxima which is separated by a comparatively low rainfall period (dry period) in August called August Break. The length of wet season is at least seven months, *i.e.* about 220-250 days, with average rain days of 159. Temperatures are very high during day with cool night (Iloeji, 2003; Umeri *et al.,* 2016).

Data acquisition

Four major dataset were considered for this study. These were climate (rainfall), topography (slope), the land use map and soil physical (soil texture) and chemical characteristics (organic carbon, available phosphorus, pH, and base saturation and cation exchange capacity).

Climate data: Rainfall data was downloaded from the Climate Research Unit website (www.cru.uea.ac.uk) for the period of 30years. The data downloaded was based on monthly records for the period between 1988 and 2018 and the overall mean was generated to study the pattern and suitability for rice production.

Slope: Shuttle Radar Topographic Mission (SRTM) for the year 2002 was downloaded from the USGS website (https://earthexplorer.usgs.gov) with 90 m spatial resolution. The slope function of the Spatial Analyst tool was used to generate the slope and the drainages. It was from these drainages that the watersheds and basins were identified which led to the choice of the study area (Figure 3).

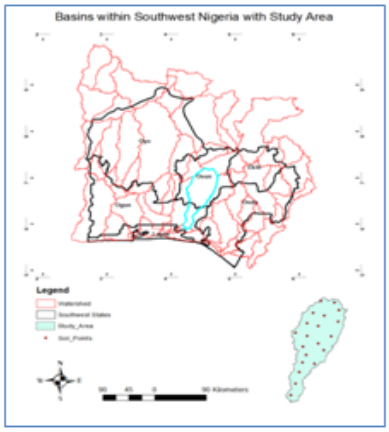


Figure 1 Map of Southwest Zone and Watersheds

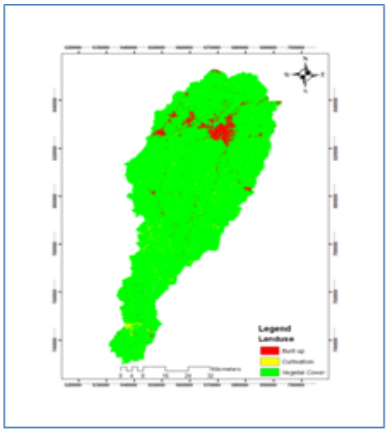


Figure 2 Land use map of study area

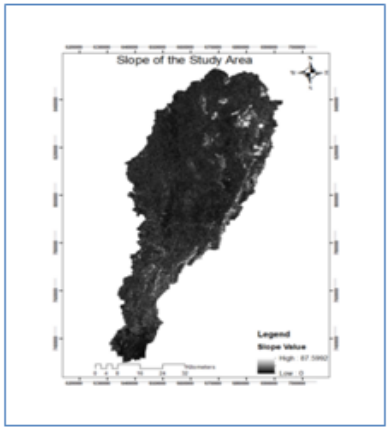


Figure 3: Slope of the study area

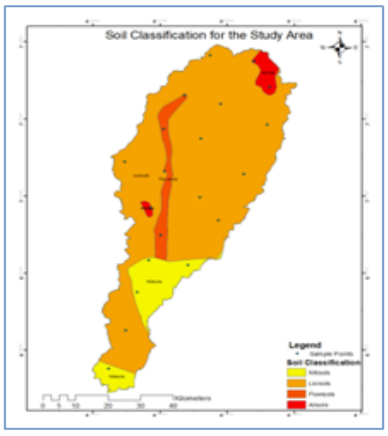


Figure 4: Soil classes within the study area

Soil: Using base maps collected from COPINE (Cooperative Information Network, O.A.U, Ile-Ife) four soil types were identified within the study area. The sample points were therefore designed to cover all the soil types within the study area. The four soil types in the study area were Alisols, Fluvisols, Lixisols and Nitisols. Thematic map was developed to show the various soil classes within the study area and it is shown in Figure 4.

ISSN 2394 - 7780

Land use land cover

The land use map used in this study was collected from Cooperative Information Network (COPINE), the Advanced Space Technology Application Laboratory situated at Obafemi Awolowo University Campus, Ile-Ife. The satellite imageries used for the classification were NigeriaSat 1 with 32m spatial resolution and Landsat 8 with 30m spatial resolution for the year 2015. Ground trouthing was carried out before and after the classification.

Data interpretation

In order to ensure adequate coverage and considering the different land use (Figure 2) and the elevation (Figure 4) observed in the study area, a grid system was used to design points of sample collections. This was based on stratified sampling technique using the fishnet technique in the ArcGIS 10.5 software (Figure 5). Soil samples were systematically collected between the depths (0-15cm) of the top surface soil relating to the shallowed-rooted arable crop of rice (Widiatmaka *et al.,* 2016). An offline map (Avenza maps) was used to trace and locate the points of sample collection and the samples collected were labeled (Figure 6).

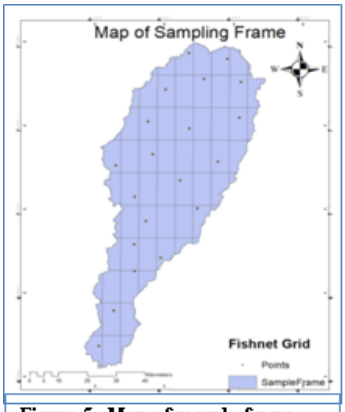


Figure 5: Map of sample frame

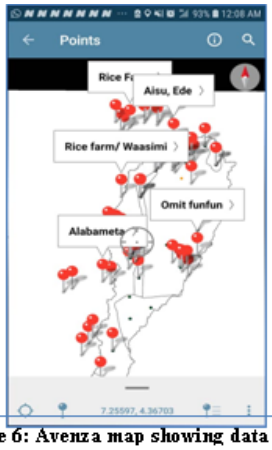


Figure 6: Avenza map showing data collection

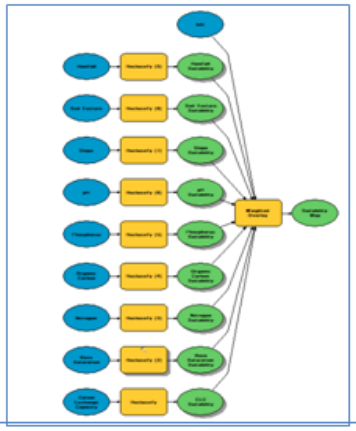


Figure 7: Flow chart for analysis in Arc GIS 10.5

Methods of data analysis

The method of data analysis followed two processes

- Laboratory analysis of soil for the physical and chemical constituents
- GIS analysis for display of maps

Laboratory analysis of soil samples

Soil as a vibrant factor for growth of crops (Ayehu and Besufekad, 2015) and survival depends on the nutrient content contained within it. The studies of Babalola *et al.* (2011) and Nuga and Akinbola (2010) had shown that soil physicochemical properties played a major role and had significant influence on the yield of rice and other cereals. The soil samples collected were air dried at room temperature depending on moisture content for two weeks and crushed to pass through sieve. Following several authors reports like on the parameters considered crucial for rice production (Babalola *et al.*, 2011; Nuga and Akinbola, 2010; Ayoade, 2016; Umeri *et al.*, 2017; Kihoro *et al.*, 2013; Ujoh *et al.*, 2019; etc), analyses were carried out to determine the Cation Exchange Capacity, base saturation, pH, Organic Carbon, Available Phosphorus, Nitrogen and soil texture. The results of the analyses were recorded in the Microsoft Excel and exported to GIS environment for further analysis and display in maps.

ISSN 2394 - 7780

GIS analysis for display of maps

This second analysis required reclassification according to the FAO guidelines for suitability. All the criteria for determining suitability (Soil, Slope, Rainfall and Land use) were reclassified and the weights (%) were assigned to arrive at final suitability map. Table 1 showed the summary of all processes carried out for this study and Figure 7 showed the flow chart for the analysis in ArcGIS 10.5.

Reclassification and re-sampling of scales for suitability

The Spatial Analyst tool of ArcGIS was used to reclassify each of the determining factors for suitability of rice production. Using manual reclassification method and choosing 4 classes, all criteria for suitability were reclassified according to the factor suitability rating of land use requirements for rice production as stated by FAO (1986).

Arc toolbox ⟶ Spatial analyst tools ⟶ Reclass ⟶ Reclassify

The weights assigned to each of the criteria for reclassification were done using FAO requirements and Analytical Hierarchical Process (AHP). This is as shown in table 1.

Determination of suitability

Weighting layers is another critical step in weighted site selection because it allows the user to place varying levels of importance on different factors. Weighted overlay allows for ranking of raster cells and assigning of relative importance value to each cell.

Equation (1) (2) and (3) showed the various criteria and the weights of influence as attached to arrive at suitability map for the basin.

$S = \sum_{i=1}^{n} WC$ ..... Eq. (1) (Eastman, 2001)

Where

W = the weight of ith factor map

C = Criteria score of class of factor i

S = Suitability index for each pixel in the map

$C = \sum_{i=0}^{n} Sl + R + S + Lu$ ..... Eq. (2)

Table 1: Weighted Indexing Table

Goal	General criteria	Criteria	Category (FAO, 1986)	Class (AHP)	Suitability rank	Weighted influence (%)
Land Suitability for Rice Production	Soil	Soil Texture	(C, SiC, CL) (SC, SiC, SiL) (SL, L, SCL) (S, LS)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	45
		Ph	(5.0-6.5) (4.5-5) (4.0-4.5)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	
		Nitrogen	(>1.5) (1.0-1.5) (0.5-1) (<0.5)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	
		Available Phosphorus	(>15) (8-15) (5-8) (<5)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	
		Organic Carbon	(2-4) (1-2) (0.5-1) (<0.5)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	

ISSN 2394 - 7780

		CEC	(>12) (8-12) (5-8) (<5)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	
		Base Saturation	(>75) (50-75) (30-50) (<30)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	
	Land	Land Use	Built up Cultivation Vegetal Cover Water Body Bare Surface Rock Outcrop	1 3 4 4 2 1 4		30
	Climate	Rainfall	(>900) (800-900) (600-800) (<600)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	15
	Topography	Slope	(<3) (4-6) (7-8) (>8)	4 3 2 1	Highly Suitable Moderately Suitable Marginally Suitable Not Suitable	10

Note: 4 – Highly Suitable; 3- Moderately Suitable; 2- Marginally Suitable; 1- Not Suitable

Where

Sl = Slope

R = Rainfall

S = Soil Physical and Chemical Characteristics

Lu = Land use

$W = \sum_{i=0}^{n} W = \sum_{i=0}^{n} 10Sl + 15R + 45S + 30Lu$ ..... Eq. (3)

The factor of climate and topography were given the weights of 25% each and the remaining factors of soil physical and chemical properties and land use were assigned 35% and 15% respectively. The cumulative of these values gave 100 percent.

Arc toolbox ⟶ Spatial analyst tools ⟶ Overlay ⟶ Weighted overlay

RESULTS AND DISCUSSION

Suitability for all criteria

Thematic maps were produced to show the suitability levels of all the criteria. The maps were produced with four colours denoting each suitability classes. Green represent highly suitable, yellow represent moderate suitability, blue represent marginal suitability and the red represent not suitable class. The suitability levels were as discussed below.

Suitability for rainfall

Figure 8 showed that the rainfall for the area of study fall under high suitability for rice production. The amount of rainfall recorded was between 1328 – 1571mm which falls within the highly suitable class of FAO requirements for suitability. Therefore, the study area is highly suitable for rice production in terms of the volume of rainfall.

Suitability for slope

The slope value for the study area ranged from 0 to 90.5%. Table 2 showed that 20% of the study area was highly suitable for rice production which was equivalent to areas with slope value of ≤ 3%. The moderate suitability class had 37% which was equivalent to areas within slope values of 3-6%. Therefore this area could be said to be of moderate suitability for rice production. These were represented in the Figure 9 with green (highly suitable), yellow (moderately suitable), blue (marginally suitable) and red (not suitable).

ISSN 2394 - 7780

Table 2: The criteria, suitability classes and percentage of suitability

Criteria	Percent suitability classes			
	Highly suitable	Moderately suitable	Marginally suitable	Not suitable
Rainfall	100%			
Slope	20%	37%	18%	25%
Land use	96%		0.4%	3.6%
pH	100%			
Soil Texture	4.7%	37%	31%	27%
CEC				100%
Available P	31%	52%	16%	1%
Organic Carbon	29%	53%	17%	1%
Nitrogen			3%	97%
Base Saturation	100%			

Suitability for Land use

Figure 10 showed that the majority of the study area (96%) is available for new cultivation.

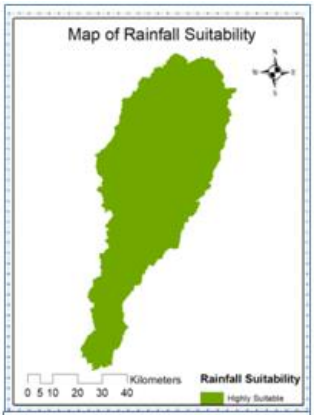


Figure 8: Map of rainfall

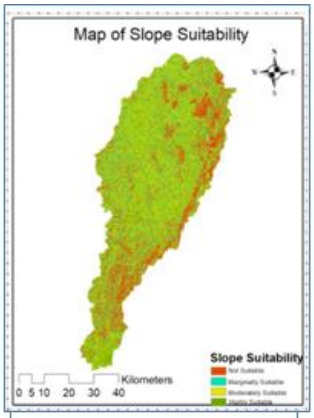


Figure 9: Map of slope

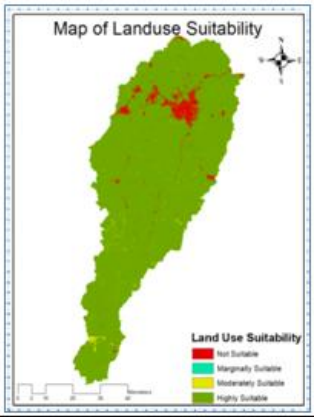


Figure 10: Map of land use

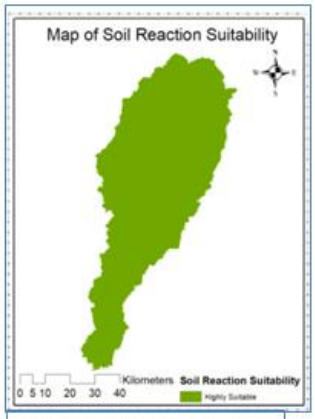


Figure 11: Map of pH

Suitability for soil reaction suitability

The pH of the soils in the study area ranged from slightly acidic to neutral which is between 5.48 and 7.2. According to the FAO requirement for suitability for rice cultivation, all the values fall within the highly suitable class. Therefore, the area is highly suitable (Figure 11) for rice cultivation with regard to the soil reaction (pH).

Suitability for soil texture

Only 4.7% of the area showed high suitability for the requirement for rice cultivation and 37% showed moderate suitability class. The remaining of 31% and 27% were for marginal suitability and not suitable classes. Highly suitable soil for rice cultivation is expected to have high concentration of clay or silt-clay or clay-loam soil while moderately suitable soil should have sandy-clay or silt-clay or silt-loam soils. It could be inferred therefore that the majority of the soil in the study area is a mixture of Sandy, Clayey, Silty and Loamy soils.

ISSN 2394 - 7780

Suitability for cation exchange capacity (CEC)

The cation exchange capacity is a function of the percentage of clay content in the soil. It is the ability of the soil to hold exchangeable cation and provides a buffer against soil acidification. The study area showed a very low CEC which might be related to the soil texture of the area. Figure 13 showed the map indicating that the whole area of study falls under not suitable (red) for rice cultivation in terms of cation exchange capacity.

Suitability for soil organic carbon

The soil organic carbon is a measure of the soil physical stability and influences aeration, water drainage and retention and reduces the risk of erosion and leaching. The study area showed that 29% of the area is highly suitability, 53% for moderate suitability, 17% for marginal suitability and 1.4% for not suitable. Figure 15 showed the distribution of the areas to different suitability classes. It could be inferred that majority of the study area is moderately suitable for rice cultivation.

Suitability for available phosphorus

The available Phosphorus for the study area (Figure 14) showed 31% of the area to be highly suitable, 52% to be moderately suitable, 16% to be marginally suitable and 0.96% to be not suitable. This implied that the majority of the area is moderately suitable for rice cultivation.

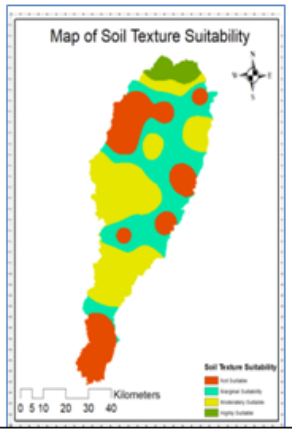


Figure 12: Map of soil texture

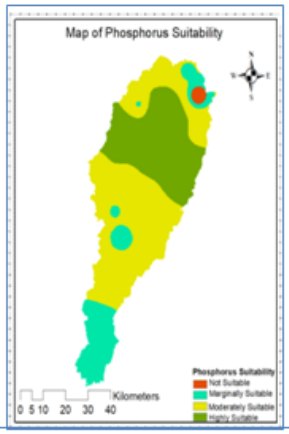


Figure14: Map of available

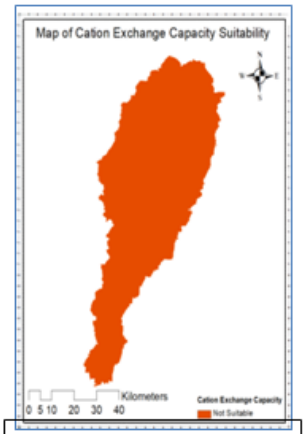


Figure 13: Map of CEC suitability

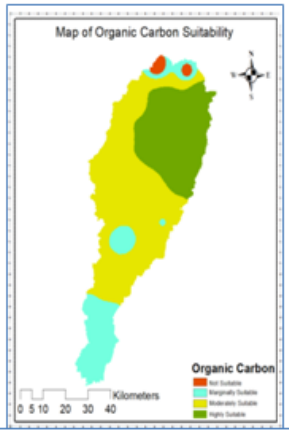


Figure 15: Map of organic

Suitability for nitrogen

Nitrogen is a vital component of the soil that plants need for growth and development. It is a major component of the chlorophyll which plants use to manufacture their food. The nitrogen content of the soil for the study area (Figure 16) showed marginal suitability (2.8%) and 97% not suitable. It could be inferred therefore that the study area is not suitable for rice cultivation in terms of Nitrogen content.

Suitability for base saturation

Base saturation shows the balance between acid and base cation adsorbed by the cation exchange capacity (CEC) of a soil. It is the percentage of the soil cation exchange capacity (CEC) occupied by basic cations, such as potassium (K), magnesium (Mg), calcium (Ca), and sodium (Na). The result of this study showed that the study area is highly suitable for rice production (Figure 17).

ISSN 2394 - 7780

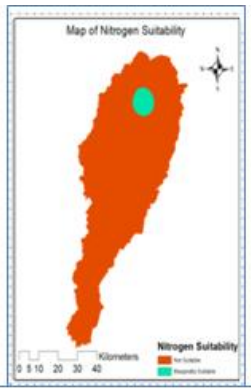


Figure 16: Map of nitrogen suitability

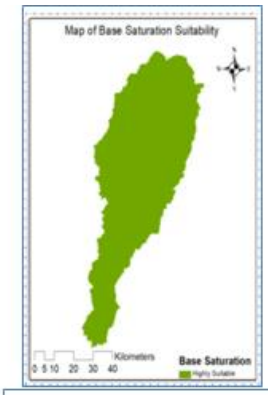


Figure 17: Map of base saturation

Figure 18: suitability of basin at (15%rainfall, 10%slope, 30%land use and 45% soil characteristics).

Suitability of the basin at a weight of (25% rainfall, 25% Slope, 15% land use and 35% soil physical and chemical characteristics)

Table 3 showed that at rainfall (25%), slope (25%), land use (15%) and soil physical and chemical characteristics (35%), the area of study had 15% of high suitability, 84% of moderate suitability and 1% of marginal suitability. It could be inferred here that most of the basin fall under moderate suitability for rice production. This is represented in the map (Figure 18) with high suitability shown in green, moderate suitability shown in yellow and marginal suitability shown in blue. Table 4 showed a summary of the scales and their suitability status. This study had shown that the basin showed high suitability for rainfall, land use, pH and base saturation; moderate suitability for slope, soil texture, available Phosphorus and Organic Carbon and no suitability for CEC and Nitrogen.

Table 3: Suitability of the basin at (25%rainfall, 25%slope, 15%land use and 35% soil characteristics).

Suitability	Percentage (%)	Area (km^2)
Not suitable	3.42	1938
Marginally suitable	0.66	371
Moderately suitable	2.71	1536
Highly suitable	93.21	52770

Table 4: Summary of suitability classes for all criteria.

Class of suitability			Highly suitable	Moderately suitable	Not suitable
Scales			Rainfall	Slope	Cation Exchange Capacity (CEC)
			Land use	Soil Texture	Nitrogen
			Soil Reaction (pH)	Avail. P	
			Base Saturation	Organic Carbon	

ISSN 2394 - 7780

The reports of Ojuola (2015) and Ujoh *et al.* (2019) showed high suitability for Organic Carbon, slope and pH and moderate suitability for Nitrogen and Phosphorus. This study however showed a high suitability for pH and moderate suitability for slope, Organic Carbon and Phosphorus and not suitable for Nitrogen. This report is in conformity with Ujoh *et al*. (2019) on the Cation Exchange Capacity which is showed no suitability. Umeri (2015) and Lawal *et al.* (2013) also reported that the Nitrogen, available P and exchangeable K showed marginal suitability at the man-grove swamp of Delta state, Nigeria. The various combinations of criteria and weights showed that the basin tends more to moderate suitability for rice production according to FAO requirements.

CONCLUSION

This study constructed a Weighted Suitability Model for suitability of rice production according to the classification by Food and Agricultural Organization (FAO), and integrated Analytical Hierarchy Process (AHP) and Multi-Criteria Evaluation (MCE), and investigated the suitability of rice production with the combination of remote sensing and Geographic Information System (GIS) combining the synthetic analysis of the physical and chemical parameters of soil properties, and land spatial distribution attributes. The results for individual factor analysis show that the basin has highly suitability for rainfall, base saturation, land use and pH; moderate suitability for soil texture, slope, Organic Carbon and Available Phosphorus and low suitability for cation exchange capacity (CEC) and Nitrogen. The nitrogen and phosphorus could be augmented for likewise the CEC. The properties that could be augmented for (e.g. CEC, Nitrogen and Phosphorus), taking into consideration the high suitability for rainfall and slope.

In summary, this study shows that: (1) the highly suitable areas are prominently distributed most of the basin about 52770km^2, (2) the moderately suitable areas are sparse, mainly in the southern part of the basin, the areas is about 1536km^2; (3) the marginally suitable areas is very small with 371km^2, mainly distributed in the southwest side of the basin; (4)the not suitable areas are in the north central and west of the basin, occupied by built-up areas for settlements (1938km^2). The proportions of highly, moderately, marginally and not suitable zones respectively are 93.2%, 2.71%, 0.66% and 3.42%. Therefore, most of the areas are potential for rice production. This study therefore concluded that the most part of the basin of Abebeyun-Eregu Owena is available based on the large expanse of land with vegetal cover and suitable for rice production, the rainfall is optimum and the Nitrogen and CEC could be augmented for optimal soil conditions in the production of rice. And the conclusion should be helpful to government to adopt some measures to promote to augment the rice production or production optimization and sustainable development of land resources in the near future.

Conflict of interest

The author declared no conflict of interest.

REFERENCES

- Akinwale, M. G., Gregorio, G., Nwilene, B. O., Akinyele, B. O., Ogunbayo, S. A., Odiyi, A. C (2011). Comparative performance of lowland hybrids and inbred rice varieties in Nigeria.*International Journal of Plant Breeding and Genetics*, 5: *224-234.* DOI: 10.3923/ijpbg.2011.224.234
- Ayanwale, A.B. and Amusan, C.A (2012). Gender Analysis of Rice Production Efficiency in Osun State: Implication for the Agricultural Transformation Agenda. Paper presented at the 13th National Conference of the Nigerian Association of Agricultural Economists, Obafemi Owolowo University, Ile – Ife, Nigeria, September 25th – 27th.10.22004/ag.econ.267885
- Ayehu, G. T. and Besufekad, S. A (2015): Land Suitability Analysis for Rice Production: A GIS Based Multi-criteria Decision Approach. *American Journal of Geography Information System*, (2015) 4 (3): 95–104.doi:10.5923/j.ajgis.20150403.02
- Ayeni L.S. and Adeleye E.O(2011): Soil nutrient status and nutrient interactions as influenced by agro wastes and mineral fertilizer in an incubation study in the Southwest Nigeria. *International Journal of Soil Science*, 6 (1): 60-68. DOI: 10.3923/ijss.2011.60.68
- Ayoade M. A (2016): Suitability assessment and mapping of Oyo State, Nigeria, for rice cultivation using GIS.TheorApplClimatol. DOI 10.1007/s00704-016-1852-4
- Dengiz O. (2013): Land assessment for rice cultivation based on GIS modeling. *Turkish Journal of Agriculture*, 37:326–334. doi:10.3906/tar-1206-51
- Eastman, R.J (2001): IDIRISI Andes; Guide to GIS and Image Processing, Clark University, USA, 144p.

ISSN 2394 - 7780

- Iloeji, S.I.(2003): General Geography of Nigeria. Heinemann Books Ibadan.
- Kihoro J., Bosco N. J. and Murage H. (2013): Suitability analysis for rice growing using a multicriteria evaluation and GIS approach in great Mwea region, Kenya, Springer Plus 2:265 DOI: 10.1186/2193-1801-2-265
- Lawal, B.A., Ojanuga, A.G., Isada, P.A., and Mohammed. T.A.(2013): Characterization, classification and agric potentials of soils on a Toposequence in Southern Guinea Savanna of Nigeria. World Academy of Science Engineering and Technology. *International Journal of Biology, Veterinary, Agricultural and Food Engineering*, 7 (5): 146-150.
- Longtau S. R(2003): Multi-Agency Partnerships in West African Agriculture: A Review and Description of Rice Production Systems in Nigeria. Eco-systems Development Organisation. WIS Partners Building, 5 Lugard Road P.O. Box 8243, Jos, Plateau State.
- Maddahi Z., Jalalian A., Zarkesh M.M.K and N. Honarjo (2014): Land suitability analysis for rice cultivation using multi criteria evaluation approach and GIS. European Journal of Experimental Biology, 4(3), 639–648
- National Bureau of Statistics (NBS, 2019): Nigerian Capital Importation (Q3)
- Naz A. and Rasheed H.(2017): "Modeling the Rice Land Suitability Using GIS and Multi-Criteria Decision Analysis in Sindh, Pakistan." *Journal of Applied Sciences, 13: 26–33.*DOI: https://doi.org/10.6000/1927-5129.2017.13.05
- Nuga B.O and Akinbola G. E. (2010): Soil survey information for sustainable agriculture in Ikwuano local government area, Abia state, Nigeria. Second RUFORUM Biennial meeting 20-24 September, Ontebbe, Uganda
- Ojehomon, V.E.T., Adebayo, S.B., Ogundele, O.O., Okoruwa, V.O., Ajayi, O., Diagne, A. and Ogunlana, O. (2009) Rice Data Systems In Nigeria (National Rice Survey 2009). Building a Rice Data System for Sub-Saharan Africa. Africa Rice, National Bureau of Statistics, National Cereal Re-search Institute, Nigeria Institute for Social and Economic Research (NISER), Department of Agric. Economics, University of Ibadan.
- Olueh, C.E(2014): Evaluation of potassium status in some soils of Delta state, Nigeria [D]. Ph.D. Thesis Department of Soil Science, Ambrose, Alli University, Ekpoma, Edo State, Nigeria.
- Ujoh F., Igbawua T and Ogidi M.P.(2019): Suitability mapping for rice cultivation in Benue State, Nigeria using satellite data. *Geo-spatial Information Science, 22:4, 332-344,* DOI: 10.1080/10095020.2019.1637075
- Umeri, C. (2015): Nitrogen and potassium status of selected soils and their effect on the growth, yield and cyanide content of cassava (*Manihotesculenta Crentz*) in Delta State, Nigeria [D]. Ph.D. Thesis Department of Crop Science, Ambrose, Alli University, Ekpoma, Edo State, Nigeria
- Umeri, C. Moseri, H. and Onyemekonwu, R.C. (2016): Effects of nitrogen and phosphorus on the growth performance of maize (*Zea mays*) in selected soils of Delta State, Nigeria. *Advances in Crop Science and Technology,* 4 (1): 1-4.DOI: 10.4172/2329-8863.1000207

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022

ISSN 2394 - 7780

ANALYSIS OF INFLATABLE SEALS OF BY-PASS VALVES IN COARSE MATERIAL CONVEYINGAPPLICATION

J. Phani Krishna[1] Dr. Ashok Kumar Katta[2] and Mr. Ashwin Jhadav[3]
[1]Engineering Manager, Conveying Solutions, Rieco industries Limited, Pune
https://orcid.org/0000-0002-2083-6417

[2]Associate Professor & Research Supervisor, School of Management Studies, VELSInstitute of Science, Technology and Advanced Studies (VISTAS), Chennai
https://orcid.org/0000-0002-1585-4856

[3]Senior Engineer-Engineering, Conveying Solutions, Rieco industries Limited, Pune

ABSTRACT

Inflatable seals are manufactured from various types of rubber compounds to suit each application. Theseal is supplied deflated, but when air pressure is applied, the seal expands to meet the sealing face. When the pressure is released, the seal returns to its relaxed position. These seals which inflate to forma tight barrier between the mounting and striking surface and offer contamination proof sealing in a wide range of applications. When compared to regular elastomeric seals, inflatable seals work effectively on irregular or misaligned surfaces, which enhance their sealing integrity. Inflatable seals are simpler to use as they demand less force while guaranteeing 100% sealing.

The current paper based on the tested and analysis data on inflated seals for a by-pass valve for ash conveying application. The seals were tested at 2~3 bar(g) pressure and after hold time checked for parameters for 100% sealing. However, to ascertain other than lab conditions, a static state analysis been carried in solid edge domain and arrived certain key data.

From the derived data to analyze displacement from different pressures as well as using von Mises yield criterion for analyzing stresses developed for various pressures been presented. In conclusion, these inflatable seals can be used for 2~3 bar pressure having a displacement of 0.8mm~1.1mm producing 4~5.3 MPa stresses for 100% sealing. Accordingly, the striking surfaces can be designed andoptimized in machining process.

Declaration: This paper has been authored based on independent works and data acquisitions. There are no Plagiarism in these works.- By Author [1]

Funding: There is no funding associated with this works. - By Author [1]

Acknowledgements: Author[1] acknowledges the guidance from Dr.Ashok Kumar, resources usage and directions to organize the data and analysis. The co-authors are deeply acknowledged for their contribution is data preparation, discussing the variations to put up a comprehensiveness of the paper in logical fashion.

PROBLEM DEFINITION:

To determine maximum yield using maximum distortion criteria for a silicon based inflatable seal and been established, so that the seals can be put to utilization in more operable cycles. The striking surface that imparts shearing actions been investigated during the analysis. The data and interpretation of these details were analyzed in this paper.

Objectives of Research:

1. To establish the range of pressure can be susceptible the seal could perform.
2. To freeze the optimized required seal gap between striking face and inflated seal.

Theoretical Framework:

There are several reasons for an inflatable seal would be used over other sealing methods. Of course, the correct seal must be used but an inflatable seal does provide a wealth of benefits.

An inflatable seal provides a leak-proof seal when preventing gases or liquids from escaping while it also provides clearance when required. It also provides a simplified design of the structure and hardware while it reduces the need for close machining or fabricating tolerances.Along with this, it is not exposed to compression set which can reduce the effectiveness of other seals.

Inflatable seals can be installed in a wide range of settings, whether that is radially in, radiallyout or axially. So, inflatable seals are suitable for specific uses and provide an effective solution for many different applications.

ISSN 2394 - 7780

They are perfect for moulding to contoured shapes, offering greater flexibility while they can be inflated to suit the specific requirements of the manufacturing process.

The developed seal has a port of M6 threaded nozzle for air filling as shown below. These sealsare silicone based compounded seal. The seal was bonded at ends using gum based on similar compound for maintaining same elastic nature.

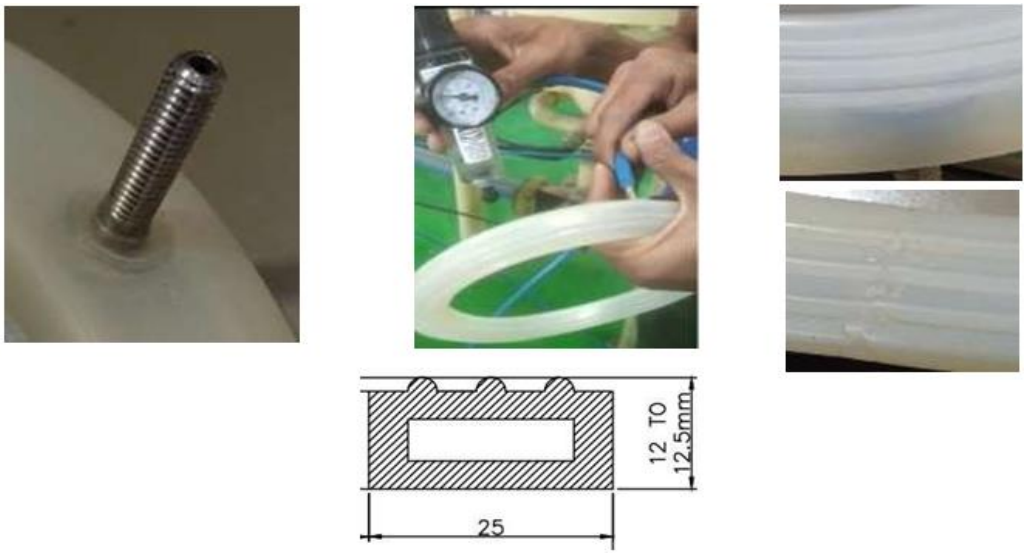


Fig 1: The lab set of seals and design of seal profile

Von Mises Stress in simple terms is the scalar representation of stress based on the second invariant of the deviatoric stress tensor. The goal of the yield criterion was to develop a method whereby the ductile behaviour of materials could be predicted for any complex loading condition, rather than just fortypical nominal laboratory test loading. To do this, we must boil the stress state down into a single scalar value that is compared to a material's yield strength and can be measured by a simple tensile test.

Hydrostatic stress is the stress that causes change in volume of the material and deviatoric stress is that which causes change in shape. The yield criterion must, therefore, relate the full stress tensor to the deformation strain energy density in some way.

The yield surface consists to better understanding about, hydrostatic stress (stresses equal in all three principal directions) is and visualises in 3D, we can visualize a line emanating from zero and extendingequidistantly from all of the principal axes to form the $\sigma 1 = \sigma 2 = \sigma 3$ axis as shown in the fig 3.

At same time about deviatoric stress it is about the distance from this line in a plane perpendicular to it.With that in mind, fig 3 will be a little differently, as if we were looking down the line of hydrostatic stress($\sigma 1 = \sigma 2 = \sigma 3$ axis) and, in this way, we only see deviatoric stresses on our plot; the magnitude of hydrostatic stress is irrelevant (remember, this is only true in metals). This might seem like a pointless exercise until we acknowledge that it is deviatoric stresses alone that result in yielding. If we were to put a point on each principal axis where yielding occurs in a tensile test, and then join them up with a circle, we now have a 2D visualization as in fig. 4 of our von Mises yield surface.

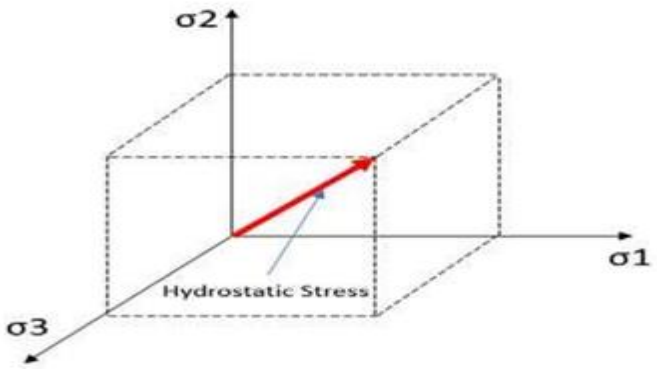


Fig. 3: stresses equal in all three principal directions

ISSN 2394 - 7780

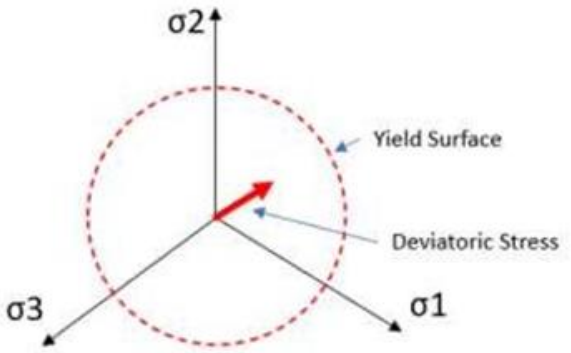
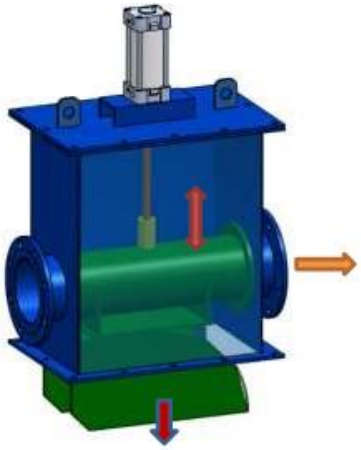


Fig. 4: principal axis where yielding occur in a tensile test

Application of By-pass valve and its application:

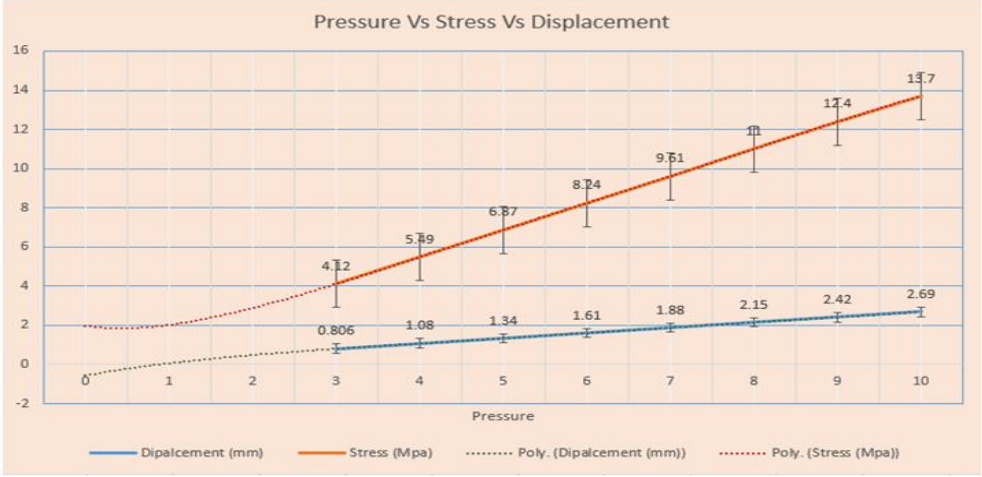
The proposed seals are located at the pipe inside the box as shownand the striking force will be developed from the surface it is in contact. This is by-pass valve for coarse materials conveying from one source point to multiple destination points.



Then the conveying of material requires to flow down either in hopper or a silo the pneumatic cylinder will raise the piston and there by the entire subassembly will lifted to certain position and the conveying will takes place towards down. So as when there is needto conveying straight and by-pass the downward source the piston will lowered, and material passes through to next destination.

Data and analysis:

A 3D model of inflatable seal developed and simulated for various pressures. The model was restricted on three sides and free bound on striking face side. This simulates exact behavior ofthe seal to perform during operation.



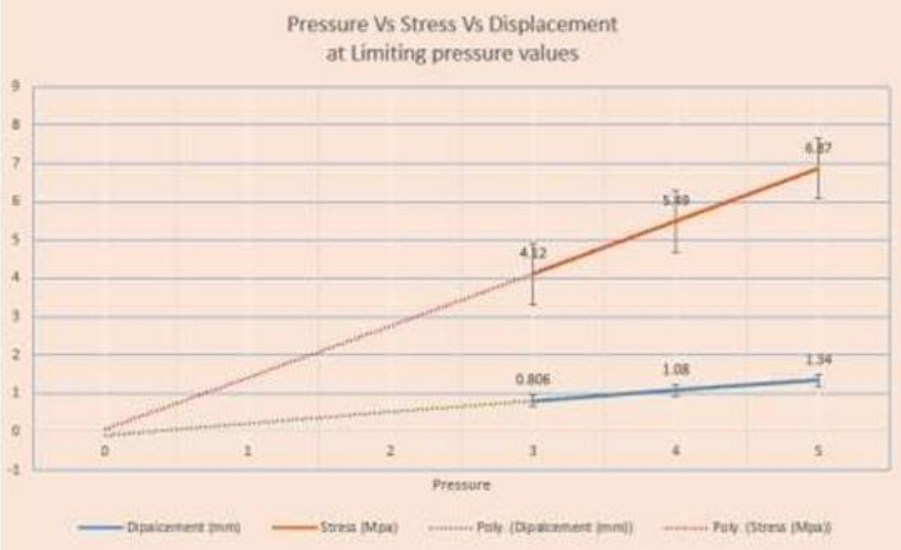
Graph 1: Air pressure for seal and resultant Elemental stress (Von Meiss Stress) anddeveloped displacement due to seal inflation

ISSN 2394 - 7780

The above Graph 1shows at various room temperature airpressure injected inseal the resultant Elemental stress (Von Meiss Stress) developed and

accordingly the displacement due to seal inflation can be seen. Though the yield stress of silicon rubber compounds are in range as 3 ~8 MPa, but such

silicone rubber can also be stretched to 700% of its original dimensions before cracking or ripping under the tension. From the above data to avoid cracking or loss of elasticity, seals willbe restricted to have 4.5 ~5 bar(g) pressure or even moderated. For such pressure limits, the displacement due to inflation will be 1.08mm ~ 1.34 mm. So the gap between the striking faceand the seal will be limited +0.5mm to avoid any leakages or false air to enter into get contact with the conveying material. If pressure is less then maintaining gap will be critical duringmanufacturing.



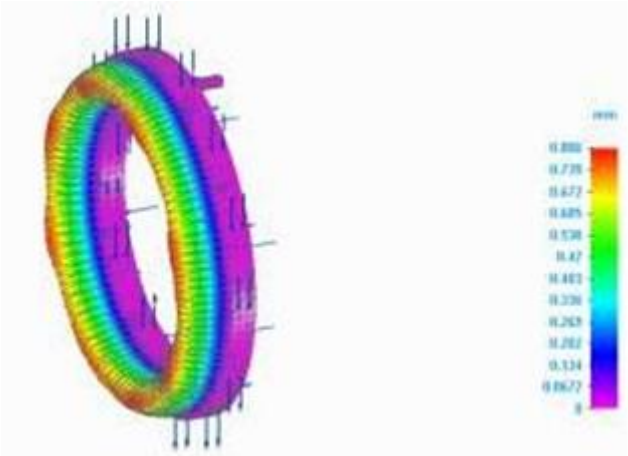


Fig 5: Displacement analysis for 3 bar(g) pressure in static study environment.

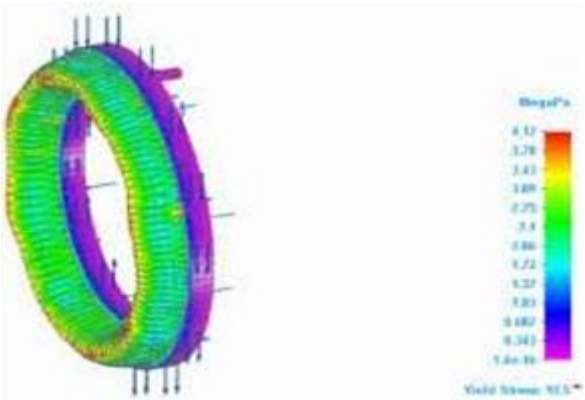


Fig 6: Elemental stress (Von Meiss Stress) for 3 bar(g) pressure in static study environment

ISSN 2394 - 7780

During the simulation to ascertain the yield stress and accordingly the displacement that can be achieved to have optimal seal gap to maintain between the sticking surface and the inflated seal surface the stress and displacement can be seen in Fig 5 and Fig 6 respectively. Where fig5 shows Displacement analysis for 3 bar(g) pressure in static study environment and Fig 6: Elemental stress (Von Meiss Stress) for 3 bar(g) pressure in static study environment

CONCLUSION

From the above lab tests and simulation of the parameters on a 3D model for a 125 mm Diameter silicon inflatable seal for by-pass valves in coarse material conveying solutions established the required gap to maintain and the yield values at various pressures, displacements of the inflated seals achieved at various pressures been established. The future study includes the completion of these valves with this data and field data to correlate as the coarse material will have different sets of shapes and characteristics and how it will be impactedin the derived gaps need to ascertain. The author thanks the lab teams and those directly or indirectly supported to this research work.

REFERENCES:

1. Research data and analytics from own sources and laboratory.
2. Huber, M.T. (1904) *Czasopismo Techniczne*, Lemberg, Austria, Vol. 22, pp. 181.
3. Von Mises, R. (1913) "Mechanik der Festen Korper im Plastisch Deformablen Zustand," *Nachr. Ges. Wiss. Gottingen*, pp. 582.
4. Hencky, H.Z. (1924) "Zur Theorie Plasticher Deformationen und der Hierdurch im Material Hervorgerufenen Nachspannungen," *Z. Angerw. Math. Mech.*, Vol. 4, pp. 323.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022

ISSN 2394 - 7780

NOTE ON DIET PREFERENCES OF ASIAN ELEPHANT (*ELEPHAS MAXIMUS*) IN SUNGAI BETIS FOREST RESERVE, GUA MUSANG, KELANTAN, MALAYSIA

Hazizi Husain[1,2], Ahmad Fitri Zohari[3], Wan Yusoff Wan Shaharuddin[4], Muhamad Azahar Abas[2], Aainaa Amir[2] and Kamarul Hambali[2*]

[1]Pejabat PERHILITAN Daerah Kuala Krai, KM.7, Lebuhraya Kuala Krai-Gua Musang, 18000, Kuala Krai, Kelantan, Malaysia

[2]Faculty of Earth Science, Universiti Malaysia Kelantan, Jeli Campus, 17600 Jeli, Kelantan, Malaysia

[3]Department of Biological Sciences and Biotechnology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor

[4]Faculty of Language Studies and Human Development, Universiti Malaysia Kelantan, 16300 Bachok, Kelantan, Malaysia

ABSTRACT

A *study of Asian elephant (Elephas maximus) diet preference was conducted in detail for 12 months. The technique was based on direct observation. The plant samples collected were identified using the identification keys for plants species or with the help of a subject expert. All plants in the study region that would be eaten by the elephants were monitored and identified. The total number of plant species collected throughout this study were 39 species that belong to 21 families. This list has been compiled by identifying the leaves and fruits directly or taken from possible plants consumed by the elephant. Elephants consume different parts of a plant like leave and twigs (twigs are generally eaten by removing the leafy portion from bark, root, fruits, flower, and stem. This study would help to get the data about the elephant's diet subsequently. The significance of this study would help the authorities, such as the Department of Wildlife and National Park (DWNP), to plan new conservation programmes for the survival of this species.*

Keyword: Diet, Asian elephant, Elephas maximus, plant species, conservation.

INTRODUCTION

In 2000-2009, Kelantan was declared as having the second-highest population of elephants which was counted at almost 250 to 300 based on the surveys from 2000 to 2009 due to the large amount of forest which is protected as Taman Negara (National Park) and large areas of continuous forest (Salman et al., 2011).

In recent years, a variety of changes and human needs have disrupted the majority of elephants' populations. The competition between them for food, shelter and other basic necessities is growing day by day. In order to continue their life, elephants consume many types of plant species. They used different plants and shrubs as their daily food too. Therefore, the study area, namely Sungai Betis Forest Reserve, Gua Musang, Kelantan, was surveyed for 12 months. This study aims to identify the diet preference of Asian elephants around Sungai Betis Forest Reserve, Gua Musang, Kelantan. Asian elephants have been engaged in the highest wildlife conflict with humans. Human-elephant conflict (HEC) occurs when elephants intrude on human use areas and cause damage to crops, property, creating an insecure situation for humans. Nevertheless, one of the factors causing the conflict is also the invasion of humans on elephants' habitat due to logging, plantation and settlement purposes. Food sources have been depleted, resulting in elephants going out looking for food and heading to settlements and plantations. This will cause humans and elephants to be engaged in conflict. The selection of food for elephants is important in wildlife management and conservation.

MATERIALS AND METHOD

Study Area

The study mainly focused on Sungai Betis Forest Reserve, Gua Musang, Kelantan since numerous complaints were filed on Asian elephants sighting by the indigenous people. Thus, the complaints have prompted the study to be conducted on this particular area. Sungai Betis Forest Reserve is also known to have a dense non-fragmented forest. Its geographical coordinates are 4°54'0" North 101°48'0" East (Figure 1). Gua Musang is situated in the south of Kelantan and is a bit isolated from Kota Bharu, which is the centre of administration in the state of Kelantan.

ISSN 2394 - 7780

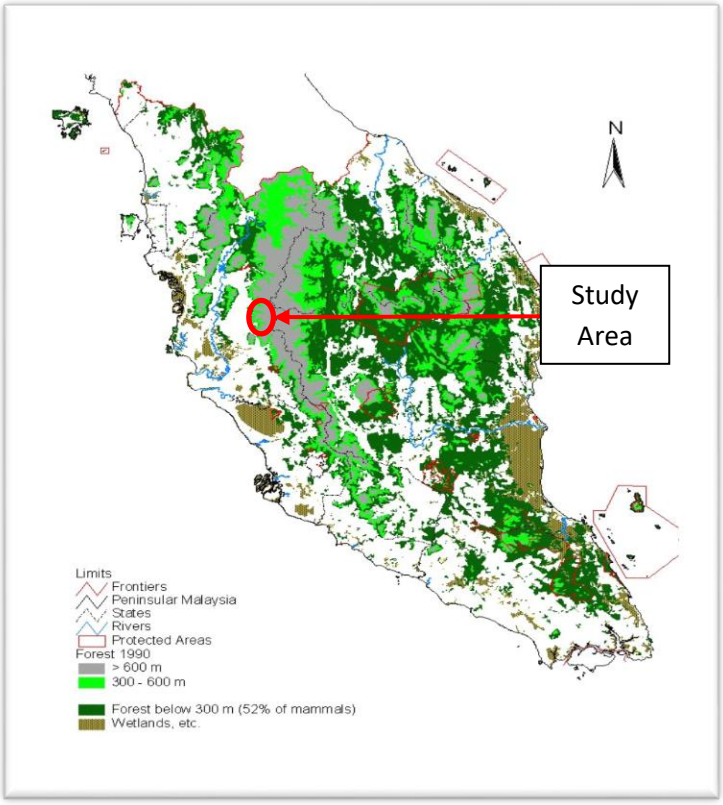


Figure 1: The location of the study area.

Direct Observation

All plants that the elephant in the study area will feed need to be observed and identified. Asian elephant diet in Sungai Betis was surveyed in detail for 12 months. At the study sites during the dung collection process, another activity noted was the observation of the feeding behaviour and diet of the elephants. All plants in the study region that would be eaten by the elephants were monitored and identified. Some plant species were familiar. The ideal time to collect samples of plants fed by Asian elephants is early in the morning and late in the evening. Asian elephants will go out looking for food from the late afternoon till morning. The rest of the time is used to rest.

RESULT AND DISCUSSION

Plants Species Identified

The plant species were identified based on the direct sighting of animals feeding and indirect evidence like feeding signs. The field observation focused more on what kind of plant species elephants fed. The plant samples collected were identified with the help of a subject expert. The plants were observed from the elephants' feeding behaviour. A few plants were uprooted and peeled off the bark of a few plant species.

The result shows the total number of plants collected throughout this study, which are 39 species belonging to 21 families (Table 1). This list has been compiled from identifying the leaves and fruits directly or taken from plants with signs of elephant feeding based on their local names.

Table 1: List of plant species that are consumed by *E. maximus* in Sungai Betis Forest Reserve, Gua Musang, Kelantan.

No.	Family	Scientific Name	Local Name	Part Eaten
1	Moraceae	*Ficus grossularioides*	Ara putih	L, S
		Artocarpus heterophyllus	Nangka	L, S, T
		Ficus schwarzii	Ara	F
2	Euphorbiaceae	*Schizostachyum grande*	Buloh Seminyeh	L, S
		Macaranga laciniata	Balek angin	L, S
		Mallotus macrostachyus	Selau, Balik Angin	L
		Macaranga gigantea	Mahang Gajah	L, T
		Balakata baccata	Ludai	L, S, B, R
		Macaranga bancana	Mahang Merah	L, S

ISSN 2394 - 7780

		Macaranga hypoleuca	Mahang putih	L, S
		Hevea brasiliensis	Getah	B, R, S
3	Poaceae	*Eleusine indica*	Rumput samba	L
		Molacanna baccifera	Berry bamboo	L
		Dendrocalamus strictus	Buluh Batu	T, L
		Paspalum conjugatum	Rumput	L
4	Musaceae	*Musa paradisiaca*	Pisang tandok	L, F, S
		Musa balbisiana	Pisang hutan	S
5	Rubiaceae	*Hedyotis* sp.	Lidah tiong	L
		Mitragyna speciosa	Ketum	L, B, R, S
6	Solanaceae	*Solanum torvum*	Terung pipit	F, L
7	Lamiaceae	*Tectona grandis*	Jati	L, B
8	Melastomataceae	*Melastoma malabathricum*	Senduduk	L, F, S
9	Cannabaceae	*Trema tomentosa*	Mengkirai	L, S, B
10	Malvaceae	*Bombax valetonii*	Kekabu hutan	L
		Durio zibethinus	Durian	F
11	Zingiberaceae	*Etlingera* sp.	-	L
12	Athyriaceae	*Diplazium esculentum*	Pucuk paku	L
13	Asteraceae	*Mikania cordata*	Selaput tunggul	L
14	Meliaceae	*Lansium domesticum*	Langsat	F, L
15	Phyllanthaceae	*Baccaurea motleyana*	Rambai	F, L
16	Clusiaceae	*Garcinia mangostana*	Manggis	F, L
		Garcinia atroviridis	Asam gelugor	F, L
17	Sapindaceae	*Nephelium lappaceum*	Rambutan	F
18	Fabaceae	*Parkia speciose*	Petai	F, T, L
19	Myrtaceae	*Syzygium polyanthum*	Serai kayu, Kelat	L, B, R, T
20	Arecaceae	*Elaeis guineensis*	Kelapa Sawit	L, B, R, T
		Cocos nucifera L.	Kelapa	L, B, R, T
		Areca catechu	Pinang	L, B, R, T
21	Graminae	*Saccharum officinarum* L.	Tebu	S

*L = leaves, T = twigs (twigs are generally eaten by removing the leafy portion from it), B = bark, R = root, F = fruits, FL = flower, S = stem.

There were 21 plant families identified during this study. The total numbers of plants collected throughout this study are 39 species. The families of the plant collected throughout this study are Arecaceae, Asteraceae, Athyriaceae, Cannabaceae, Clusiaceae, Euphorbiaceae, Fabaceae, Graminae, Lamiaceae, Malvaceae, Melastomataceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Phyllanthaceae, Poaceae, Rubiaceae, Sapindaceae, Solanaceae, and Zingiberaceae. The family of Euphorbiaceae dominates in the diet of elephants consisting of eight species. This is followed by the Poaceae family with four species. The results of direct observations have found that Asian elephants only eat leaves, bark, trunks and even tree roots. The percentage of the share of trees consumed by elephants includes leaves with 84.4%, stems 33.3%, fruit 25.6%, bark 20.5%, roots 17.9% and twigs 17.9%. This is because the leaves are most easy to eat and always grow even in the off-season compared to the fruit.

In a few plant species, elephants utilised both leaves and twigs as their fodder, for example, when feeding on species like *Artocarpus heterophyllus* and *Dendrocalamus strictus*. There were a few plant species whereby the elephant only utilised leaves on species like *Molacanna baccifera, Eleusine indica* and *Hedyotis* sp., Fruits of *Artocarpus heterophyllus*, *Musa paradisiaca* and *Solanum torvum*. Furthermore, elephants often uprooted the plant with the help of the trunk and sometimes with the help of their forefoot.

In addition, the elephant is a generalist feeder, consuming different parts of a wide variety of grasses, herbs, shrubs and trees (Sukumar, 1989). In certain areas with a lack of food sources, Asian elephants are forced to eat for survival. This applies in areas of forest that are cut down for plantation purposes. If the food source is not available in the area, the Asian elephants will move to a large resourced area in the village, and there will be conflict between humans and elephants.

ISSN 2394 - 7780

CONCLUSIONS

Based on this study, the elephants can also alter the physical structure of the plants they feed on by mobilising vast quantities of nutrients through their feces, creating habitats for many vertebrates and invertebrates besides providing food. This study would help enhance public awareness of the importance of preserving, conserving, and managing the elephant population. They provide one of the vital balancing roles in maintaining the natural environment and reshaping biodiversity in tropical rainforests.

RECOMMENDATION

The authorities are also recommended to be mindful of future road projects as not to disturb the movement pattern of elephants (Sharma, et al., 2020). The recommendation should include total protection of the current habitat and rehabilitation of the area. Suggestions on the construction of a wildlife corridor would also help facilitate the movement of the elephants from one place to the other without having to cross the road that would risk their lives (Sharma et al., 2020). Other wildlife species may also gain benefit from the corridor as well. Since water sources are also a very important aspect of these elephants' ranging behaviour and habitat utilisation, it is essential that logging, cultivation of crops, and others that had the potential of polluting the water source be held at a threshold distance. In addition, land management should consider the presence of this species.

This study has also recommended collecting data on suitable times and weather in the ranging area. For example, the data is only collected at the registered ranging area on the map to make sure the sample data is accurate and reliable. Besides that, this study requires a long time to get more data about elephants' feeding preferences and diet. This is because if a lot of time is allocated, many plant species that elephant consumes can be identified.

Elephant's feeding preference need to be observed directly. The observation should start in the early morning and a few hours before sunset because that is the best time to search and observe them at a close distance in the open area. Field binoculars also can be used for observing their feeding preference without disturbing them from a safe distance. From this observation, the plant species and their feeding preference can be identified more clearly. There are still many more species of plants that we have yet to identify in the diet of elephants. A lot of research and time is needed for us to identify such samples

ACKNOWLEDGEMENT

We want to express our gratitude towards the Kelantan State Forestry Department and the Department of Wildlife and National Park for permitting this study. We also like to express our appreciation to the Faculty of Earth Science, Universiti Malaysia Kelantan, for providing the necessary facilities. We wish to thank Nor Ashira Binti Che Mustafa and Nurul Izzati Bt Khairuddin for assisting with the sample collection and analysing the collected data.

REFERENCES

- Sharma, P., Panthi, S., Yadav, S. K., Bhatta, M., Karki, A., Duncan & Acharya, K. P. (2020). Suitable habitat of wild Asian elephant in Western Terai of Nepal. *Ecology and Evolution*, 10(12): 6112-6119.
- Salman, S., Nasharuddin, O., Nawayai, Y., Burhanuddin, M. N., Zafir, A. and Campos Arceiz, A. (2011). Current Status of Asian Elephants in Peninsular Malaysia. *Journal of Wildlife and Parks*, 35: 67-75.
- Sukumar, R. (1989). Ecology of the Asian elephant in Southern India. I. Movement and habitat utilisation pattern. *Journal of Tropical Ecology*, 5: 1-18.
- Sukumar, R. (2006). A brief review of the status, distribution and biology of wild Asian elephants Elephas maximus. *International Zoo Yearbook*, 40: 1-8.
- Zafir, A. (2017). *Factors Affecting Human-Elephant Conflict in Jeli, Kelantan*. PhD Thesis. Universiti Kebangsaan Malaysia.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

A STUDY ON AWARENESS ABOUT EDUCATION LOAN AMONG UNDERGRADUATE STUDENTS OF MUMBAI DISTRICT

[1]Mr. Vikas Mishra and [2]Dr. Susmita Daxini
[1]Assistant Professor, KES Shroff College, Mumbai
[2]Associate Professor, DTSS College, Mumbai

ABSTRACT
Education is an essential requirement for development of a society. Financial problem of family is a great obstacle for financially weak students, to complete their higher or professional education. Most of the undergraduate students are not aware about the education loan and its process. Fear of non-payment of loan and lack of awareness are the two main factors for not applying for education loan.

Keywords: Education loan, Bank

INTRODUCTION:

Education is a tool for socio-economic development. Education not only help a person in his economic development but also it help in his social, ethical and mental development also. Government schemes like "Sarva Shiksha Abhiyan" indicates the important of education. Government has made various plan and schemes for the promotion of basic education but basic education is not sufficient for the career development. To excel in career one has to acquire higher and technical education. Cost of acquiring higher and technical education is one of the important factor that affects the enrollment of students for higher and technical education. Privatization of education in India has made the education more costly. Many meritorious and deserving students are not able to enroll himself for higher and technical education due to high cost. Finance and education go hand in hand. Finance helps to achieve education and education helps to acquire finance, so they both are interdependent on each other. To solve the problem of cost of finance for higher and technical education government decided to provide financial assistance to students in the form of loan. A meeting Chief executive officer of the public sector bank and finance minister of India held on 13th June 2000 to highlight the role of commercial bank with respect to education loan for higher education with in India and outside India. RBI has issued certain guidelines and eligibility norms for education loan.

1.1 Courses eligible For Education loan:

a. Studies in India:

- School education including plus 2 stages.
- Graduation courses: BA, B.Com., B.Sc., etc.
- Post-Graduation courses: Masters & Ph.D.
- Professional courses: Engineering, Medical, Agriculture, Veterinary, Law, Dental, Management, Computer etc.
- Computer certificate courses of reputed institutes accredited to Dept. of Electronics or institutes affiliated to university.
- Courses like ICWA, CA, CFA etc.
- Courses conducted by IIM, IIT, IISc, XLRI. NIFT etc.
- Courses offered in India by reputed foreign universities.
- Evening courses of approved institutes.
- Other courses leading to diploma/ degree etc. conducted by colleges/ universities approved by UGC/ Govt./ AICTE/ AIBMS/ ICMR etc.
- Courses offered by National Institutes and other reputed private institutions. Banks may have the system of appraising other institution courses depending on future prospects/ recognition by user institutions.

b. Studies Abroad: -

- Graduation: For job oriented professional/ technical courses offered by reputed universities.
- Post-graduation: MCA, MBA, MS, etc.

ISSN 2394 - 7780

- Courses conducted by CIMA- London, CPA in USA etc.

1.2 Student eligibility:

- Should be an Indian National
- Secured admission to professional/ technical courses through Entrance Test/ Selection process.
- Secured admission to foreign university/ Institutions.
- Should have scored minimum 60% (50% for SC/STs) in the qualifying examination for admission to graduation courses.

1.3 Expenses considered for loan:

- Fee payable to college/ school/ hostel.
- Examination/ Library/ Laboratory fee.
- Purchase of books/ equipments/ instruments/ uniforms.
- Caution deposit/ building fund/ refundable deposit supported by Institution bills/ receipts.
- Travel expenses/ passage money for studies abroad.
- Purchase of computers - essential for completion of the course.
- Any other expense required to complete the course - like study tours, project work, thesis, etc.

1.4 Quantum Of Finance:

Need based finance subject to repaying capacity of the parents/ students with margin and the following ceilings.

- Studies in India - Maximum Rs.7.50 lacs.

- Studies abroad - Maximum Rs.15 lacs

EDUCATION LOAN SCHEMES - RATE OF INTEREST (w.e.f. 10.02.2020)

Loan Limit	3Year MCLR	Spread	Effective Interest Rate	Rate type
Up to 7.5 lacs	8.15%	2%	10.15%	Fixed
Above 7.5 lacs	8.15%	2%	10.15%	Fixed

0.5% concession on rate of interest is allowed to girl students.

SBI SCHOLAR LOAN SCHEME

LIST		1 YEAR MCLR	Spread	Effective Interest Rate	Rate type
AA	ROI	7.85%	0.20%	**8.05%**	Fixed
A	All IIMs & IITs	7.85 %	0.35%	**8.20%**	Fixed
	Other institutes	7.85%	0.50%	**8.35%**	Fixed
B	All NITs	7.85%	0.50%	**8.35%**	Fixed
	Other institutes	7.85%	1.00%	**8.85%**	Fixed
C	All NITs	7.85%	0.50%	**8.35%**	Fixed
	Other institutes	7.85%	1.50%	**9.35%**	Fixed

Part time courses (Available only at mapped branches for 15 selected institution)

Source: https://www.sbi.co.in/web/interest-rates/interest-rates/loan-schemes-interest-rates/education-loan-scheme

OBJECTIVES:

- To study the level of awareness of students towards education loan.
- To examine the student's perception level towards education loan.
- To find out the causes of not applying for education loan.

REVIEW OF LITERATURE:

Jandhyala B G Tilak (2004) analyses the departure of the Government from increased expenditure in higher education sector consequent on the commitment of universal primary and secondary education.

ISSN 2394 - 7780

Devasia M.D. & Meerabhai M.(2005) have found that Kerala has definitely predominant position in Indian states in literacy and primary education.

Premsai C. (2007) elaborates on the Government of India's Policy decisions on private participation in the expansion of higher education in India.

Peter Comes et.al (2008) studied that very few students are concerned about obtaining a job after the studies.

Manoj P. K and Meera Bai (2009) in their joint study have analysed the emerging trend in respect of technical education in India.

Manoj P K and Arunachalam (2009) in their study have looked into the problems and challenges of management education in India, with a focus on the issue of quality of the management graduates.

Alan Nasser and Kelly Norman (2011) found that in 2011 the student loans outstanding rose to $ 830 billion while the credit card lendings trailed behind at $ 827 billion in the United States.

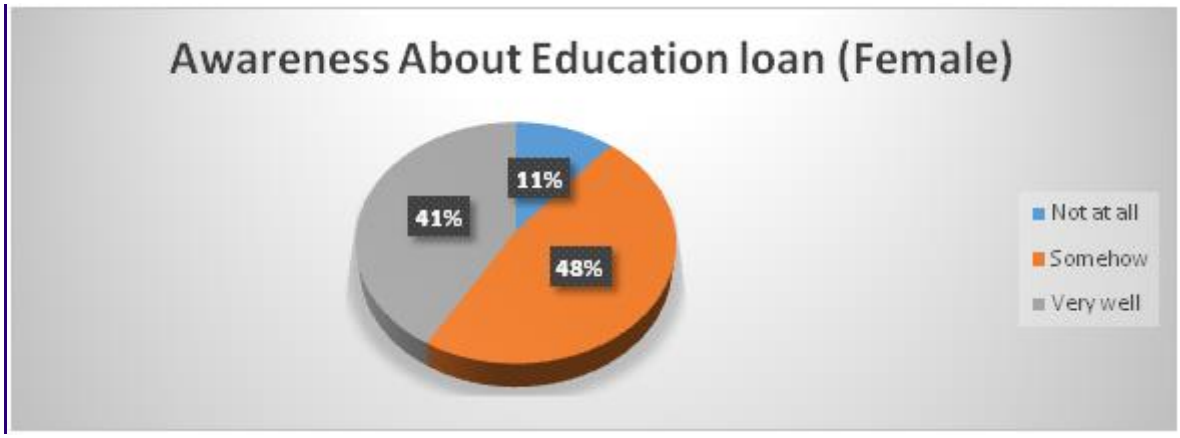
May Luong (2010) observed that students are least bothered about the cost of the post-secondary education, even if not all of them are going to do well after their studies.

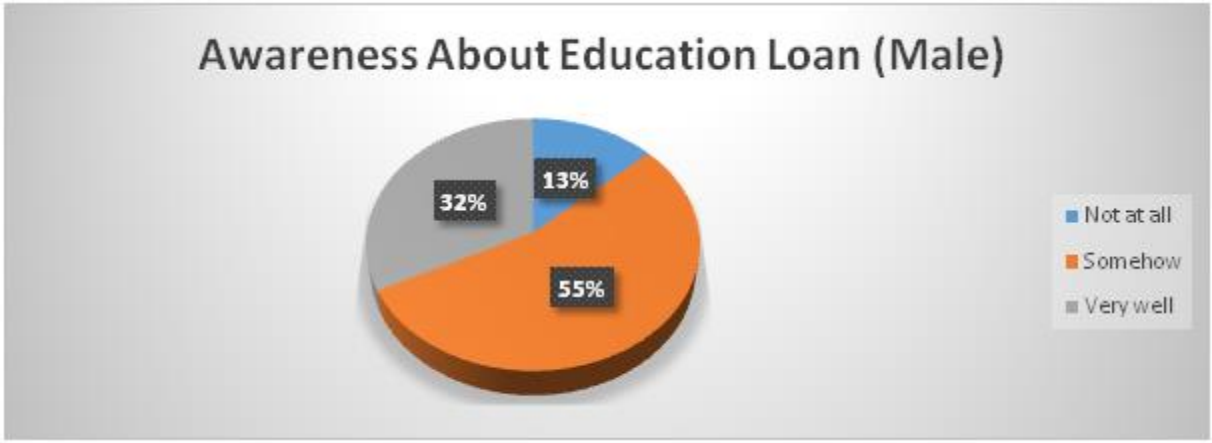
Research Methodology: Researcher has collected data through primary and secondary source both. Data with respect to rate of interest and other basic information of education loan are collected through secondary source and data with respect to student's awareness level is collected through primary data. 150 students are collected as sample from western suburban areas of Mumbai district. Convenience method of sampling is adopted for selecting samples.

FINDINGS:

Gender Wise Awareness

Gender	Not at all	Somehow	Very well	Grand Total
Female	9	39	34	82
Male	9	37	22	68
Grand Total	**18**	**76**	**56**	**150**



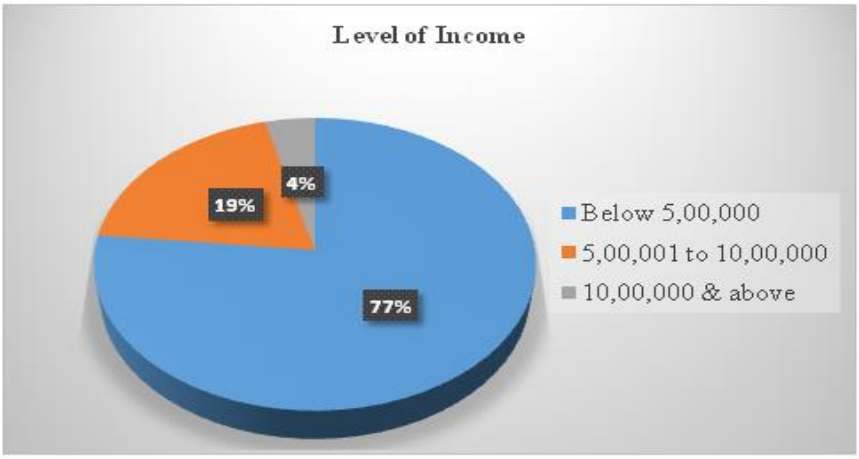


ISSN 2394 - 7780

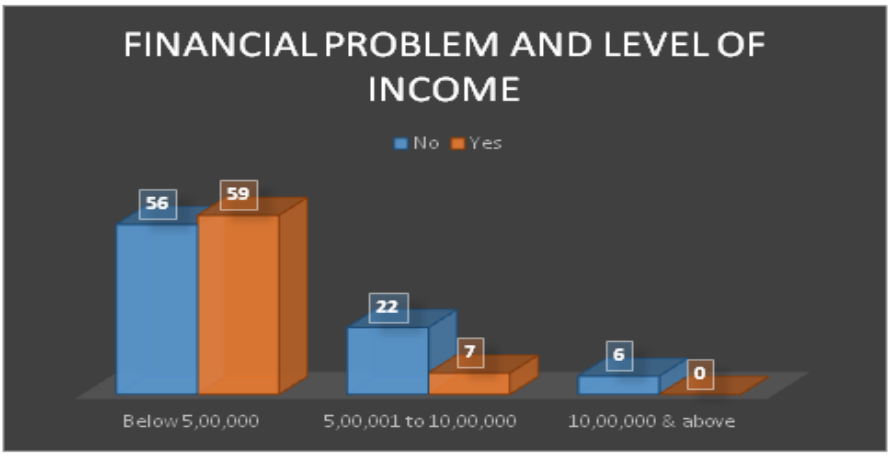
Above table and diagram shows gender wise awareness level about education loan among undergraduate students. Researcher found that 13% male respondents and 11% of female respondents are not at all aware about education. 48% of female students and 55% of male students have very less awareness about education loan.

Level of Income

Income Level	No	Yes	Total
Below 5,00,000	56	59	115
5,00,001 to 10,00,000	22	7	29
10,00,000 & above	6	0	6
Grand Total	**84**	**66**	**150**



Many students due to weak financial conditions have to discontinue their studies. Here researcher tries to study relation between income level and financial problem faced by students during their studies. The diagram indicates that family income of respondents. 77% of the respondents have family income up to 5 lakhs and 19% of respondents have income from 5 lakhs to 10 lakhs. Only 4% of respondents have family income 10 lakh and above.

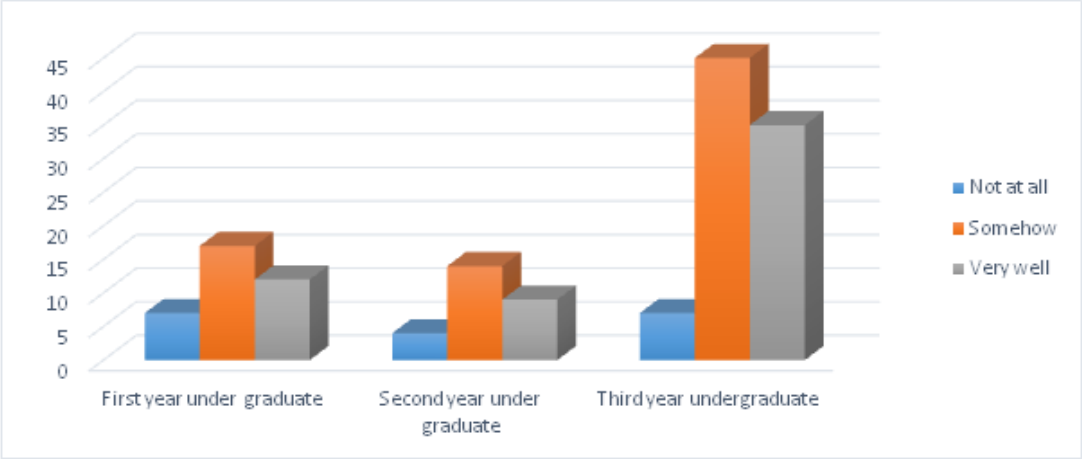


Above bar diagram shows 51.30% of respondents who have family income up to 5 lakhs accepted that they had face some financial problem and 48.69% of respondents from this group accepted that they do not face any such problem. 24.13% of respondents from group of 5 lakhs to 10 lakhs accepted that they face some financial problem while 75.87% of respondents from this group accepted that they had not face any problem. 100% of respondents having income level 10 lakhs and above accepted that they do not face any such problem.

Class wise Awareness About Education Level

Class	Not at all	Somehow	Very well	Grand Total
First year under graduate	7	17	12	36
Second year under graduate	4	14	9	27
Third year undergraduate	7	45	35	87
Grand Total	**18**	**76**	**56**	**150**

ISSN 2394 - 7780



Did any bank come for Promoting Education loan to your campus?

Maybe	74
Never	68
Sometime	8
Grand Total	150

45% of respondents accepted that none of bank came to their institute for promoting education loan, only 5% of respondents accepted that sometimes banks came for promoting educational loan.

Reasons for not Applying Education Loan:

Reason for not Applying	Frequency	%
Complex process	25	21.93
Fear of non-payment of loan	35	30.70
Lack of documents	5	4.39
No awareness	34	29.82
Non-availability of Guarantor	15	13.16
Grand Total	**114**	**100**

Out of 150 respondents 114 respondents accepted that they do not approach any bank for education loan. So researcher tries to find out reasons for not approaching to bank for education loan. Fear of non-payment of loan is a major cause for not applying for education. Lack of awareness is second major cause for not applying for second loan. Bank should conduct some promotional activities with respect to education loan among undergraduate students.

CONCLUSION:

Education loan is a great assistance for those students who are not able to complete their education due to financial problems of their family. In above researcher no significant difference is found in awareness level of male and female students. Researcher also observed that banks are not taking initiatives to promote education

ISSN 2394 - 7780

loan among under graduate students. Fear of non-payment of loan and lack of awareness are two important reason for not opting for education loan.

WEBLIOGRAPHY:

- https://www.crifhighmark.com/news-events/news/2019/may/education-loans-in-india-shrink-25-in-4-yrs-crif-insights
- https://pib.gov.in/PressReleasePage.aspx?PRID=1575481
- https://timesofindia.indiatimes.com/business/india-business/edu-loans-in-india-shrink-25-in-4-yrs/articleshow/69490291.cms
- https://www.rbi.org.in/scripts/NotificationUser.aspx?Id=369
- https://www.ugc.ac.in/page/Educational-Loan.aspx
- https://www.credenc.com/blog/rbi-guidelines-for-education-loan
- https://mhrd.gov.in/statistics-new?shs_term_node_tid_depth=387
- https://www.sbi.co.in/web/interest-rates/interest-rates/loan-schemes-interest-rates/education-loan-scheme
- https://www.crifhighmark.com/news-events/news/2019/may/education-loans-in-india-shrink-25-in-4-yrs-crif-insights

REFERENCES:

1. Alan Nasser and Kelly Norman(2011), " The Student Loan Debt Bubble -Curse of the First Austerity Generation", Global Research. ca/Global Research.org accessed on 30 June 2012 |
2. Devasia,M D; Meera Bai,M (2005) Economics of Human Resource Planning With Special Reference to Higher Education in Kerala, Dyuthi, Cusat. |
3. Manoj P.K and Meera Bai M, "Technical Education in India: The Way Ahead" in Meera Bai M (Ed.), Technical Education in Kerala: Emerging Trends, Serials Publications, New Delhi, 2009, pp.247-273. |
4. Manoj P.K and P. Arunachalam, "Saving Management Education in India from Irrelevance: Some Strategic Imperatives" in Meera Bai M (Ed.), Technical Education in Kerala: Emerging Trends, Serials Publications, New Delhi, 2009, pp.274-283. |
5. May Luong(2010) The financial impact of student loans, Statistics Canada, www.statcan.gc.ca Home > Publications > 75-001-X > Perspectives on Labour and Income > January 2010 > |
6. Peter Comes et al(2008), Student Loans and their Effects on College Consumption, ACES, Illinois, US. | 7. Premsai C. (2007)"Higher Education in India -From Socialism to Capitalism" Legal Services India.com Online article published on August 23, 2007 accessed on 25 June 2012 |

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

A STUDY ON DIVERSITY DISTRIBUTION AND STATUS OF AVIFAUNA IN JASHPUR DISTRICT (C.G)

[1]Jyoti Tirkey, [2]K. R. Sahu and [3]Pratibha Pandey
[1]Department of Zoology Govt. R.B.R. N.E.S. P.G. College Jashpur Nagar, Dist.-Jashpur (C.G)
[2]Department of Zoology Govt. Pt. Madhav Rav Saprey College, Pendra Road (C.G)
[3]Department of Zoology Dr. C.V. Raman University Kota, Bilashpur (C.G.)

ABSTSACT
A brief study on avifaunal diversity was Carried out in Jashpur district (C.G.) during the month of June 2021 to December 2021. A Total of 61 Species of birds belonging to 35 families and 16 orders were recorded. The order Passeriformes has maximum 25 species of birds Red Vented bulbul and Plum-headed Parakeet are the most abundant residential Species in Jashpur,- Rudyshelduck, Red napped ibis were winter migrants. The Vegetation of any area is important factor affecting the abundance of avifauna. This study suggests that Jashpur district is more suitable habitat than the other because of the availability of food and suitable climate for their breeding. The result of this study showed that the forest habitat of Jashpur attracts wide range of bird species. Here is a diversity of species but the number of birds are decreasing rapidly, because of many factors, hence there is a dire need of conservation of this habitat.

Keyword – Avifaunal diversity, migratory.

INTRODUCTION:-

Birds are an important part of our eco system as they maintain the balance in our environment and they indicate the natural changes (eco system changes) and therefore birds are also known as bio-indicators. Various biotic and a-biotic factors directly affect the diversity and distribution of the bird species. Water resources, forest areas and the climate of Jashpur district are suitable for various different types of species of birds and that's why several different species of the birds are found in the district. As per different type of vegetation found in different areas of the district. Birds observed in minimum and maximum study period residential and migratory birds are included. According to the bird count of India 2018's survey, 163 different species of birds are found and recognized in the district. Here the species of the birds are in diversity but the numbers of birds are decreasing.

METHOD AND MATERIAL:-

Study area:- Above mentioned report is based on the investigation carried out in the forest area of Jashpur district of Chhattisgarh state. Jashpur district is located in the North East region of Chhattisgarh state. The district is located in between 22.17° and 23.15° northern latitude and 83.30° and 84.24° eastern longitude. 3 areas were selected to study bird diversity. The areas are as following:

Site A: forest area where tall trees, shrubs and grass exists.

Site B: forest area where maximum bushes are there and the area near residential settlement.

Site C: forest area where maximum grass is exists and paddy fields also included in it.

Method:- This investigation was carried out from June 2021 to December 2021 in three selected areas. Bird observation was regularly done for thrice a month in the time frame of morning 6 to 9 o'clock and evening 4 to 6 o'clock. The observation was done using binocular and DSLR photography (Nikon 5600 with zoom lens). 'Bird Identification' was done on basis of Grimmet and Ali.

CHEKLIST OF AVIAN DIVERSITY:- Table 1

S.no.	Order	Family	Common name	Scientific name	Status
1.	Anseriformes	Anatidae	Ruddy Shelduck	*Tadorna ferruginea*	*M*
2	Psittaciformes	Psittaculidae	Plum-headed Parakeet	*Psittacula cyanocephala*	*R*
3	Strigiformes	Strigidae	Jungle Owlet	*Athene brama*	*R*
4	Accipitriformes	Accipitridae	Black-winged Kite	*Elanus caeruleus*	*R*
5	Pelecaniformes	Ardeidae	Indian Pond-Heron	*Ardeola grayii*	*R*
6	Charadriiformes	Jacanidae	Pheasant-tailed	*Hydrophasianus*	*RM*

ISSN 2394 - 7780

			Jacana	*chirurgus*	
7	Passeriformes	Zosteropidae	Oriental White-eye	*Zosterops palpebrosus*	R
8	Pelecaniformes	Ardeidae	Little Egret	*Egretta garzetta*	*R*
9	Cuculiformes	Cuculidae	Asian Koel	*Eudynamys scolopaceus*	*R*
10	Cuculiformes	Cuculidae	Common Hawk-Cuckoo	*Hierococcyx varius*	*R*
11	Pelecaniformes	Threskiornithidae	Red-naped Ibis	*Pseudibis papillosa*	*M*
12	Bucerotiformes	Upupidae	Eurasian Hoopoe	*Upupa epops*	*RM*
13	Passeriformes	Laniidae	Long-tailed Shrike	*Lanius schach*	*R*
14	Passeriformes	Artamidae	Ashy Woodswallow	*Artamus fuscus*	*R*
15	Passeriformes	Muscicapidae	Black Redstart	*Phoenicurus ochruros*	*R*
16	Passeriformes	Paridae	Indian black loret tit	*Machlolophus xanthogenys*	*R*
17	Passeriformes	Campephagidae	Scarlet Minivet	*Pericrocotus speciosus*	*R*
18	Passeriformes	Corvidae	Rufous Treepie	*Dendrocitta vagabunda*	*R*
19	Passeriformes	Oriolidae	Indian Golden Oriole	*Oriolus kundoo*	*R*
20	Passeriformes	Sturnidae	Common Myna	*Acridotheres tristis*	*R*
21	Anseriformes	Anatidae	Bar-headed Goose	*Anser indicus*	*R*
22	Coraciiformes	Alcedinidae	White-throated Kingfisher	*Halcyon smyrnensis*	*R*
23	Passeriformes	Sturnidae	Asian Pied Starling	*Gracupica contra*	*R*
24	Passeriformes	Passeridae	House Sparrow	*Passer domesticus*	*R*
25	Passeriformes	Pycnonotidae	Red-vented Bulbul	*Pycnonotus cafer*	*R*
26	Accipitriformes	Accipitridae	White-eyed Buzzard	*Butastur teesa*	*R*
27	Charadriiformes	Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	*R*
28	Passeriformes	Muscicapidae	Oriental Magpie-Robin	*Copsychus saularis*	*R*
29	Pelecaniformes	Ardeidae	Cattle Egret	*Bubulcus ibis*	*R*
30	Psittaciformes	Psittaculidae	Rose-ringed Parakeet	*Psittacula krameri*	*R*
31	Columbiformes	Columbidae	Spotted Dove	*Spilopelia chinensis*	*R*
32	Cuculiformes	Cuculidae	Greater Coucal	*Centropus sinensis*	*R*
33	Cuculiformes	Cuculidae	Banded Bay Cuckoo	*Cacomantis sonneratii*	*R*
34	Cuculiforme	Cuculidae	Indian Cuckoo	*Cuculus micropterus*	*R*
35	Cuculiforme	Cuculidae	Common Cuckoo	*Cuculus canorus*	*R*
36	Passeriformes	Corvidae	Crow	*Corvus splendens*	*R*
37	Piciformes	Megalaimidae	Coppersmith Barbet	*Megalaina haemacephalus*	*R*
38	Anseriformes	Anatidae	Lesser Whistling-Duck	*Dendrocygna javanica*	*R*
39	columbiformes	columbidae	Dove	*collumdalivia*	*R*
40	Passeriformes	Muscicapidae	Indian Robin	*Copsychus fulicatus*	*R*
41	Passeriformes	Dicruridae	Black Drongo	*Dicrurus macrocercus*	*R*
42	cicoriformes	Ciconiidae	Asian openbild	*Anastomus oscitans*	*M*

ISSN 2394 - 7780

			stork		
43	Columbiformes	Columbidae	Laughing Dove	*Spilopelia senegalensis*	*R*
44	Passeriformes	Nectariniidae	Purple Sunbird	*Cinnyris asiaticus*	*R*
45	Coraciiformes	Meropidae	Green Bee-eater	*Merops orientalis*	*R*
46	Gruiformes	Rallidae	common Moorhen	*Gallinula chloropus*	*M*
47	Passeriformes	Motacillidae	Tawny Pipit	*Anthus campestris*	*R*
48	Galliformes	Phasianidae	Gray Francolin	*Francolinus pondicerianus*	*R*
49	Galliformes	Phasianidae	Red Junglefowl	*Gallus gallus*	*R*
50	Passeriformes	Campephagidae	Small Minivet	*Pericrocotus cinnamomeus*	*R*
51	Anseriformes	Anatidae	Northern Pintail	*Anas acuta*	*M*
52	Pelecaniformes	Phalacrocoracidae	Little Cormorant	*Microcarbo niger*	*M*
53	Passeriformes	Leiothrichidae	Jungle Babbler	*Argya striata*	*R*
54	Passeriformes	Motacillidae	Western Yellow Wagtail	*Motacilla flava*	*M*
55	Passeriformes	Campephagidae	Large Cuckooshrike	*Coracina macei*	*R*
56	Passeriformes	Muscicapidae	Pied Bushchat	*Saxicola caprata*	*R*
57	Charadriiformes	Rostratulidae	Greter painted-snipe	*Rostratula benghalensis*	*R*
58	Coraciiformes	Coraciidae	Indian Roller	*Coracias benghalensis*	*R*
59	Strigiformes	Strigidae	Spotted Owlet	*Athene brama*	*R*
60	Gruiformes	Rallidae	White-breasted Waterhen	*Amaurornis phoenicurus*	*R*
61	Strigiformes	Strigidae	Rock Eagle owl	*Bubo bengalensis*	*R*

Result:- Total 61 species are recorded in this study period, which belongs to 35 families and 16 orders. It includes both residential species and migratory species of birds. Avian diversity and abundance was recorded highest in site A. Site C had more amount of migratory birds but species diversity and abundance both were less in site C. Bird species found in higher proportion during the observation includes species like Red-Vented Bulbul, Plum headed Parakeet, Coppersmith Barbet, Cattle Egret, Common Myna and Pigeon; while migratory birds' species like Lesser Whistling and Ruddy Shelduck etc are also observed. Grey Francolin and Red Jungle Fowl were observed for 5 times only in site A

Discussion:- Migratory and residential birds are part of our bio-diversity. Any change in residence and nutrition of this species of birds can easily make us feel natural imbalance caused. There is no doubt that decreasing number of birds is a big point of concern for us because these birds give us a warning and indication of climate change and pollution. Various species of birds were identified and recognized through this observation. Study was also done on the reasons behind decreasing number of birds and their extinction. We need to make people sensitized and aware for the birds so that the conservation of birds can be done.

REFERENCE –

1. Ali, Salim (2002). The book of Indian Birds, BNHS, Oxford University Press Mumbai.
2. Bharatha Lakshmi B, Rao BT, Rama Rao K, Poli Naidu Y. Diversity, Distribution and Status of Birds of Kolleru Lake A Ramsar Site in Andhra Pradesh. International Journal of Innovative Research in Science, Engineering and Technology. 2015; 4:5759-5784.
3. Dhindsa MS , Saini HK {1994} Agriculture ornithology : an Indian perspective Journal of biosciences 19: pp. 391-402
4. Grimmett R, Inskipp C and Imskipp T (2016). Hinds of the Indian subcontinent. Oxford University.
5. Joshi, k k, Bhatt Dinesh, Arya Ashish Kumar 2021 Avian Diversity in forest, agriculture and water stream habitats of dehradun valley, Uttarkhand, india Biodiversity Data Journal 9:e61422
6. Palei H.S. Debata S. Mohapatra P.P. Mishra A.K. (2017) Diversity and status of birds in Bonai Forest Division, Odisha, India e-planet 15 (2): 166-177

ISSN 2394 - 7780

7. Pradhan, R.N. Palei,H,S and Sahu, H.K 2012 Checklist of waterbirds in angul district Orrissa, India Tiger Paper 39:31-32.
8. Preliminary survey on the avian community of Dalma Wildlife Sanctuary, Jharkhand, India. Journal of Threatened Taxa 3(5): 1764-1770.
9. Rubina M, Nadaf CB, Ganesh D. A Study on Avifaunal Diversity Status in Lakes of Dharwad, Karnataka State. J Ecophysiol. Occup. Hlth. 2016; 16(1, 2):13-21.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

A CASE STUDY OF KATSINA STATE ACADEMIC LIBRARIES ON ACQUISITION AND SELECTION; COLLECTION DEVELOPMENT POLICY AND SUPPLY OF INFORMATION RESOURCES

[1]Mohammed Tukur Lawal and [2]Nafiu Maharazu
[1]Research Scholar, Department of Library and Information Science, SRM University, Sonepat, Haryana, India
[2]Department of Library and Information Science, Umaru Musa Yar'adua University, Katsina

ABSTRACT
The study is based on "the acquisition and selection policy in tertiary institution in katsina metropolitans" Acquisition policy comprised of searching and gathering the quit sound information resources through either purchase, gift and donation, whereas information resources included; books, journals, magazines, newspapers, memos, government publication e-resources/digital resources. the study touches different angles for acquisition in tertiary institutions particularly on how such information are acquired and through which selection procedures that the libraries adopted in acquiring these resources and how effective these policies are in carrying out such activity. The research methodology used in the research was qualitative technique for gathering a reliable data, however the result of the findings from the respondents revealed that Information resources in the studied libraries are acquired through direct purchase, exchange, downloading from the Internet, gift and donation The major sources of funds are parent institutions. However, the finding reveals that, there was no standard budget for these libraries. The libraries are generally faced with financial problems especially from the parent institutions, Lack of qualified staffs/professional staffs, Lack of cooperation from academic staffs

INTRODUCTION
Library collections are one of the major concern and integral part of library and information services provision. Any academic library that aims to satisfy the information needs of its patrons must be concerned with the development of its collections. The process should not be approached in a haphazard manner, but must be carefully planned, monitored and executed because it is central to the library fulfilling its mission and objectives.

Information resources development is a vital aspect in libraries. It is considered the backbone of every library, because without adequate and relevant collections, the library goals and objectives will not be achieved. It is against this background this study evaluated the different processes academic libraries in metropolitan Katsina pass through to develop their collections.

Statement of the Problem
The importance of collection development policy (CDP) in a library is to clarify how collection of the library will be developed right from selection, acquisition, description and arrangement to evaluation. Majority of libraries are not following the guidelines (policy) for building library collections. Nonexistence of the policy or a well-documented CDP may be the problem.

The primary task of every academic library is to identify its community of users through user survey/ community analysis etc. then select, acquire and provide access to relevant information resources.

Selection of relevant resources to be included in the library collection is a daunting task. The librarians should not be left alone to make selection for their library. All stakeholders within the community the library operates needs to participate when making selection of information resources for their library, because they constitute the primary users of the collections. Despite the importance of selection of information resources in libraries, there is a problem with regards to critical selection. This may be as a result of non existence of selection committee in the libraries

Research Objectives
The objectives of this study were to:

1. Examine the type of collection development policy used by academic libraries in metropolitan Katsina.
2. Find out the different processes of selecting information resources by the libraries under study.
3. Determine the methods of acquiring library information resources by the libraries under study.

ISSN 2394 - 7780

LITERATURE REVIEW

Resources Development Process in Academic Libraries

Libraries strive to develop collections, resources, and services that meet the cultural, informational, educational, and recreational needs of their community. (Ifidon, 2007). Central to the ability of library to meet patron's demands is the collection of information resources upon which its patrons and staff alike will draw. Evans, (2000). Collection developments in libraries passes through some stages before the collection are developed. It is a universal process in the world whereby library staff brings together a variety of information resources to meet patrons demand. Evans (2000) describes collection development as a constant cycle that consists of six definable elements as:

Information Resources Development Policy (also known as acquisition policy, selection policy, collection development policy statements) have proven valuable tools for many collection development and management librarians in academic libraries. Works on information resources development policies are few and most of them are purely done on importance of policy to a particular library in their effort to achieve the parent institution goals. Information resources development policy defines the scope of collection and provides a constant guide for future growth and development. Fourie, (2001) defined collection development policy (CDP) as "the written statement that provides planning and implementation guidelines for most collection building task." According to Fourie, (2001), a collection development policy (CDP) contains three kinds of statements:

Selection Process of information resources in Academic Libraries

Selection simply means choosing. In the context of library information resources denotes filtering or sieving the most relevant of all publication pertaining to particular field of knowledge from those that are not relevant. It is a form of decision making on which item will best suit patron's community. Selection is a very important aspect of collection development especially these days when money is never enough to buy every things we need in the library couple with increasing flow of information both print and non print information resources due to information explosion (Ifidon, 2007).

Selection of information resources is usually the joint responsibility of the library staff and academics in an academic institution. (Aina, 2004). Responsibility should be clearly spelt out in policy statements. Because it could be library managers, subject librarians or people specifically appointed to develop and manage collections. (Van 2003). It is generally accepted that librarians, working in a consultative relationship with academics, are in the best position to build library collections

Furthermore, selection process is a collective responsibility of the acquisition librarian and the selection committee of a library. They select from publishers catalogue, or announcement list, suggested list by lecturers from academic committee in which a librarian is a member (Ukejianya 2007). Books and other information resources recommended are passed to the acquisition unit for necessary action. In some academic libraries there are also suggestion boxes where readers submit their suggestion as to books, journals, and some other information resources they want the library to procure

Acquisition Process of information resources in Academic Libraries

Acquisition refers to the process by which libraries acquire their information resources either by purchases, exchange, gifts or donations. It involves locating and acquiring the items identified as appropriate for the collection. Evans and Soprano (2005), sees acquisition as the process by which library physically serve (through buying, gifts or exchange) the items that selection personnel have identified as desirable addition to the collection. "Acquiring information resources is a core activity of libraries. Libraries all over the world still acquire and maintain massive book collections while managing other formats. Despite prophecies of vanishing print collections and emergence of the digital paradigm, printed books still have a central role in library collections and publishing industry" (Kanwal 2005)"

Population of the Study

The population of the study comprised of all the academic libraries of high institutions in Metropolitan Katsina.

Academic libraries available in metropolitan Katsina.

S/No	Institutions	Year Of Establishment Of Institution	No. Of Library Staff	
			Professionals	Paraprofessionals
1	Umaru Musa Yar'adua University Katsina (UMYU)	2006	23	36
2	Haasan Usman Katsina Polytechnic (HUK)	1979	15	27

ISSN 2394 - 7780

3	Federal College Of Education Katsina(FCEK)	1989	18	26
4	Katsina University Katsina (AUK)	2005	10	15
5	National Open University Of Nigeria (NOUN)	2006	7	21
6	School Of Nursing, Katsina	1985	3	7
	Total		76	132

RESULT OF THE FINDINGS

Information about the Participants

S/No	Institution	Year of Establishment	Rank	Years in service	Highest educational Qualification	Codes	Date & time of the interview
1	Federal College Education Katsina	1989	Collection development librarian	23	PhD	P1	4/1/2022 09:00-09:52am
2	Hassan Usman Katsina Polytechnic, Katsina	1979	Acquisition librarian	9	MLS	P 2	4/1/2022 2:00-2:45pm
3	Umaru Musa Yaradua University, Katsina	2006	Acquisition librarian	32	PhD	P 3	4/1/2022 11:12-12:00 pm
4	Alqalam University Katsina	2005	Librarian	31	MLS	P 4	4/1/2022 10:01-10:50 am
5	School of Nursing Katsina	1985	Librarian	32	BLS	P 5	4/1/2022 12:12-01:00 pm

The data collected on the information about the participants indicates the names of the libraries under study, year of establishment, the rank or position of the participants, years of service of the participants. The data also indicated the qualification of each participant from degree, Master of Library Science to PhD Library Science. P1, P3 have PhD in Library Science and P4 and P2 have master of library science while P5 is degree holders. The data also reveal the time and date the researcher conducted the interview.

Interview Data Analysis

Collection Development Policy in Academic Libraries in Metropolitan Katsina

This interview guide was designed to address objective number one and sub objectives which focuses on collection development policy.

Question: The researcher asked the participants the types of collection development policy they are using in their libraries.

Responses

From the qualitative data collected from the participants, it was revealed the type of CDP in academic libraries in metropolitan Katsina. P1and P2 revealed that their S1 is written; While P3, P4 and P5 revealed that their S1 is not written rather it is verbal because it is not documented.

Responses

P1 reported that their S3 covers user analysis, selection, acquisition, weeding and payments, P2 stated that their S3 covers user needs assessment, selection and acquisition while P3 stated that, if their S3 drafted it will cover all aspect with regard to resources development in the library while P4 reported that their guidelines which is just like the S2 covers selection, acquisition and weeding. P5 stated that their verbal guidelines cover acquisition.

The objective one aimed at determining the type of CDP used in academic libraries in metropolitan Katsina. The objective was accompanied with sub-objectives that include guidelines for writing CDP, coverage and level of adherence to the CDP. The study reveals that P1 and P2 have documented CDP; and three libraries P3, P4, and P5 have verbal policy. (Unwritten).

ISSN 2394 - 7780

It could be seen from the findings that those with written CDP were the oldest libraries among the study libraries. This means that those with unwritten CDP might have formulated their own after some years because they were not up to fifteen years of establishment. It should also be noted from this findings that, academic libraries in metropolitan Katsina doesn't give much emphasis to the advantage and importance of the policy as it prevent a library from been driven by events and individual enthusiasm, and from buying at random

Selection Process in Academic Libraries in Metropolitan Katsina.

This interview guide was designed to address objective number three and sub-objectives which focuses on selection process

Question: The researcher asked the participants whether their libraries have selection committee.

Responses
P1, P2 and P3 confirmed that there exist S7 in their libraries while P4 stated that their S7 rest in the hand of university library committee and P5 confirmed that they don't have such committee.

The researcher further asks the participants who are members of selection committee in their libraries.

Responses
P1 reported that their S8 are the librarian, collection development librarian, head of technical department, and Deans of schools while P2 reported that their S8 include the librarian, the professionals' staffs, head of acquisition unit, and representative from each department. P3 was on the opinion that their S8 are the librarian, Acquisition librarian, head of technical services, head of reader's services, and some members from institution library committee. P4 stated that their S8 is all members of the university library committee, and P5 revealed that their S8 rest with the librarian and the principal.

The researcher went further to ask the participants of the most used selection tools in their libraries.

Responses
P1 confirmed that their S9 are Publishers catalogue, vendors list and suggested list from lecturers. P2 revealed that their S9 are Publishers catalogue and vendor list while P3 reported that their S9 are Publishers catalogue, request from lecturers, and OPAC. P4 stated that their S9 are Publisher's catalogue and departmental list and P5 stated that their S9 are vendors list.

The researcher asked the participants the criteria for selection used in their libraries.

Responses
All the participants stated that, their S10 were, author's reputation, relevance, accuracy, as well as currency of information resources were the criteria adopted in selecting information items in their libraries.

Finding of this objective reveals that four of the studied libraries had selection committee that comprises of the library staffs and some teaching staffs including Head of Departments

It could also be observed that one of the advantages of having selection committee in libraries is that all stakeholders within the library community will have representatives so as to avoid bias when making selections of information resources with regards to prints and electronic resources.

Findings on this objectives also reveals that librarian, Head of Units in the library, professionals librarians, Deans/ HODs and University library committee were the members of selection committee in the study libraries.

4.2.4 Acquisition Process

This interview guide was designed to address objective number four and sub-objectives which focused on acquisition process.

Question: The researcher asks the participants what acquisition methods are used in their libraries.

Responses
P1, P2 and P3 stated that their S11 were conventional methods that include direct purchase, donation, gift, and downloading from the Internet. P4 is on the opinion that their S11 are through purchase, exchange gift, and donation while P5 stated that their S11 are through purchase gift and donations.

To explore more on acquisition methods the researcher asks the participants how frequent their library acquire information resources

ISSN 2394 - 7780

Responses:
P1, P2, and P3 revealed that their S12 is regular, but the major acquisition took place when TETFUND allocation came to the library while P4 stated that their S12 is regular but the major purchases is annually. P5 revealed that their S12 is occasional.

The researcher further asked the participants the criteria used in acquiring information resources.

Responses
All the participants indicated that, there S13 are credibility of author and physical qualities as criteria adopted before an item is to be acquired. All the participants also indicated that these criteria are applied to printed information resources especially books. P1, P2, P3 and P4 stated that there is no specific criteria adopted for electronic information resources because they subscribe to online databases that are well known.

The researcher asked the participants about responsibility for procurement of library materials?

Responses
P1, P2 and P3 confirmed that their S14 were management of the institutions while P4 reported that their S14 rest with the librarian and P5 reveal that the S14 is in the hand of the principal and the provost.

This objective was aimed at determining methods of acquisition employed by the libraries and to ascertain the periodicity of acquiring the resources. Finding reveals that, the studied libraries employ conventional methods of acquisition that include: purchase, exchange, gift and donation, Findings also reveal that, information resources are acquired regularly usually on annual basis. This means that information resources are acquired regularly, but the major ones took place annually.

CONCLUSION
The objectives of the study were to found out whether collection development policy are being practiced in the studied libraries. Information resources development/Collection development processes are the various stages that libraries are expected to follow in order to develop their collections. These stages are central to the ability of the library to meet patron demands. The results of this study have increased understanding on the processes of developing collections in the study libraries

RECOMMENDATIONS
The following recommendations are made with regards to the findings of the study:-

Those with unwritten collection development policy should formulate a written one in line with the libraries goals and objectives, and the policy document should be reviewed and revised regularly to meet the current challenges posed by technology. The collection development policy should also clearly spell how collections are developed right from budget; user needs assessment, selection, acquisition, and weeding. The libraries should also adhere to the policy document as it will protect the library against illegal, unethical or unreasonable acquisition.

The libraries should also engaged non-teaching staff in the selection process through their representatives and all Head of departments should be members of selection committee to avoid bias. They should also use OPAC as a tool for selection as current information resources were available online.

The libraries should add more effort to see that adequate collection are been provided for users and embraced bequeath, photocopying and internal generation as methods of acquisition. Responsibility for procurement of library information resources should be shifted from the management to the library itself. So also library objective should first be considered as a criterion for acquiring information resources.

The management of these libraries should employ more trained and qualified staffs particularly professionals who are knowledgeable to carry out collection development activities effectively. There is also the need for the management of these institutions to develop infrastructures and enlighten teaching staffs to be committed whenever the libraries seek their input on relevant collections to be added to the holdings of the libraries.

REFERENCES

- Evans, G. E. (2000). *Developing Library and information center collections 4th ed.* Englewood. colorado: library unlimited.
- Evans and Soprano (2005), Needs analysis and collection development policies for culturally diverse populations. *Collection Building,* 11 (4):pp. 16-27

ISSN 2394 - 7780

- Fourie, J.A (2001), *collection management and development: only study guide for P15305 –P. pretoric*: university of South Africa
- Ifidon, S. E. (2007). An assessment of collection development in Nigeria college of education libraries. *Nigerian library link* , 65-73.
- Kanwal, Ameen (2005). Issues of book acquisition in university libraries: A case study of Pakistan available at http://www.webpages.uidaho.edu/m-bolin/ameen.htm
- Ukejianya, C.R (2007) The role of effective collection development in the attainment of school libraries goals. *Nigerbiblios.* Vol. 18 (122) pp
- Van- Zijl, C.I *(2003) Developing and managing information collections for academics and researchers at University of Technology: A case study, unpublished PhD thesis of University of South Africa.*

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

EFFECTS OF COLLECTION DEVELOPMENT POLICY NON-IMPLEMENTATION IN NIGERIAN ACADEMIC LIBRARIES: A CASE STUDY OF HASSAN USMAN POLYTECHNIC LIBRARY

[1]Mohammed Tukur Lawal and [2]Dr. Badamasi Babangida Mohammed
[1]Research Scholar, Department of Library and Information Science, SRM Institution, Sonepat, Haryana, India
[2]University Librarian, ANAN University Kwall, Plateau State

ABSTRACT
The study is analysis "the collection development policy in Nigerian academic libraries: a case study of Hassan Usman Polytechnic Library*" Acquisition policy comprised of searching and gathering the quit sound information resources through either purchase, gift and donation, whereas information resources included; books, journals, magazines, newspapers, memos, government publication e-resources/digital resources etc. the study touches different angles for acquisition HUK Library, particularly on how such information are acquired and through which selection procedures that the library adopted in acquiring these resources and how effective these policy are in carrying out such activity. The research methodology used in the research was qualitative technique for gathering a reliable data, however the result of the findings from the respondents revealed that Information resources in the studied library are acquired through direct purchase, exchange, downloading from the Internet, gift and donation The major sources of funds are from TETFUND, the state government, and the management of institution However, the finding reveals that, there was no standard policy they used in the library. The libraries are generally faced with financial problems especially from the parent institutions, Lack of qualified staffs/professional staffs, Lack of cooperation from academic staffs and NGOs, Non adherence to collection development policy, Departmentalization and compartmentalization of subjects, Lack of information infrastructures and second hand acquisition*

INTRODUCTION
The library is the academic arm of the Institution to which the academics must relate for the satisfaction of their information needs. The library acts as the store house for instructional and research materials; it adopts measures to increase the accessibility of human and material resources with a view of making them useful to academics, staff and students.

The role of academics is to prosecute the tripartite functions of instruction, research and public service. To achieve these goals, the academics need a core collection of print and digital resources and other forms of recorded knowledge. Library collections are one of the major concern and integral part of library and information services provision. Any academic library that aims to satisfy the information needs of its patrons must be concerned with the development of its collections.

A number of problems associated with collection building in libraries which include but not limited to inadequate funding, lack of or non-adherence to collection development policy, periodic assessment of collections, improper acquisition etc. which are all important for effective resources development in libraries. It is against this background this research conducted to study Effects of collection development policy non-implementation in Nigerian academic library in Hassan Usman Polytechnic Library pass through to develop their collections.

The rationale for choosing this topic was born out of the importance of information resources development in library. Any library that aims to maintain its relevancy to its community of users must be developed and managed relevant collections to satisfy the needs of users, because the satisfaction of users is directly the satisfaction of the library

Statement of the Problem
Hassan Usman Katsina Polytechnic Library has undergone changes in the past in terms of academic programmes offered. Each change has brought about a higher level of education which in turn results into acquiring different information resources in the library to be able to meet the information needs of patrons. The importance of collection development policy (CDP) in a library is to clarify how collection of the library will be developed right from selection, acquisition, description and arrangement to evaluation. According to Johnson (2009), the policy document serves as a guide for selection and de-selection of materials (prints and electronic), and provide a sound foundation for future planning. Despite the importance of collection development policy in libraries, most libraries in Nigeria HUK inclusive have the existence of the CDP but appeared not complying with the policy when developing their collections, while little has no such policy.

ISSN 2394 - 7780

Hence, collection development and its policy is one of the major factors that enhance the development of a library and its collection, but unfortunately, it is no longer given proper attention. Some of the libraries that claim to have collection development policy do not implement it, while in some libraries, collection development policy is non-existing. This study will be undertaken to identify problems and effects hindering the implementation of collection development policy in academic libraries in HUK.

OBJECTIVES OF THE STUDY

1. Examine the type of collection development policy used by academic libraries in Hassan Usman Katsina Polytechnic.
2. Determine the causes of poor implementation of collection development policy in institution under study.
3. Determine the effects of poor implementation of collection development policy in library under study

LITERATURE REVIEW

Information Resources Development Process in Academic Libraries

Libraries strive to develop collections, resources, and services that meet the cultural, informational, educational, and recreational needs of their community. (Ifidon, 2007). Central to the ability of library to meet patron's demands is the collection of materials upon which its patrons and staff alike will draw. Evans, (2000). Collection developments in libraries passes through some stages before the collection are developed. It is a universal process in the world whereby library staff brings together a variety of materials to meet patrons demand. Evans (2000) describes collection development as a constant cycle

Types of Collection Development Policy

Collection development policy differs from library to library out there. There are basically two types of collection development policies".

Written Collection Development Policy

A written collection development policy came in form of a document, with the policy written in it. It acts as a guide to the library and ensures that adequate materials are provided for the library. A written collection development policy is seen as a contract between libraries and their users, and helps to know what to expect from the library. Collection development policy has several merits, it can be easily understood since it can be read and re-read as needed. Written policies are easier to distribute or exchange, it can be more equated, analyzed, or interpreted in training or orientation consistency of action is more likely with a written policy.

The written collection development policy is also unlikely to be misunderstood because it is more formal. The written policy is more likely to prevent inappropriate or undue community pressure or even pressure from influential people.

Unwritten Collection Development Policy

Unwritten collection development policy is not written down on any paper but only exist in the librarian mind, the unwritten collection development policy is easier to defend but every librarian should bear in mind that a good policy deals with an important, it is based upon a thoughtful analysis of parent institution, goals and objectives. It is considers what will be emphasized, available resources including personnel, focus on audience. It clearly stated in a few words as possible using Standard English Language with minimal professional jargon. The policy is reasonably stable that is, it should serve for three years or so without major change. A good policy is one that has been explained to those who will implement it.

Factors Affecting Collection Development Policy

The factors that affect collection development policy as enumerated by Okee. (2005), are:

Time to draw up: This is before it finally adopted by the library. All these processes are tedious which make many libraries to see it as waste of time.

Financial constraint: Drawing of a collection development policy has to do with a lot of financial involvement. The money involved can be exorbitant that the library sometimes considers using their funds for other things.

Some libraries lack awareness of the merits of collection development policy so they naturally don't see any need for it.

Population of the Study

Table 1 Population of the study

S/N	Respondents	Population
1	Professional Librarians	15

ISSN 2394 - 7780

2	Non-Professional Librarians	21
3	Total	36

Figure 1

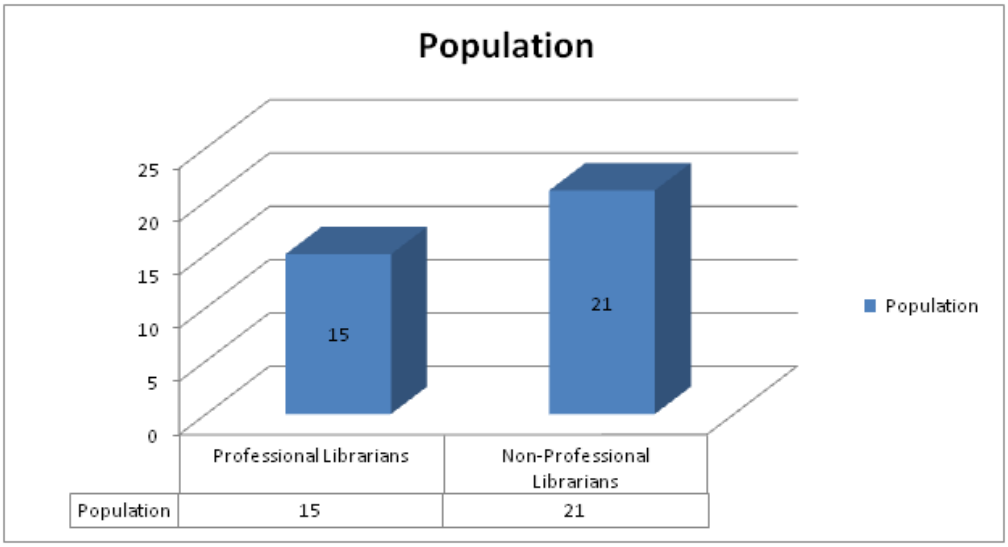


Table 1 and figure 1. Above presents the population of the respondents to determine the Effects of collection development policy non-implementation in Nigerian academic library in Hassan Usman Polytechnic Library, both professional and non professional staffs

FINDINGS OF THE STUDY

Interview Data Analysis

The following section discusses collection development librarians/acquisition librarian's response to each question and problems affecting collection development policy .

Collection Development Policy in Academic Libraries HUK, Katsina

The researcher asked the participants the types of collection development policy they are using in the library.

Responses

From the qualitative data collected from the participants, it was revealed the type of CDP in HUK Katsina. P1and P2 revealed that their S1 is written;.

Selection Process in Academic Libraries in HUK, Katsina.

The researcher asked the participants whether the library has selection committee.

Responses

they confirmed that there exist of such committee. The researcher further asks the participants who are members of selection committee in the library.

Responses

Reported that the committee are the librarian, collection development librarian, head of technical department, and Deans of schools, the professionals' staffs, head of acquisition unit, and representative from each department

The researcher went further to ask the participants of the most used selection tools in the library.

Responses

The respondents confirmed that there are Publishers catalogues, vendors list and suggested list from lecturers.

The researcher asked the participants the criteria for selection used in the library.

Responses

All the participants stated that, there were, author's reputation, relevance, accuracy, as well as currency of a material were the criteria adopted in selecting information.

. This support the opinion of Sani, (2011) who reported that selection responsibility lies in the hands of selection committee of the library. The findings also support the opinion of Ukejianya, (2007) and findings of Owolabi, , (2002), said that, selection of materials in library are done through appropriate selection committee.

ISSN 2394 - 7780

It could also be observed that one of the advantages of having selection committee in library is that all stakeholders within the library community will have representatives so as to avoid bias when making selections of materials with regards to prints and electronic resources.

Findings on this objectives also reveals that librarian, Head of Units in the library, professionals librarians, Deans/ HODs and Institution library committee were the members of selection committee in the study library. This is in line with the opinion of Aina, (2004), who reveals that Selection of materials is usually the joint responsibility of the library staff and academics in an academic institution. Responsibility should be clearly spelt out in policy statements. Because it could be library managers, subject librarians or people specifically appointed to develop and manage collections. (Van Zijl 2003). The finding also agrees with that of De Stefano (2001) whose reveals that librarians, working in a consultative relationship with academics, are in the best position to build library collections. The finding further reveals that publisher's catalogue, vendor list and suggested list from lecturers are the major tools for selecting relevant materials. This support what Adewuyi (2005) reported that, the most frequently used selection tools by libraries were publishers' catalogue and what Owolabi, and Akintola, (2009) revealed, that the major tools used in the selection of library materials are vendor lists and suggestions from lecturers. This means that the study library were not using OPAC as a selection tools despite its advantage.

On criteria for selection, finding reveals that author reputation, relevance, accuracy as well as currency of the materials were the selection criteria adopted by the study library. This shows that other selection criteria that include aims, scope, depth and special features as opined by Ifidon, (2007) where not been considered in the libraries.

From the findings, it could be seen that, selection as a concept under collection development cycle by Evans is being practiced in the study libraries. Furthermore the finding reveals that selection processes involved in the study libraries corroborate what many scholars posited, that standard selection of materials in libraries passes through some stages that include: clear policy on selection, selection committee, and appropriate selection tools. Example of such studies include: Aina, (2004), Van-Jizl, (2003), Sani. (2010) and Owolabi, and Akintola, (2009).

Acquisition Process
Question: The researcher asks the participants what acquisition methods are used in their libraries.

Responses
Responses by the respondents stated that there were conventional methods that include direct purchase, donation, gift, and downloading from the Internet.

To explore more on acquisition methods the researcher asks the participants how frequent the library acquire information resources

Responses:
it revealed that is regular, but the major acquisition took place when TETFUND allocation came to the library

The researcher further asked the participants the criteria used in acquiring information resources.

Responses
All the participants indicated that, there are credibility of author and physical qualities as criteria adopted before an item is to be acquired. All the participants also indicated that these criteria are applied to printed materials especially books

The researcher asked the participants about responsibility for procurement of library materials?

Responses
It was confirmed by the respondents that there were management of the institutions and librarian

Responsibility for Procurement of Library Materials

This objective was aimed at determining methods of acquisition employed by the libraries and to ascertain the periodicity of acquiring the resources. Finding reveals that, the studied library employ conventional methods of acquisition that include: purchase, exchange, gift and donation, this support the opinion of Onyekachi, (2007), who reveals that the most used acquisition methods by most libraries are: purchase, gifts and donation. The finding is in line with what Ifidon, (2007) stated that, every library adopts acquisition method that is most suitable to the parent organization. From the revelation of the five participants, the study libraries were not

ISSN 2394 - 7780

engage in photocopying, internal generation and cooperative acquisition methods of acquisition as revealed by Onyekachi, (2007).

Findings also reveal that, information resources are acquired regularly usually on annual basis. This means that information resources are acquired regularly, but the major ones took place annually. This findings support that of Nnadozie, (2006) who reveals that most academic libraries in Nigeria were non-committal in respect of periodicity, rather purchases and other methods of acquisition take place whenever the need arise or occasion present itself. Addition of relevant materials to the collection should be an ongoing exercise depending on the availability of funds, donors, and depositors. The study library adopts combination of different methods using two accepted criteria which are: credibility of author and physical qualities. This is in line with what Onyekachi, (2007) pointed out, that criteria for acquisitions should include: purpose or aims and objectives of the library, because type of library always determine the type of material to be acquired by the library, credibility of author in terms of credentials, existing library collections so as to avoid duplication, readability of the material with regards to language used, physical qualities such as format, binding, illustrations, index etc.

Problems of Collection Development

This part of the interview asks questions on problems associated with collection development in the study library.

Question: The researcher asked the participants the challenges associated with collection development in their libraries

Responses

The respondents stated that the there are shortages of funding, inadequate qualified staffs, and lack of cooperation from academic staffs, second hand acquisition, lack of written collection development policy, proliferation of courses and programs, non-documented acquisition policy, professionalism in staffing skills, non-charlatan attitude by copartners (academic staffs) because they are not helpful in terms of assisting the library with relevant items to be included in the collections, growing populations of users, and departmentalization and compartmentalization of subjects,

The finding agrees with some researches that reported inadequate funding, lack of professional's staff and second hand acquisition as the problems of collection development in libraries. Lack of cooperation from academic, staffs, non-adherence to collection development policy, inadequate infrastructure as well as departmentalization and compartmentalization of subjects were also problems for effective collection building in the study library

CONCLUSION

The objectives of the study were to found out the effects of collection development policy non-implementation in Nigerian academic libraries: a case study of Hassan Usman Polytechnic Library, whether collection development concepts are being practiced in the studied library. Information resources development/Collection development processes are the various stages that library is expected to follow in order to develop their collections. These stages are central to the ability of the library to meet patron demands. The results of this study have increased understanding on the processes of developing collections in the study library, sources of funds and problems that affect collection building.

RECOMMENDATIONS

The following recommendations are made with regards to the findings of the study:-

1) The library should adhere to the policy document as it will protect the library against illegal, unethical or unreasonable acquisition.
2) The library should also engaged non-teaching staff in the selection process through their representatives and all Head of departments should be members of selection committee to avoid bias. They should also use OPAC as a tool for selection as current information resources were available online.
3) The library should add more effort to see that adequate collection are been provided for users and embraced bequeath, photocopying and internal generation as methods of acquisition. Responsibility for procurement of library materials should be shifted from the management to the library itself. So also library objective should first be considered as a criterion for acquiring information resources.
4) Weeding of collections should be carried out time to time as this will serve as evaluating the collections.

ISSN 2394 - 7780

5) There should be an improvement in the funding of this library. The budget of these library should be directly controlled by the library itself so as to spend this money based on selected library materials. This will greatly assist the library in ordering and payments in time.

6) The management of these library should employ more trained and qualified staffs particularly professionals who are knowledgeable to carry out collection development activities effectively.

REFERENCES

- Adewuyi, O.W (2005), collection management practice in Nigerian University libraries: A study of six selected libraries in South-Western Nigeria *Gateway library Journal* Vol.8 (1/2) PP 69-80
- Aina, L.O (2004). *Library and information science text for Africa.* Ibadan: world information science ltd.
- De Stefano, P (2001) selection for digital conversion in academic libraries. *College and research libraries* Vol. 62 (1) pp. 48-69
- Evans, G. E. (2000). *Developing Library and information center collections 4th ed.* Englewood. colorado: library unlimited.
- Ifidon, S. E. (2007). An assessment of collection development in Nigeria college of education libraries. *Nigerian library link* , 65-73.
- Johnson, P. (2009). *Fundamentals of collection development and management.* USA: ALA.
- Nnadozie, C. A. (2006). collection development activities in selected academic libraries in Nigeria. *Nigerbiblios vol 17 (1-2)* , 22-27.
- Okoro, Okee. (2005), *A book of reading in library and information science* Owerri: Ihem Davis press.
- Onyekachi, Essien N, (2007), Acquisition for maximum benefit in libraries: issues and challenges. *Nigerbiblios*. Vol. 18 (122) PP 1-11
- Owolabi, K.A & Akintola, B.O (2009). A survey of collection development activities in Nigerian university libraries. *PNLA quaterly* Vol.
- Sani, S O, (2011) Current trends in collection development in Nigerian Libraries being a paper presented at the 5th national conference of college of administration and management studies, Hassan Usman Katsina Polytechnic, Katsina held on 23-27 may 2011
- Ukejianya, C.R (2007) The role of effective collection development in the attainment of school libraries goals. *Nigerbiblios.* Vol. 18 (122) pp
- Van- Zijl, C.I *(2003) Developing and managing information collections for academics and researchers at University of Technology: A case study, unpublished PhD thesis of University of South Africa.*

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

PRELIMINARY DATA REGARDING COPPER BIOACCUMULATION CAPACITY BY SUBMERGED PLANT *NAJAS GRAMINEA* DELILE

Ticuța Negreanu-Pîrjol[1*], Dan Răzvan Popoviciu[2*], Ioana-Eliza Stanciu[1], Bogdan-Stefan Negreanu-Pirjol
[1]Ovidius University of Constanta, Faculty of Pharmacy, Capitan Aviator Al. Serbanescu Street no. 6, Campus, Corp C, Constanta, 900470, Romania
[2]Ovidius University of Constanta, Faculty of Natural Sciences and Agricultural Sciences, 1, University Alley, Campus, Corp B, Constanta, 900470, Romania

ABSTRACT
Najas graminea Delile, known as ricefield water nymph is a species of underwater plant found in freshwater habitats, especially in calm or slow-moving waters such as ponds and rice fields. This opportunistic aquatic plant is becoming more and more common, including coastal lakes in Southeastern Europe. Individuals studied in this paper were from Tăbăcăriei Lake of Constanța city, Romania. Plants were grown in experimental aquariums with filtered freshwater supplemented with different concentrations of $CuSO_4$. Water samples were analyzed for pH, dissolved oxygen and electrical conductivity. Copper content was determined by atomic absorption spectrometry, flame technique. Photosynthetic pigments concentrations and final biomass were alo determined, as indicators of plant health. The results obtained in terms of oxygen, assimilation pigments concentration and dry biomass, indicates the existence of moderate stress induced by copper phytotoxicity, but without direct effects on plant biomass, indicating tolerance to selected copper concentrations. Following this experiment, it can be stated that the potential use of Najas graminea Delile species as a bioaccumulating aquatic plant requires further investigations.

Keywords: Najas graminea Delile, submerged plant, copper, bioaccumulation, AAS

INTRODUCTION
Heavy metal pollution is a major environmental issue, due to the extensive toxic effects on various ecosystems. Main sources of such pollution are geological sources, mining industry and metallurgy, pesticide and dye industry, waste piles etc.

Copper metal is one of the main such pollutants. Under certain concentrations, it is a valuable microelement to plants. It is a component of plastocyanin, it plays a role in binding several components of the photosynthetic system and also in electron transport in plant photosystems. Copper also helps maintaining the normal structure of chromosomes (Maksymiec, 1997).

However, copper is also a more and more common pollutant, due to its many uses in industry and agriculture (such as copper-based pesticides). Excess of copper stimulates chlorophyll synthesis while inhibiting leaf development. A high amount negatively affects thylacoid structure. It also affects DNA conformation, hindering cell division. It enhances lipid peroxidation and induces abnormal senescence in leaves and inhibits elongation growth of plant organs (Maksymiec, 1997).

Najas graminea Delile (ricefield water-nymph; Hydrocharitaceae family; Fig. 1) is a submerged water plant. It has long, branched stems (up to 60 cm), with gracile, linear-lanceolate leaves. It is monoecious and pollinated by water (Huxley, 1992). The optimal flowering season is July-September. Roots may become long, creeping in soft mud (Holm et al., 1997). A native plant of Africa, Middle East, Mediterranean areas, South and Central Asia, Papua and Australia, becoming increasingly invasive plant throughout the world. Populating various types of still and slow-moving waters, ponds, paddy fields (Triest, 1988) is more and more widespread in the Balkans (Lannsdown et al., 2016).

The paper aim was to assess both the capacity of the *Najas graminea* Delile submerged plant species to bioaccumulate copper from the aquatic environment and its tolerance to high copper levels, in experimental conditions.

ISSN 2394 - 7780

(a) (b)

Fig. 1. *Najas graminea* Delile species, fresh plant (a) in Tăbăcăriei Lake of Constanta, Romania and after oven (b)

MATERIALS AND METHODS

Najas graminea Delile plants, were collected from Tăbăcăriei Lake, a 99 ha coastal lake in North of Constanța city, Romania. The plants were moved to five 3 L laboratory aquariums, filled with filtered lake water from Tăbăcăriei Lake, supplemented with copper, added as $CuSO_4$ up to a total copper concentration of 0, 100, 250, 500 and 1,000 mg/L, respectively. Each aquarium contained 10 g plants (wet weight). The experiment was conducted for 28 days. Aquariums water parameters were analyzed weekly, including *p*H, total dissolved oxygen and electrical conductivity, using a multiparameter water quality meter (EDGE, Hanna Instruments).

At the end of the experiment, plants were also analyzed. A quantity of 0.1 g from each batch were ground in 80% acetone, filtered and analyzed with a WPA S106 UV-Vis spectrophotometer (absorbance read at 470, 647, 663 nm wavelengths). The concentrations of chlorophyll *a*, chlorophyll *b* and total carotenoids were determined using trichromatic equations (Negreanu-Pîrjol et al., 2019; Negreanu-Pîrjol et al., 2017). The rest of the plant samples were dried at 80 ºC in a period of three days, for dry biomass determination.

A quantity of 0.25 g of each dry vegetal sample was digested in 5 mL concentrated HNO_3 and boiled at 150ºC. 2 mL H_2O_2 (30%) were added and boiled again. The resulting solution was diluted up to 50 mL (with 2% NH_4Cl and 0.5% $CaCl_2$). Copper HR-CS AAS ContrAA700, Analytik Jena AG, Germany, acetylene-air flame technique was reading at 324 nm wavelength (Popoviciu et al., 2018; Popoviciu et al., 2016; Bucur Arpenti et al., 2014). Aluminium concentrations from the plant tissues, has been calculated and expressed as mg/kg.

The biological accumulation coefficients (BAC), were also calculated as ratios of tissular Cu to background water Cu concentrations (Nazir et al., 2011).

RESULTS AND DISCUSSION

Water *p*H emphasized weekly variations, with a tendency towards alkalinization, especially in samples with lower copper content (Fig. 2).

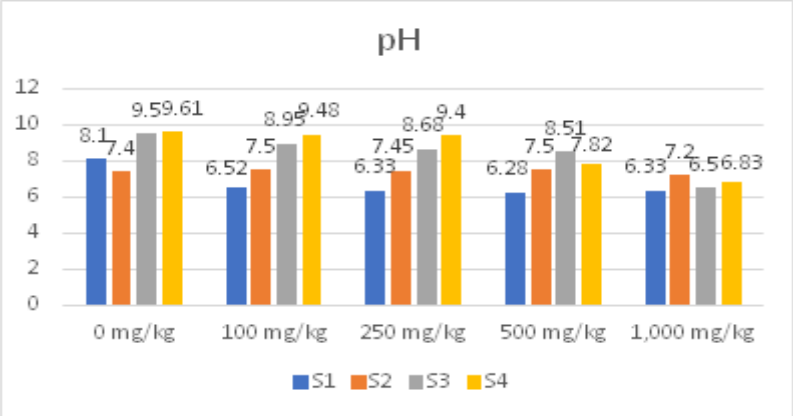


Fig. 2. Weekly water *p*H evolution in experimental aquariums with different copper concentrations.

ISSN 2394 - 7780

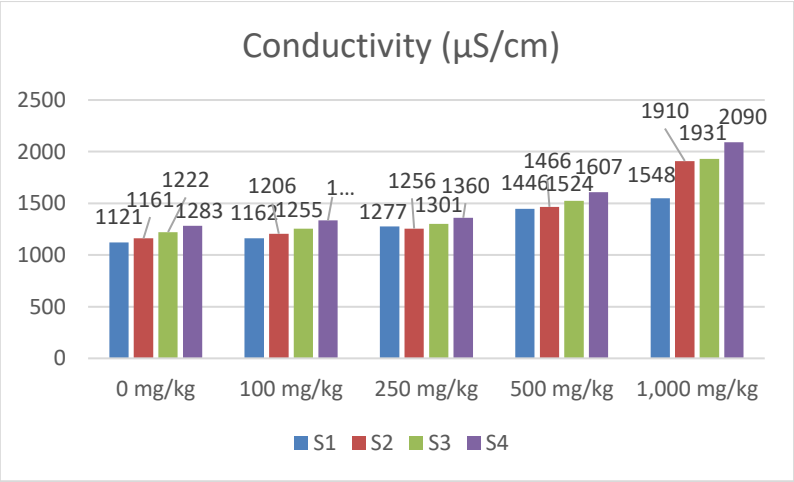


Fig. 3. Weekly water conductivity evolution in experimental aquariums with different copper concentrations.

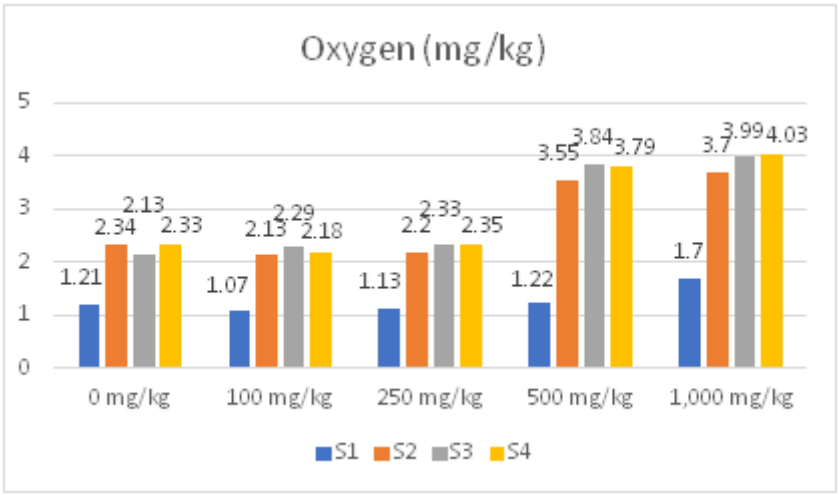


Fig. 4. Weekly water dissolved oxygen evolution in experimental aquariums with different copper concentrations.

Water conductivity (an indicator of dissolved compounds amount) also showed an increased over time, with a maximum value above 2,000 µS/cm (at 1000 mg/kg Cu; Fig. 3).

Dissolved oxygen increased in contaminated water, up to 4.03 mg/kg. The lowest values were found in aquariums with low copper levels. A progressive increase in dissolved oxygen over time can be linked to plant photosynthetic activity. Thus, high copper levels triggered an increase in photosynthesis in *Najas graminea*.

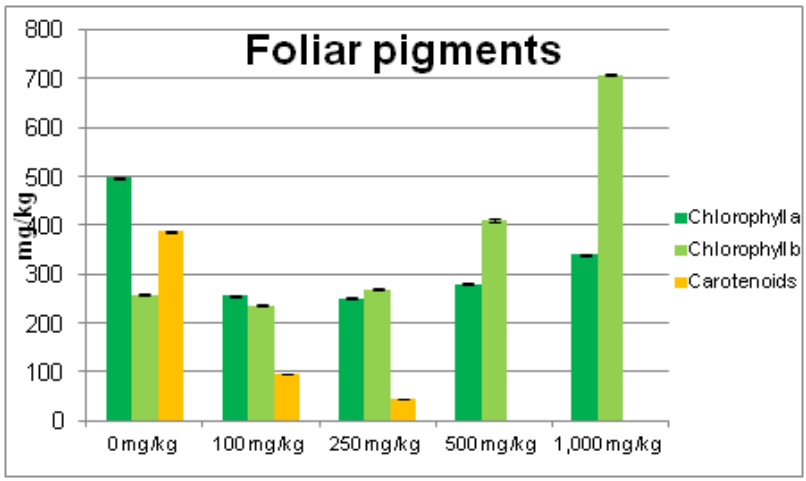


Fig. 5. Concentration of foliar pigments in *Najas graminea* plants at the end of the experiment, for each background copper concentration.

ISSN 2394 - 7780

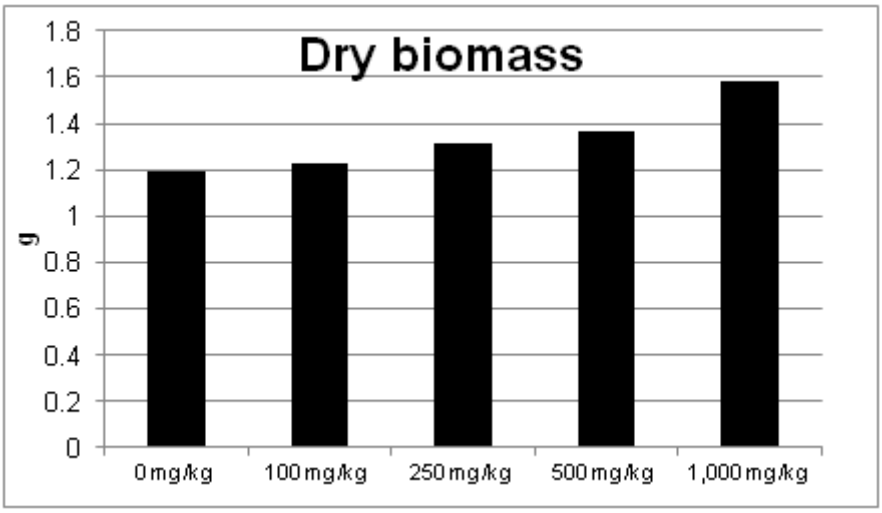


Fig. 6. Dry biomass of *Najas graminea* plants at the end of the experiment, for each background copper concentration.

Foliar pigments had a diverse evolution, depending on copper contamination. Chlorophylls and especially chlorophyll b synthesis, was favoured by high background levels (500-1,000 mg/kg). Carotenoids, on the other hand, showed a major decrease, from 387 mg/kg to below detection limits (Fig. 5). The concentration of the different pigments affects the photosynthetic process being a good indicator of plant health and physiological stress. No major differences were observed in biomass, that even had a tendency to be higher at 500-1,000 mg/kg Cu (Fig. 6).

Table 1. Tissular copper concentrations in *Najas graminea* plants and Biological Accumulation Coefficients (BAC)

Background copper concentration (mg/kg)	Tissular copper concentration (mg/kg)	BAC
0 mg/kg	9.02	-
100 mg/kg	41.56	0.4156
250 mg/kg	82.14	0.32856
500 mg/kg	267.74	0.53548
1000 mg/kg	914.22	0.91422

When assessing plant phytoaccumulation, there are several comparison standards. There is the „standard reference plant", an average concentration of various chemical elements in known World vegetation. For copper, the standard reference level is 10 mg/kg (Popoviciu et al., 2018), lower than in all *Najas graminea* samples at background Cu concentrations above 100 mg/kg.

Second, there are the minimal thresholds for copper hyperaccumulation. Many authors accept 1,000 mg/kg, with an alternative proposal of 300 mg/kg (Popoviciu et al., 2018). Only the samples taken at 1,000 mg/kg background Cu exhibited values above the latter threshold, implying a minimal limit for copper hyperaccumulation between 500-1,000 mg/kg environmental concentration.

Finally, there is the BAC, with some specialists proposing a BAC classification scale ranging from non-accumulating plants (<0.01) to low accumulating (0.01-0.1), moderately accumulating (0.1-1) and hyperaccumulating plants (>1; Sekabira et al., 2011). Thus, *Najas graminea* Delile plants can be considered a moderate copper accumulator, but not a hyperaccumulator. However, it should be noted that BAC is a coefficient designed primarly for land plants, as a ratio of metal concentration in plant dry mass versus that in soil dry mass. Extrapolating it to aquatic environments can be troublesome, since it would imply a dry mass to water mass ratio.

CONCLUSION

The evolution of oxygen amount in water, photosynthetic pigments and dry biomass emphasize the existence of a moderate physiological stress induced by copper phytotoxicity, without hindering plant growth. This indicates that *Najas graminea* is a copper-tolerant plant, at least up to 1,000 mg/kg background concentration.

ISSN 2394 - 7780

Taking into consideration absolute tissular copper concentration, this species can be characterized as a hyperaccumulator at 1,000 mg/kg, but not according to BAC values, which were all subunitary.

However, even non-hyperaccumulating plants can be used as stabilized environmental pollutants on a long term. Further research is needed in order to precisely assess this species potential.

REFERENCES

- Bucur Arpenti M., Negreanu-Pîrjol T., Ehlinger T., Paraschiv G.M., Tofan L. (2014). Heavy Metal Content Analysis of Siutghiol Lake Water and Sediment to Assess its Pollution Level, Rev. Chim. (Bucharest), 65(9): 1108 – 1113.
- Holm L., Doll J., Holm E., Pancho J., Herberger J. (1997). World Weeds: Natural Histories and Distribution. John Wiley & Sons, Hoboken.
- Huxley A. (1992). The New RHS Dictionary of Gardening. MacMillan Press, New York.
- Lansdown R.V., Anastasiu P., Barina Z., Bazos I., Çakan H., Caković D., Delipetrou P., Matevski V., Mitić B., Ruprecht E., Tomović G., Tosheva A., Király G. (2016). Review of alien freshwater vascular plants in South-east Europe, Rat M., Trichkova T., Scalera R., Tomov R., Uludag A. (eds.), ESENIAS Scientific Reports 1. State of the Art of Alien Species in South-Eastern Europe, Novi Sad, Serbia, University of Novi Sad, pp. 137-154.
- Maksymiec, W., 1997. Effect of Copper on Cellular Processes in Higher Plant Photosynthetica, 34(3): 321-342.
- Nazir A., Malik R.N., Ajaib M., Khan N., Siddiqui M.F. (2011). Hyperaccumulators of heavy metals of industrial areas of Islamabad and Rawalpindi. Pak J Bot, 43(4): 1925-1933.
- Negreanu-Pîrjol B.S, Negreanu-Pîrjol T., Sîrbu R., Popoviciu D.R. (2019). Bioaccumulation and effects of aluminium on plant growth in three culture plants species. Rev. Chim. (Bucharest), 70(2): 602-604.
- Negreanu-Pirjol B.S., Negreanu-Pirjol T., D.R. Popoviciu (2017). Copper, Manganese and Zinc Bioaccumulation in Some Common Poaceae Species Along Romanian Black Sea Coast, Rev. Chim. (Bucharest), 68(11): 2488 – 2491.
- Popoviciu D.R., Negreanu-Pirjol T., Bercu R. (2016). Copper, Chromium, Zinc and Manganese Accumulation in Three Common Brassicaceae on the Romanian Littoral, Rev. Chim. (Bucharest), 67(4): 670 – 672.
- Popoviciu D.R., Negreanu-Pîrjol T. (2018). Copper, manganese and zinc bioaccumulation in three common woody species from Black Sea coastal area, UPB Sci. Bull., Ser. B, 80(2): 49-56.
- Sekabira K., Oryem-Origa H., Mutumba G., Kakudidi E., Basamba T.A. (2011). Heavy metal phytoremediation by *Commelina benghalensis* and *Cynodon dactylon* growing in urban stream sediments. Int J Plant Physiol Biochem, 3(8): 133-142.
- Triest L. (1988). A revision of the genus *Najas* L. (Najadaceae) in the Old World. Koninklijke Academie voor Overzeese Wetenschappen, Bruxelles.
- Yruela I. (2005). Copper in Plants. Brazilian Journal of Plant Physiology. Brazilian Journal of Plant Physiology, 17(1): 145-156.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

WATER HYACINTH AS NITROGEN RICH COMPOST & SOURCE OF ENERGY: A REVIEW

Ramsing Thakur and Dr. Rahul Barjibhe
Department of Mechanical Engineering, SSGBCOET Bhusawal, MS, India

ABSTRACT
Water Hyacinth (WH) are free floating plants becomes a problem in Water bodies. This paper tries to focus on study on different ways to use WH as a source of fertilizer in agriculture and as alternative energy source. This literature review clearly mentioned that WH are rich in Nitrogen up to 3.2% of Dry Mass (DM) and have Carbon to Nitrogen (C:N) ratio 15. WH can also use as Biomass and produce Biogas. The Slurry from biogas plant after production of Biogas can be use as fertilizer. Fertilizers obtain from WH improves Quality of soil as it provides nutrition to soil. Composting is an efficient way to use WH because of its high Nitrogen content. In many developing countries WH found which grows naturally so no new harvesting method required and can be use as compost because of its decomposed structure. Because of ever growing need of fertilizers in agriculture WH can be a efficient Compost to fulfill the need. WH has very high protein content which can be use as fodder to animals along with some additives in it.. Silage can be done using finely chopped WH. It avoids anaerobic mould formation during fermentation. Sun drying is best pretreatment can be done on WH which reduces water weight from WH and causes small loss in its nutrition. Transportation is one of the biggest problem in utilization of WH. Due to its water content and water weight so Sun drying is an economical way to reduce water content and weight of WH and makes it easy to transport. As harvesting of WH is quite easy which does not require much efforts, manpower so WH can be a fruitful source of fertilizer and energy in developing countries.

Keywords: — Water Hyacinth, Compost, Energy Source, Silage.

I. INTRODUCTION
WH (Eichhornia Crassipes) is free floating hydrophytes which grow together on water bodies to form mat like structure. Roots and rhizomes of WH are submerged in water. This study tries to focus on importance of WH as integrated solid waste management and aquatic weeds management. The compost obtains from WH increases nutrition contains in soil. And also improve water carrying capacity of soil. It also helps to reduce plant diseases and pest. It increases agricultural productivity of soil. The use of WH as compost improve growth of crop and fruit yielding capacity and quality of crop [Andesina 2011].

WH also known as 'Blue Devil' grows rapidly on stagnant water bodies like ponds, Streams and backwater of dams etc [Center et al. 1999]. Growing mat of WH reduces the sunlight which will reach at bottom of WH, reduces the growth of algae which is food to aquatic animals also causes oxygen fluctuation and raises temperature of water [Anjanabha and Pawan 2010]. Water content in WH is high up to 92.8%, The ash content is 417 gkg^{-1}, total organic carbon found is around 338 gkg^{-1}, Nitrogen -9.5 $gkg^{-1,}$ C:N ratio is 36:1 and Phosphorus 5.4gkg^{-1} [Ayesha and Padmaja 2010].

Dried WH can be directly use in agriculture field as it is high in nutrition's. This plant retains most of its nutrition when dried. WH can be converted into ash and mix with soil it enhances the biological, chemical, and physical properties of soil [Gunnarsson and Peterson 2007].

Growth of WH is mostly double in just two weeks. The seed production by a single plant is tremendous and it remain viable for nearly 30 years. The wind and flow of water stream helps to spread water hyacinth. In India water hyacinth becomes problem to water bodies as in many cities government is spending money to remove WH from stagnant river water. The peoples leaving in that area suffers due to insects and mosquitoes whose number increases due to presence of WH. Presence of WH in river affect the environment and biological system of river it also creates problem to boats and fisherman. The mat of WH covers the surface of water bodies which causes fluctuation of oxygen causes to reduce fishes in infected area. For the management of WH we can use it as green manure and source of energy is an effective way.

II. WATER HYACINTH
The growth of WH over water bodies is very fast and it almost double in seven days in favorable conditions which are high temperature and humidity. The presence of WH is more common in tropical and subtropical countries. The mixing of sewage water in fresh water bodies enhances the growth of WH. Ethanol can also be produce from WH so it is having potential to become source of energy. The WH also uses wind velocity to spread over water bodies. Mechanical harvesting is best method to control over WH but it is expensive and time consuming. Advantages of mechanical water hyacinth are it gives immediate result without damage to the

ISSN 2394 - 7780

ecosystem. These water bodies can be used for agriculture water supply. Mechanical method can be applied for both open as well as close water bodies [Aweke 1993].

III. TREATMENT ON WATER HYACINTH

A. Drying:

This is most effective pretreatment as drying can be take place directly in sunlight which reduces water weight from WH, however steam can be use to dry WH [Patel 1993]. Treated WH to temp 50, 100, 121 ^{0}C with steam. He also noticed that process of bio methanation is maximum when WH are pretreated at pH 11 and temperature 121 ^{0}C.In case of machine drying the important parameters are finale moisture content, moisture ratio, drying rate, tensile strength. The number of passes made by air also has importance in drying rate.

B. Silage:

Silage can be defined as grass or other green fodder compacted and stored in airtight conditions, typically in a silo, without first being dried, and used as animal feed in the winter. In Vietnam good quality grass is not readily available and becomes very scarce during summer. At the same time, starch and protein sources become more expensive to feed to animals. A number of non-conventional feed resources such as cassava foliage, sugarcane tops, maize, including WH are available in Vietnam and have become more interesting to use the min dry season [Devendra 1985].For making the silage chopped crops are put into a "pit" and packing it down well so that any oxygen pockets are eliminated. Oxygen pockets encourage spoilage of the feed. aerobic-loving bacteria turn it into a brown to black slimy mess, that often smells like tobacco or burnt caramel. If silage of poor quality is fed to the cow the milk of cow can have bad odor. Silage can be performed by finely chopped water hyacinth which avoids anaerobic mould formation during fermentation. Before fermentation WH are pretreated by acid hydrolysis and detoxification because it is difficult to convert hemicelluloses to xylose. For fermentation low pH (below 4) value is desired. Normally WH have 0.52% of fermentable sugar so addition of 0.4% of sugar relation to fresh weight is enough to reach the desired pH value (Bolenz 1990).

Ho Than Thamp (2013) studied the effect of combination of WH along with rice straw and cotton seed cake as silage on feed to cattle he concluded that use of WH feed to cattle along with rice straw resulted in a decreased rice straw intake. The presence of crude protein content of WH, rice straw and cotton seedcakes were 174, 53 and 370 g/kg DM, respectively. Digestibility of Organic Matter, Crude Protein, Neutral Detergent Fiber and Acid Detergent Fiber enhanced with increasing level of WH offered in silage. It is recorded that WH at levels of at least 50% of the diet has the potential to support Metabolism Energy for reasonable Live Weight gains in cattle. Increase in level of WH in diet of cattle increases digestibility of Nutrients. The Crude Protein content and its digestibility increased with increase in level WH in silage. During deficiency of high-quality feeds in the summer season, WH can prove itself as viable alternative in ruminant diets.

C. Fodder:

WH can useas fodder for animals with addictive like rice branand stalk. Green leaves of WH can be mix with another food supplement. The leaves have to chop then it can be digesting easily. It is also noted that WH contain crude protein, crude fat and minerals. The nutrient value can be increased by mixing WH with molasses. In china WH boil along withvegetables waste and feed to pig and same practices are done in Malaysia fresh WH is cooked with rice bran and feed to fish pond and ducks [Indulekha 2019].

D. Sewage Water Purifier:

As WH floats freely on water bodies and takes all its vital nutrients directly from water. WH mainly grows in nutrients enrich fresh water in tropical climate zone. WH withdraws heavy metal from water which includes Cd, Ni, Pb and Hg. It also removes toxins and cyanides and arsenic from drinking water. A four week study was carried out on WH to check it as a water purifier which shows WH progressively absorbed nutrients from sewage up to the fourth week and signs of toxicity were observed through wilting along with loss of turgidity and reduction in count of leaf. The maximum efficiency of the WH with some adoptions to remove pollutants (nutrients) from raw sewage was enhanced by 93%

[Ayade 1998].

Bin Lu (2018) performs experiment on removal of water nutrients by different aquatic plant species to make rivers pollution free. The aquatic weeds he selected were water hyacinth, water lettuce, myriophyllum spicatum. The result was, removal efficiencies of chemical oxygen demand (COD) by the water hyacinth, water lettuce, and Myriophyllum spicatum ponds were 68.21%, 61.70%, and 62.55%, respectively. The WH pond had the highest removal efficiency of COD, because of its richest root system. It was concluded that roots of aquatic weeds provide a suitable environment for aerobic microorganisms to degrade organic matter and nutrients into inorganic compounds, which are then utilized by the plants. It is also noted that WH achieved the highest

ISSN 2394 - 7780

removal efficiency for Total Nitrogen (89.4%) and Ammonia Nitrogen (99.0%), and water lettuce possesses the highest removal efficiency for total phosphorus (93.6%) during the static experiment performed. Y B Ho (1994) concluded that It is concluded that WH improves the quality of wastewater in small-scale sewage treatment plants and it is recommended that frequent harvests of WH would increase the treatment efficiency of sewage water treatment plant. This method is effective especially during the active growing season with high temperatures coupled with intense solar radiation and humid air condition which enhance growth of WH.

E. Fertilizer and Compost:

WH can be a good fertilizer. This plant is ideal for composting. Fresh WH plant contain 90 to 95% moisture. After drying of WH it can be mix along with ash, soil and

some animal manures. Microbial decomposition breaks down fats, lipids, protein, sugar and starches. The warm environment in tropical countries enhances the process of decomposition. The composting obtain from WH enhances soil fertility and crop yielding capacity and improve quality of soil. The result of WH compost is better than chemical fertilizer. WH has significantly high Nitrogen (3.72%) and potassium (2.86%) content which proves it as a good micronutrient fertilizer. Decrease in C:N ratio is problem for composting which leads to loss of nitrogen via ammonia volatilization. It is also concluded that optimum C:N ratio for microbes is somewhere between 15 to 30 [Haung 1993]. Some researcher claims that optimal C:N ratio lies between 20 to 40 for bacterial decomposition [Polpraser 1980 and Gunnarsson 1997]. C:N ratio of water hyacinth is given in below table-I

Table-I:- C:N ratio from different source

Researchers	Polprasert	Gunnarsson	Abdel h-amid	Dalz e-ll
Year	1980	1997	1991	1979
C:N	15.8	23.5	16	20

Chemical analysis of WH can be done on availability of crude protein, ether extract, nitrogen free extract, ash and presence of calcium, phosphorus and other elements. Table-II shows comparison of values of these parameters available from different sources. The values are in form of percentage of Dry Mass (%DM).

Table II:- Chemical Analysis of WH from different sources.

Parameters	Agrawala 1988(%DM)	Patel 1993(%DM)	Ayade 1998(%DM)
Crude Protein	13.9	11.9	11.5
Ether Extract	2.3	----	----
Crude fiber	19.8	25.6	20.5
Nitrogen free Extract	32.1	----	-----
Ash	31.9	20.2	-------
Calcium	1.42	-----	------
Phosphorus	0.59	-----	0.29
Sulphur	-----	------	0.33
Magnesium	-----	-----	2.0
Hemicellulose	-----	42.4	-------

The important nutrient requires to improve quality of fertilizer are Nitrogen, Phosphorus and Potassium which are present in WH compost. Addition of WH compost to the soil increases level of extractable Nitrogen, Phosphorus and Potassium in the top 250 cm soil. It is also found that WH compost increases productivity of sesame crop in Egypt (Abdel-Sabour 1996).

WH can be prove themselves as effective green manure. If it is just sprayed on soil and after some days it mixes with ash, soil and animal manure. Microbial decomposition of WH breaks down the fats, lipids, proteins, sugars and starches. In developing country where mineral fertilizers are expensive WH manure can replace them. The nutrients in compost do not run away with rain water they remain available to plant and enhance disease resistant capacity of plant.

WH when use as biofertilizer in wheat crop agricultural fields it increased the production of the wheat from plant. Study done by Majid (1983) have reported enhancement in yield/plant in rice, corn, sesame, brinjal, onion and gourd, using WH compost. Majid (1980) & Majid (1992), reported the increased yield in above plants with

ISSN 2394 - 7780

both compost as well as manure of WH used in combination with other aquatic weeds. Gunnarsson & Petersen (2006) also reported that use of compost from WH material could serve as quality manure for improving fertilityand condition of soil and thus enhances crop yield capacity of plant. Enhanced effects of WH compost have been reported by Kayum(2008) on productivity of tomato crop. It is noted that increase in productivity of crops by plant is due to availability of nitrogen provided by the WH compost or manure. The availability of nitrogen increased due to release of nitrogen from WH during the process of mineralization. This is also reported by Contantinides and Fownes (1994) who mentioned that quality and quantity of added organic materials into soil may enhances rate of decomposition and process of mineralization. The same reporting is done by Widjajanto (2001). The increase in the growth attributes of wheat seedlings after provision of WH manure may be due to the enhancement in physical and biochemical properties of the soil as has been reported by Lata &Veenapani (2011).

Sharda (2014) perform experiment on WH green manure and notice that the application of water hyacinth manure had significant influence on the growth attributes and yield of the wheat plant when compared to no WH manure supplied control plot. There was a significant increase in the percentage of germination, fresh weight, dry weight, biomass, root and shoot length when compared to control plot with no supply. For the experimentation she uses twenty plastic pots of equal sizes and divided equally for control as well as experimental sets. The water hyacinth manure was mixed with garden soil (1:1 ratio) and filled in the pots. Fifty wheat seeds were sown in these pots and were allowed to germinate for fifteen days. A control set without manure was also maintained along with for the equal duration.WH was collected from the water garden of Smt. C. H. M. College at Ulhasnagar India campus. About 3 kg of the plant material was chopped into small pieces and composted in soil for forty-five days under shade. Water was sprinkled after every layer in order to maintain moisture content. The manure was mixed with soil and used for treatment studies

Adesina (2011) reported that application of mineral fertilizer and compost of WH along with Neem had significant effects on the performance of cucumber. He supplied fertilizers to control plots in form of 60 kg N/ha through NPK (MF), 60 kg N/ha through Neem compost (NC), 30 kgN/ha through NPK + 30kg N/ha through Neem compost, 60 kg N/ha through water hyacinth compost,30 kgN/ha through NPK + 30kg N/ha through water hyacinth compost and no fertilizer supplied to last control plot. After study of 8 week after sowing combined application of 30 kg N/haMineral Fertilizer (MF) + 30 kg N/ha through Neem Compost produced the longest vine (132.67 cm), second one of (122.33 cm), which was produced by 60 kg N/ha MF, and the shortest vine was produce from the control plots that received no fertilizer. This study also mentioned importance of WH compost with additives like Neem.

IV. DISCUSSION AND CONCLUSION

Nitrogen content in WH lies between 1.2% to 3.2% on dry matter basis so compost obtain from WH can replace expensive mineral fertilizer in developing countries and increase productivity of agricultural field.

Management of WH involves the processes of harvesting, transport, pre-processing and processing. To Harvest WH from water bodies a method must be develop as supply of WH is unlimited, depend on availability of water in water bodies. Considering per hector production of WH it is nearly 140 Ton of DM (Abdelhamid and Gabr 1991). For large scale harvesting specially design machine can be employed to remove WH from water. For small scale harvesting by hand is preferred as it is easy and inexpensive compare to machine harvesting. WH can be collect manually from shores of water bodies as they come on shores due to wind.

Presence of WH mats on surface of water bodies causes to spread disease like malaria and bilharzias so harvesting can provide relief on the spread of these diseases. Harvesting also provide relief to the ecosystem of water bodies. Harvesting also tends to more open water surface tends to reach more sunrays to depth of water and growth of algae which is food to aquatic animals results in more biodiversity in water bodies. Removal of WH also makes ease to fisherman to catch fishes, which will improve economical condition of fisherman.

Sun drying process is much effective and inexpensive process compared to the steam drying. Drying of WH gives an option to store WH and use them whenever required, it reduces water weight of WH without losing much of its nutrients and make their transport easy. Cutting of WH is again essential for anaerobic digestion. Anaerobic process can give sludge and gas. Gas can be use for cooking and other applications. The presence of fresh water in WH helps in process of composting in hot and evaporative environment in tropical countries.

To meet evergrowing demand of energy we can use WH as source of biomass. In many developing countries WH are available in adequate quantity by using them as compost and source of biomass. In many developing countries WH are available in adequate quantity by using them as a source of biomass it can provide relief on waste management of WH. WH can also use as pond cleaning agent along with some additives as it having

ISSN 2394 - 7780

property of absorb toxins from water. The WHare good absorber of nitrogen, phosphorus and potassium from water.Its utilization may become a way of its management. WH also improves quality of water by reducing pollutant and salt content in it. Use of WH as silage may provide protein rich nutrition to animals in deficiency of green grass especially in summer season of tropical countries. Some additives along with silage improve quality of milk of cattle.

Increase in growth of WH itself become problem to the environment and mechanical control over them is not feasible option to get rid of WH so use of WH as compost, silage, fodder and as biomass will provide solution to management of WH as describe in this paper.

REFERENCES

[1] Andesina G O, Akanbi W B, Akintoye O S, (2011) Effect of water hyacinth and neem based compost on growth, fruit yield and quality of cucumber, African Journal of agricultural research 6(31) 6477-6488.

[2] Abdel-Sabour, M.F., AboElSeoud, M.A., 1996. Effects of organic waste compost addition on sesame growth, yield and chemical composition. Agriculture, Ecosystem and Environment 60,157-164.

[3] AbdelhamidA.M., Gabr, A.A., 1991. Evaluation of water hyacinth as feed for ruminants. Archives of Animal Nutrition (Archivfuer Tierernaȕhrung) 41(7),745–756.

[4] Agarwala O N, 1988. Water Hyacinth (Eichhornia crassipes)Silage as Cattle Feed, Elsevier Applied Science Publishers Ltd, England.24 (1988) 71-73.

[5] Anjanabha T D , Pawan K (2010) Water hyacinth as a potential bio fuel crop. Elect. J. Environ. Agric. Food Chem., 9(1)112-122.

[6] Ayade B. B., (1998), Development of Toxicity Tolerant Water Hyacinth (Eichhornea crassipes) for Effective Treatment of Raw Sewage. Acta Biotechnol, 18 (1998) 1.43-50.

[7] Ayesha Parveen A. and Padmaja C.K. (2010). Bioconversion of municipal solid waste (MSW) and water hyacinth (WH) into organic manure by fungal consortium. J. Sustainable Develop., 3(1),91-97.

[8] Aweke G., (1993). The water hyacinth (Eichhornia crassipes) in Ethiopia Bulletindesseances. Acade´mieroyaledesSciencesd'outre-mer, Brussels39(3),399–404.

[9] Bin Lu, Zhongshuo Xu, Jianguo Li, Xiaoli Chai2018 Removal of water nutrients by different aquatic plant species: An alternative way to remediate polluted rural rivers, Ecological Engineering110 (2018) 18-26

[10] Bolenz S., Omran H., Gierschner K., 1990. Treatments of water hyacinth tissue to obtain useful products. Biological Wastes 33(4), 263–274.

[11] Center, G A Dray, G P Jubindsky, M J Drodowitz (1999) Biological control of Water hyacinth under conditions of maintenance management: can herbicides and insects be integrated? Environ Ma. 23 241-256.

[12] Contantinides M., Fownes J. H. (1994). Nitrogen Mineralization from Leaves and Litter of Tropical Plants: Relationship to Nitrogen, Lignin and Soluble Polyphenol Concentrations. Soil. Biol. Biochem. 26: 49- 55.

[13] Devendra C. Non-conventional Feed Resources in Asia and the Pacific. 2nd edn. FAO Regional Office for Asia and the Pacific; Bangkok, Thailand: 1985.

[14] Gunnarsson, C. C., Petersen, C. M. (2006). Water Hyacinth as a Resource in Agriculture and Energy Production: A Literature Review. Waste Manage. 27, 117-129.

[15] GunnnarssonCC, Petersen C M (2007) Water hyacinth as a resource in Agriculture and energy production: A literature review. Waste Manage., 27, 117-129.

[16] Ho Thanh Tham, Peter Udén (2013) Effect of Water Hyacinth (Eichhornia Crassipes) Silage on Intake and Nutrient Digestibility in Cattle Fed Rice Straw and Cottonseed Cake, Asian-Australas J Anim Sci. 2013 May; 26(5): 646–653.

[17] Indulekha V P, Thomas C G (2019) Utilization of waer hyacinth as livestock feed by ensiling with additives, Indian Journal of Weed Science 51(1): 67–71

[18] Kayum, M. A., Asaduzzaman M., Haque M. Z. (2008). Effects of Indigenous Mulches on Growth and Yield of Tomato. J. Agric. Rural. Dev. 6, 1-6.

ISSN 2394 - 7780

[19] Lata, N. and Veenapani, D. (2011). Response of Water Hyacinth Manure on Growth Attributes and Yield in Brassica juncea. Journal of Central European Agriculture. 12(2),336-343.

[20] Majid, F. Z., Lutfun, N., Sajeda, B., Rahima, K., Akhatar, N. (1980). Use of Naturally Occurring Algae as Biofertilizer or Organic Manure. National Workshop on Algal Systems Proceedings. Madras, India. 26: 11-14

[21] Majid, F. Z. (1992). Aquatic Weeds, Utility and Development (Ed. By S. S. Purohit), Agro Botanica Publishers (India), Dhaka Bangladesh, India.

[22] Patel V., Desai M., Madamwar D., 1993 a Thermochemical pretreat- ment of waterhyacinth for improved biomethanation. Applied Biochemistry and Bio technology 42, 67–74.

[23] Polprasert C., Wangsuphachart S., Muttamara S., 1980. Composting night soil and water hyacinth in the tropics. Compost Science/Land Utilization 21(2).

[24] Sharda V. and Lakshi G. Water hyacinth as a green manure for organic farming, International Journal of Research in Applied, Natural and Social Sciences (IJRANSS), Vol. 2, Issue 6, Jun 2014, 65-72

[25] Widjajanto, D. W., Matsushila, K., Honmura, T., Miyanch, N. (2001). Studies on the Release of N from Water Hyacinth Incorporated into Soil-Crop Systems Using 15N-labeling Techniques. Part J. Biol. Sci. 4: 10754-1077.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

IMPACT OF WATER AS WORKING FLUID IN WRAPAROUND HEAT PIPE PERFORMANCE CONSIDERING ENVIRONMENT

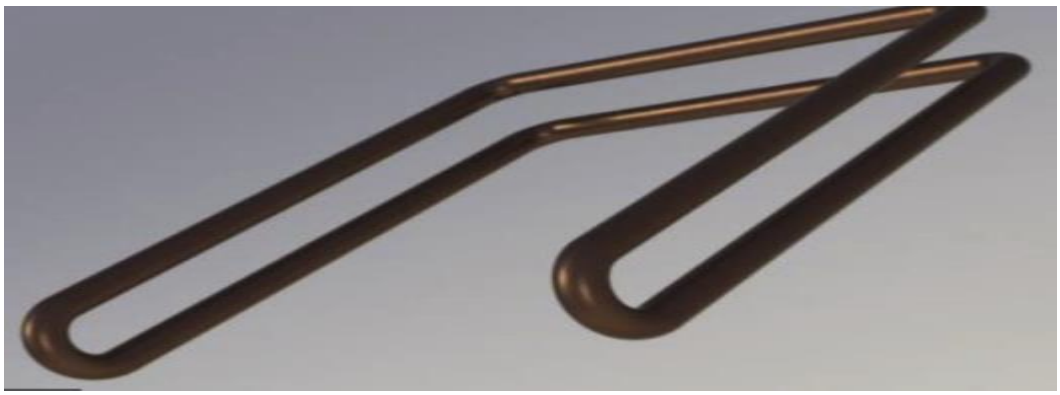
Mahesh Raosaheb Jagadale[1] and Amit Malsiddrappa Patil[2]
[1]PHD Research Scholar, Mechanical Engineering, Shri JJT University, Rajastan, India
[2]Associate Professor, Zeal College of Engineering Pune, Maharashtra, India

ABSTRACT
Heat pipe is a hotness move gadget that joins the standards of warm conductivity and stage progress to proficiently oversee move of hotness between two strong points of interaction. The fundamental component of hotness pipe is that it tends to be intended to move heat between the heart source and the hotness sink with tiny temperature distinction. The variables influencing the exhibitions of hotness pipe are different cutoff points, for example, viscous cutoff, sonic cutoff, Capillary cutoff, boiling limit, Entrainment limit. Improvement in Performance of hotness line should be possible based on determination of different working liquids. Refrigerant as working fluid used in heat pipe. But refrigerant has impact on Global warming and Ozone Layer Depletion. So many studied were carried out to find alternate for working fluid. In this paper discussion on Water as working fluid of wraparound heat pipe is done. As water has no impact on Global warming and Ozone Layer Depletion.

Keywords-Wraparound Heat pipe, Effectiveness, wick structure, working fluid

1. INTRODUCTION

A hotness pipe is a hotness move gadget that consolidates the standards of both warm conductivity and stage progress to productively deal with the exchange of hotness between two strong connection points. At the hot connection point of a hotness pipe a fluid in touch with a thermally conductive strong surface transforms into a fume by engrossing hotness from that surface. The fume then, at that point, goes along the hotness line to the chilly connection point and gathers once again into a fluid - delivering the inactive hotness. The fluid then, at that point, gets back to the hot connection point through hairlike activity, diffusive power, or gravity, and the cycle rehashes. Because of the exceptionally high hotness move coefficients for bubbling and buildup, heat pipes are profoundly powerful warm guides



Wraparound Heat Pipe Fig1

A commonplace hotness pipe comprises of a fixed line or cylinder made of a material that is viable with the functioning liquid, for example, copper for water heat lines, or copper for copper heat pipes. Commonly, a vacuum siphon is utilized to eliminate the air from the unfilled hotness pipe. The hotness pipe is to some degree loaded up with a functioning liquid and afterward fixed. The functioning liquid mass is picked with the goal that the hotness pipe contains both fume and fluid over the working temperature range. Beneath the working temperature, the fluid is excessively cold and can't disintegrate into a gas. So essentially a hotness pipe is a hotness move gadget that consolidates the standards of both warm conductivity and stage change to really move heat between two strong connection points.

2. LITERATURE REVIEW

Vishnupant J, et.al[1]

Test examinations of two unique level plate heat pipes (FPHP) are introduced. The slender construction is made of a couple of screen network layers for the primary FPHP and screen network covered depressions for the second FPHP. The hotness pipes, loaded up with methanol, were tried in various designs for example with

ISSN 2394 - 7780

different areas of hotness sinks and hotness sources, numbers and qualities of the hotness sinks and direction. Water heat exchangers were first utilized as hotness sinks to assess the presentation of the hair like constructions. The outcomes show the interest of this answer for the proposed application. The strategy picked to gather this FPHP model with networks is extremely basic and modest. Running against the norm, the presentation of the hotness pipe acquired with the relationship of sections and networks isn't quite as high as one could anticipate. Without a doubt, on the off chance that this slim design permits working in shifted troublesome position, which is unimaginable with furrowed hotness pipe, an unmistakable nucleate bubbling impediment is noticed for rather little hotness transitions.

Gerardo Carbajal, et.al[2] A multifunctional sandwich board joining proficient underlying burden backing and warm administration qualities has been planned and tentatively surveyed. The idea depends on a shortened, square honeycomb sandwich structure. In shut cell honeycomb structures, the vehicle of hotness from one face to the next happens by a mix of conduction through the networks and convection/radiation inside the cell. A thermodynamic model was utilized to direct the plan of the hotness pipe sandwich board. We portray the aftereffects of a progression of tests that approve the functional guideline of the multifunctional heat pipe sandwich board and describe its transient reaction to an extraordinary confined hotness source. The frameworks measure warm reaction to a limited hotness source concurs well with that anticipated by a limited contrast technique model used to foresee the warm reaction.

B.Ch. Nookaraju,et.al[3] In this work the scientists had done the test on sintered copper underhanded hotness pipe set at various directions and note the hotness move paces of the hotness pipes at each position. The temperature at vanishing segment and buildup segment of the hotness pipe is estimated utilizing K sort thermocouple. From this trial and error we here by infer that sintered copper evil hotness pipe warm execution is extremely less impacted by gravity and point of direction due to high slim activity of the wick.

R.A. Hossain, et.al[4] An exploratory examination is done likewise to research the presentation of the MHP with various trial boundaries. These trial boundaries incorporate tendency point, coolant stream rate, working liquid and hotness input. Tendency point are fluctuated from 300 to 900, while coolant stream rate and hotness input are shifted from 0.3 lit/min to 1.0 lit/min and 0.612 W to 8.71W separately. Three unique kinds of working liquids are utilized; CH3)2CO, ethanol and methanol. For each functioning liquid, heat move attributes are resolved tentatively for various tendency point and different coolant stream rate at various hotness input. CH3)2CO is ended up being better as working liquid. A connection is additionally made for CH3)2CO to relate other test boundaries for assurance of hotness move coefficient.

Per Wallin[5] This paper centers around the choice on turning out liquid for execution upgrade of hotness pipe. Heat pipes are normal in numerous application fields for instance cooling of gadgets. The plan of a hotness pipe is fairly intricate with numerous interesting points. In this project the center is the get information regarding who to choose the functioning liquid to be utilized. Three unique sorts of working liquids are utilized; CH3)2CO, ethanol and methanol.

R.Manimaran ,et.al [6] Heat pipes are heat move gadgets that upgrades huge measure of hotness which chips away at the standard of dissipation and buildup of a functioning liquid. Disregarding wide use of hotness pipe in microelectronics cooling framework the pattern of the chips execution and power use has been expanded every year and a total comprehension of component has not yet been finished despite the fact that it can work against gravity and a more noteworthy greatest hotness transport capacity.

Tian F Z., et. al. [7]: Gravity heat pipe has been for the most part used in numerous glow move devices due to its high warm conductivity, negligible cost and test structure. In the paper, an exploratory assessment of the gravity heat pipe with cross internal helical miniature blade gravity with two kind of working fluid (water and butyl alcohol plan with 5% mass division) was presented from even and vertical position. The experimental outcomes showed that in the level position, self-rewetting fluid can basic forms quite far, decreases the warm hindrance and further develops the glow move execution. In the vertical position, gravity sway play key limits on fluid return, self-rewetting have not been exhibited to have accepted a positive part on the glow move execution. In the vertical position, gravity sway play key limits on fluid return, self-rewetting have not been exhibited to have accepted a positive part on the glow move execution.

WORKING PRINCIPLE

A hotness pipe is a warm exchange gadget. It's essentially a fixed cylinder loaded up with refrigerant. HPT-Wrap Around Heat Pipe. It regularly ranges the stockpile air and exhaust air sides of a framework. Energy is moved - with no moving parts - from one air stream to the next (as long as there is a temperature distinction). Refrigerant is vanished on the hot side and moves to the opposite finish of the line in view of fume pressure. On

ISSN 2394 - 7780

the virus side refrigerant gathers and afterward streams back. It's actually basic. The fold over heat pipe is a hotness pipe folded over a cooling curl. It comprises of two segments, precool (evaporator) area put before the cooling curl and the warm (condenser segment) put after the warm loop. The precool segment is situated in the approaching air stream before the cooling loop. Whenever warm air ignores the primary segment, the fluid refrigerant disintegrates, moving hotness to the warm area (downstream from the cooling loop). As heat has been taken out from the air before the cooling curl, air going through the cooling loop drops to a lower temperature, bringing about more condensate evacuation. The over cooled air is then warmed to an agreeable temperature and a lower relative mugginess by the warm segment, utilizing a similar hotness initially consumed by the main segment.

2.1 EFFECT OF DIFFERENT WORKING FLUID

Working fluid is used in wraparound heat pipe to transport heat from evaporator section to condenser section. Different working fluid is used in wraparound heat pipe in HVAC system. We are selecting different working fliud and comparing the results obtained in terms of effectiveness.

3. PROBLEM DEFINITON

Heat pipe is a hotness move gadget utilized for cooling in numerous applications like space applications, electronic gear cooling, energy frameworks, human internal heat level cooling and so on It has exceptionally high powerful warm conductivity. From the review it is observed that upgrading the presentation of hotness pipe has become vital as a result of wide utilizations of hotness pipe.

The conventional turning out liquid for HVAC heat pipes has been a refrigerant and a substitution liquid is attractive as a short and long haul choice. From a natural point of view, water is an ideal applicant and a large number of its warm vehicle properties recommend that it ought to be practical. There are producing issues related with utilizing water which are not the worry of this paper; the's paper will probably demonstrate the feasibility of water and contrast its exhibition and

that of customary refrigerants.

3.1 OBJECTIVES

To study the wraparound heat pipe performance of different working fluid

4. MEHTHODOLOGY

The ventilation of consumed spaces subject to hot and soggy airs uses colossal measures of energy. In such regions, the sogginess load is incredibly high with external suddenness substance of up to 25 g/kg being ordinary. In order to strengthen the inside air with air at lower sogginess substance, chillers and cooling equipment should be assessed to deal with these unbelievably high lethargic weights. Heat pipes have been utilized in these applications for energy save reserves.

Heat Pipe Design: The wraparound circle heat pipes (WLHP) used economically are depicted as thermosyphons and rely upon gravity for the appearance of thick liquid rather than on thin or various powers. Wraparound type heat pipe design is most critical part. While arranging the hotness pipe we really want to think about various limits, for instance, holder material assurance, working fluid decision and wicking material decision. a) Working Fluid Material: There is no resemblance quite far as a result of the nonattendance of a wick in a thermosyphon. In any case, the temperature drop may be clear in which case the fluid should be picked to restrict this. A previously thought in the ID of a suitable working fluid is the functioning smoke temperature go. Inside the estimated temperature band a couple of potential working fluids might exist, and an arrangement of characteristics should be reviewed to choose the most satisfactory of these fluids for the application being considered. The superb necessities are as Similarity with wick and divider materials, Great warm adequacy ,Wet-ability of wick and divider materials ,Fume pressures not extremely high or low over the functioning temperature go ,High latent hotness ,High warm conductivity ,Low liquid and smoke viscosities, High surface strain, palatable freezing or pour point.

To analyze heat transfer performance:

Wraparound heat pipe execution can be depicted by suitability. This is the genuine temperature qualification across one leg of the hotness pipe parceled by the most outrageous temperature contrast between the air entering one leg of the hotness line and air entering the other leg of the hotness pipe. In light of the temperatures as the viability is equivalent to

$\mathcal{E}$= (T1-T2)/(T1-T3) or $\mathcal{E}$=(T4-T3)/(T1-T3)

T1-Temp.before condenser leg

ISSN 2394 - 7780

T2-Temp.after condenser leg

T3-Temp before evaporator leg

T4-Temp after evaporator leg

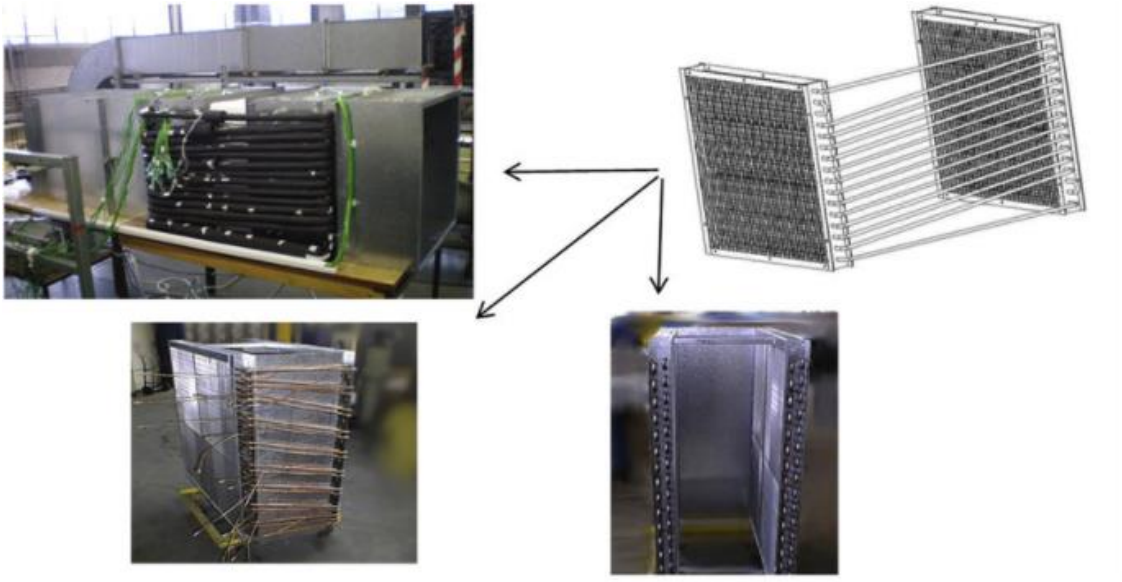


Fig No.2 Test Set Up

5.1. SPECIFICATIONS OF COMPONENTS

One of the design parameter of heat pipe is selecting the operating temperature range. In this project setting the Operating temperature range as 20-70oC, since there are many conventional application falling in this range. The boiling point of the acetone falls in the selected operating temperature. Selecting the working fluid as acetone, since useful range of acetone is 0-100oC. The compatible material for acetone is steel with high thermal conductivity. Hence, the steel is selected as pipe wall material. The larger the diameter more cross-sectional area available to allow the vapour to move from the evaporator to condenser. This allows the greater power carrying capacity. Hence, selecting the outer diameter 12mm and length 250mm, with L/D=20.83 as it will give a greater power carrying capacity and better understanding of fluid flow will be performed on it.

Specifications:

1. Wall Material: Copper.
2. Working Fluid: R134a,R290,
3. Wick Structure: Meshing
4. Thermocouple: Resistance Temperature Detectors (RTDs).
5. 1/2″ rifled copper tubes for enhanced thermal performance
6. Aluminum fins (8-14 Fpi)
7. Galvanized steel casing
8. Up to 10 rows
9. Aspect ratios can be square

For Control Panel

Ammeter: 0-5 mA

Voltmeter: 0-300 V.

4-channel Digital Temp. Indicator (0°C-500°C) with RTD Thermocouple.

RESULT

Working Fluid: Water

T1=42

ISSN 2394 - 7780

T3=19.6

T4=26.8

Effectiveness=Ɛ= (T4-T3)/ (T1-T3)

Ɛ= (26.8-19.6)/ (42-19.6)

Ɛ=0.32

Working Fluid: R134a

T1=41

T3=14

T4=21

Effectiveness= Ɛ= (T4-T3)/ (T1-T3)

Ɛ= (21-14)/ (41-14)

Ɛ=0.259

Working Fluid: R600a

T1=40

T3=13

T4=20

Effectiveness= Ɛ= (T4-T3)/ (T1-T3)

Ɛ= (20-13)/ (40-13)

Ɛ=0.2258

Result:

We found effectiveness of refrigerants

Refrigerant: Water=0.276

Refrigerant: R134a =0.259

Refrigerant: R600a=0.2258

6. CONCLUSIONAND DISCUSSION

After observing Wraparound Heat Pipe effectiveness we found that water has higher effectiveness comparing with R134a, R600a. The conventional turning out liquid for HVAC heat pipes has been a refrigerant and a substitution liquid is alluring as a short and long haul choice. From a natural outlook, water is an ideal up-and-comer and a large number of its warm vehicle properties recommend that it ought to be viable. The utilization of wraparound heat pipes that is getting looked at depends upon explicit sizes and directions of cylinders and the finishes of the report give pointers towards additional exploration which should be attempted, or is in progress, to decide the degrees of appropriateness of water as a functioning fluid. It has been shown that water as a working fluid possesses more feasible qualifications as well as gives some per-formance upgrade in this application. When consolidated with the present status of the workmanship as far as assembling it implies that there are no further obstructions to the utilization of water as a working fluid in the application considered. Its utilization in heat pipes for other air conditioning frameworks, notwithstanding, should be painstakingly considered and tested.Hence ecofriendly working fluid water which has no effect on environment gives better results.Also water does not impact to global warming and ozone layer depletion.

REFRENCES

1. Vishnupant J. Sargar , Pruthveeraj D. Mali, “Design, Development and Testing of Cross flow Circular Heat Pipe For Cooling Of Oil”, International Journal Of AdvancedTechnology In Engineering and Science, Vol.2,Issue No.12, pp 683-689,Dec-2014.
2. Gerardo Carbajal, Haydn N.G. Wadley, Douglas T. Queheillalt, “A multifunctional heat pipe sandwich panel structure”, International Journal of Heat and Mass Transfer 51, pp 312-326, 2008.

ISSN 2394 - 7780

3. B.Ch. Nookaraju, P S V Kurmarao, H.Prashanth, C.Pradeep, "Experimental Study On Behaviour Of Sintered Copper Wick Heat Pipe at Different Orientations", International Journal Of Innovative Research In Advance Engineering, Issue-5,Vol.2, pp 176-180, May-2015.
4. R.A. Hossain, M.A.K Chowdhuri , C. M. Feroz, "Design, Fabrication and Experimental Study Of Heat Transfer Characteristics of a Micro Heat Pipe", Jordan Journal Of Mechanical and Industrial Engineering, Volume 4, Number 5,pp 531-542, 2010.
5. Per Wallin, " Heat Pipe ,Selection Of Working Fluid", Project Report MVK160 Heat and Mass Transfer, ppl-7, 2012.
6. R.Manimaran , K.Palaniradja , N.Alagumurthi , J.Hussain, "Factors Affecting The Thermal Performance of Heat Pipe-a review", Journal Of Engineering Research and Studies, Vol. 3,Issue 2, pp 20-24, 2012.
7. Tian F Z, Xin G M, Hai Q, Cheng L. An investigation of heat transfer characteristic of cross internal helical microfin gravity heat pipe with self-rewetting fluid. Advanced Materials Research, 2013, 765– 767: 189–192

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

KOJIC ACID EFFECTS ON THE INTERNAL ORGANS OF ZEBRAFISH (*DANIO RERIO*)

Tigran-Lucian Mandalian[1] and Aurelian-Sorin Pasca[2]
[1]Faculty of Natural Sciences and Agricultural Sciences, University "Ovidius" of Constanta, Alley of the University, 900470, Constanța, Romania
[2] "Ion Ionescu de la Brad" Iasi University of Life Sciences, 3 Mihail Sadoveanu Alley, 700490, Iași, Romania

ABSTRACT
Kojic acid (5-hydroxy-2-(hydroxymethyl)-4H-pyran-4-one) is a common contaminant of many food products which are part of humans or animals daily nutrition (sake, soy sauce, cereals, fodder and dairy products). This mycotoxin has demonstrated antibacterial, antifungal, antiparasitic, insecticide, antioxidant and skin whitening effects.

In this study, adult zebrafish were divided in 4 groups: Control and 3 kojic acid-treated groups which were exposed to 100 mg/l, 204 mg/l and 284 mg/l kojic acid for 7 days. Histological alterations of the control and kojic acid-treated group were examined and compared, with emphasis on liver, kidney, pancreas, intestine, brain and myocardium. While the Control group had no histological alterations, the kojic acid-exposed zebrafish show hepatocytes hyperhydration/vacuolation, fragmentation of the cell membrane, nuclear karyolysis/pycnosis, a significant shortening of the intestinal villi, myocardiocytes degeneration, a moderate-severe myocardial congestion, an important lipid infiltration of the exocrine pancreas leading to the atrophy of the acini, nephrocyte degeneration and hyalinosis, nuclear hyperhydration, reduction to annulation of the tubular lumens. The histological alterations increase proportionally with the kojic acid dose.

Keywords: kojic acid, pancreas, intestine, myocardium, zebrafish, Danio rerio, mosquito, aedes aegypti

INTRODUCTION
Kojic acid is produced by *Aspergillus sp.* and *Penicillium sp*. and is an important contaminant of many food products which are part of humans or animals daily nutrition: sake, soy sauce, cereals, fodder and dairy (Burdock et al. 2001).

This mycotoxin has an antibacterial (on *Bacillus subtilis, S. aureus, S. epidermidis, P. aeruginosa, E. coli, K. pneumoniae*) (Rajamanikyam et al. 2017), antifungal (on *C. albicans, S. cerviseae, A. niger, R. oryzae*) (Siddhardha et al. 2010), antiparasitic (on *L. amazonensis* (Rodrigues et al. 2014), *S. mansoni* (Fitzpatrick et al. 2007)) and nematicidal effects (on *M. incognita*) (Kim et al. 2016).

Kojic acid has demonstrated insecticidal effects on *D. melanogaster* (Dobias et al. 1977 cited by Mohamad et al. 2010), on *H. zea* and *S. frugiperda* (Dowd 1988 cited by Mohamad et al. 2010). High doses of kojic acid (204-284 mg/L) led to a 90-95% mortality of exposed *A. aegypti* larvae (Rajamanikyam et al. 2017), thus it can be taken into consideration for mosquito population control.

A. aegypti females are vectors of Yellow fever, Dengue fever, Chikungunya viruses (Service 2012). Due to the large spread of these mosquitoes, it is necessary to discover new control measures to which these insects have not acquired resistance.

Zebrafish (*Danio rerio*), native to South and Southeast Asia, inhabit slow-flowing or stagnant waters (Spence et al. 2008), cohabiting with the larvae of *A. aegypti*.

Kojic acid decreases the heart rate of *Danio rerio* embryos (Choi et al. 2007), while the exposed zebrafish adults show a state of anxiety, a decreased activity of the antioxidant enzymes (CAT, GPX) and an increased lipid peroxidation in the brain (Ciornea et al. 2019).

Following exposure to 100 mg/L kojic acid, zebrafish embryos showed pericardium edema (Veselinović et al. 2017), which shows the need of testing these concentrations in adults as well.

The effects of the 204 mg/L and 284 mg/L kojic acid doses have not been previously studied.

In contrast to the case of zebrafish, kojic acid effects on the internal organs of mammals are well-studied: pallor of the liver and kidneys (Kynoch & Lloyd 1977 cited by Burnett et al. 2010), increased liver and kidneys mass (Kariya et al. 1979 cited by Burnett et al. 2010), hepatocellular adenoma (Watanabe et al. 2005 cited by Burnett et al. 2010), thyroid hyperplasia, decreased triiodothyronine and thyroxine levels and increased TSH levels (Fujimoto et al. 1999). Literature also highlights the behavioral effects of this mycotoxin: rat females exhibit cannibalistic behavior (Choudhary et al. 1992 cited by Burnett et al. 2010). Lethargy, ataxia, loss of reflexes,

ISSN 2394 - 7780

tremors and convulsions were registered in kojic acid-exposed rodents (Kynoch & Lloyd 1977 cited by Burnett et al. 2010).

This study aims to evaluate the histological effects of kojic acid exposure on the internal organs of adult zebrafish, a species that cohabits and feeds on the larvae of *A. aegypti*. Thus, we can assess the ecological impact on fish in the case of using kojic acid to control the mosquito population.

Matherials and methods

IN THE PRESENT STUDY WE USED ZEBRAFISH (*DANIO RERIO*), PURCHASED FROM LOCAL PRODUCERS (IASI, ROMANIA) WITH A BODY WEIGHT RANGING BETWEEN 0.48 - 0.74 G.

Zebrafish were kept in a ZebTEC (Tecniplast) recirculating system at University "Ovidius" of Constanta. Culture water was obtained through reverse osmosis and activated carbon filtration of tap water, complemented with salt (Instant Ocean Synthetic SeaSalt, Spectrum Brands), and automatically adjusted for pH and conductivity. Water temperature was 26 ± 1ºC, conductivity 800 ± 50 mS, pH 7.5 ± 0.5, and dissolved oxygen equal or above 95% (7.6 mg/L) saturation. A 14:10 h light : dark photoperiod was maintained. The adult fish were fed twice a day with commercially available artificial diet for tropical fish, Norwin Norvital.

The fish acclimatization period lasted 7 days.

THE BREEDING AND USE OF LABORATORY ANIMALS WERE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE FEDERATION OF EUROPEAN LABORATORY ANIMAL SCIENCE ASSOCIATIONS (FELASA).

Kojic acid was obtained from Carl Roth GmbH + Co KG (Karlsruhe, Germania).

For the administration of the desired toxin dose we used an AND HR-202 (4 decimals accuracy) analytical balance. Being water-soluble, the kojic acid was administered by immersion.

The animals were divided into 4 groups of 20 individuals: control (nothing was administered for 7 days); kojic acid I (100 mg/L kojic acid was administered daily, 7 days); kojic acid II (204 mg/L kojic acid was administered daily, 7 days); kojic acid III (284 mg/L kojic acid was administered daily for 7 days).

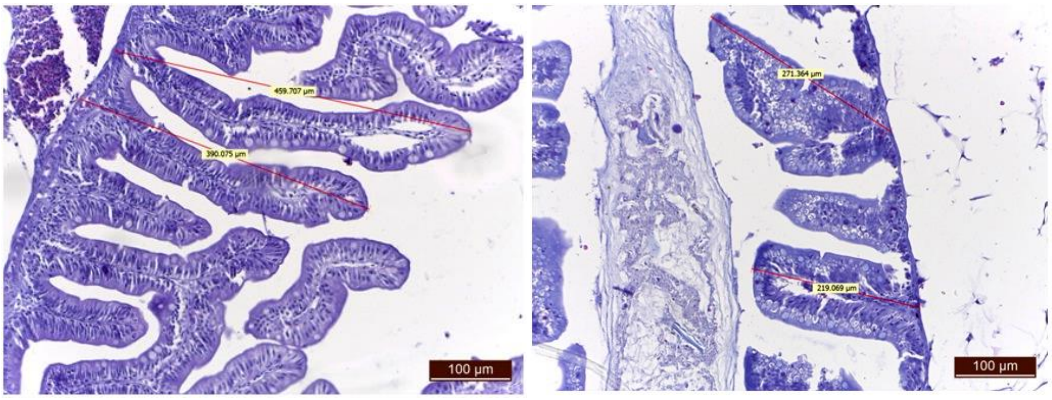
Immediately after euthanasia, 8 zebrafish from each group were fixed in formaldehyde solution (10%) for 48 hours. Then, for demineralization, the zebrafish were immersed in Bouin solution for 24 hours. For the sectioning, the zebrafish were fully embedded in paraffin, using a Leica TP 1020 histologic processor. Starting from the median axis, 5 µm thick histological sections were made longitudinally. We have used Masson's trichromic stain (hematoxylin – eosin – methylene blue) presented by Diaconiță et al. (1953) and Șincai (2000). Histological examination was made under a Leica DM 750 light microscope and the images were captured with a Leica HD digital camera. Histological alterations of the control and kojic acid-treated groups were examined and compared, with emphasis on intestine, myocardium and pancreas.

Results

After examining the zebrafish from the Control group, we observed there were no histological alterations of the intestine, myocardium or pancreas.

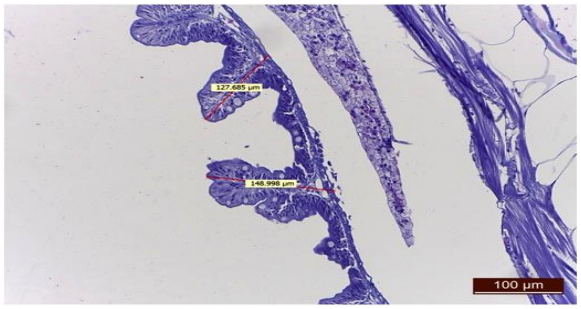
Effects on the intestines

Following exposure to 100 mg/L kojic acid, there were no significant changes in the size of the intestinal villi (Fig. 1 a).



a **b**

ISSN 2394 - 7780



c

Fig. 1 - Kojic acid effects on the intestine: a – 100 mg/L; b – 204 mg/L; c – 284 mg/L. Masson's trichrome stain

Following exposure to 204 mg/L kojic acid, the intestinal villi are shortened (Fig. 1 b). This effect can cause malabsorption syndrome. No fusion of intestinal villi was observed. Compared to the 100 mg/L exposed group, there was a 38% reduction in the size of intestinal villi.

The malabsorption of lipids, carbohydrates, proteins, vitamins, water and mineral salts will lead to decreased energetic reserves, affecting the structure of membranes, nucleus, cellular organelles, affecting transmembrane and intercellular transport, transmission of nerve impulses. The synthesis of hormones, enzymes and nucleic acids will also be affected.

The reduction of chicken body weight after being exposed to kojic acid (0.25 % of food) for 3 weeks (Giroir et al. 1991), shows that this mycotoxin causes nutrient malabsorption in both zebrafish and these birds.

Despite antioxidative properties, the study by Minaiyan et al. (2012) demonstrated that kojic acid (70 - 300 mg/kg) is not effective in reducing intestinal inflammation in rats.

The mycotoxins toxicity on intestines has been demonstrated in several studies: mice exposed to Aflatoxin B1 exhibited a decrease of the intestinal villi length (Abdu et al. 2013); rats exposure to DON reduces the viability of intestinal epithelial cells, induces intestinal cell apoptosis and nuclear pycnosis (Bianco et al. 2012).

The length and morphology of the intestinal villi of DON-exposed pigs were affected in proportion to the toxin's dose: flattening, fusion and length decreasing by approx. 1/3 (from 150-155 µm to approx. 100 µm) (Kolf-Clauw et al. 2009). This difference is similar to that observed in the 100 mg/L kojic acid-exposed group and the 204 mg/L kojic acid-exposed group.

Following exposure to 284 mg/L kojic acid, the atrophy of the intestinal villi was noted (Fig. 1 c). The undersized villi may be responsible for a malabsorption syndrome.

Compared to the 100 mg/L exposed group, there was a 68% decrease of the intestinal villi size.

Compared to the 204 mg/L exposed group, there was a 52% decrease of the intestinal villi size.

Effects on the heart

In the case of 100 mg/L kojic acid-exposed fish, the myocardiocytes are degenerated, having a slightly vacuolated perinuclear sarcoplasm (Fig. 2). It was also observed a moderate-severe myocardial congestion, characterized by ectasia and erythrocyte overload of the interstitial capillaries. These effects can cause a decrease of the heart rate and a decrease of the heart contractions amplitude.

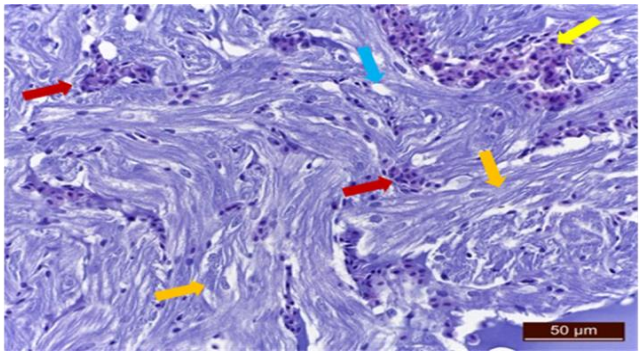


Fig. 2 - Degenerated cardiomyocytes (→), vacuolation (→). Congestion (→), ectasia, capillary overload (→). Masson's trichrome stain

ISSN 2394 - 7780

The rodents exposed to kojic acid-producing fungi showed hemorrhagic lesions in the myocardium (Kinosita et al. 1968).

Also in the case of *Danio rerio* embryos, kojic acid exposure (within 9-72 hours after fertilization, 20 mM = 2.84 g/L) led to a slight decrease of the heart rate (Choi et al. 2007).

Exposed to 900 mg/kg kojic acid doses (17.64 % of LD50 mice) by gavage, pregnant female mice exhibited a heart weight decrease (Burnett et al. 2010).

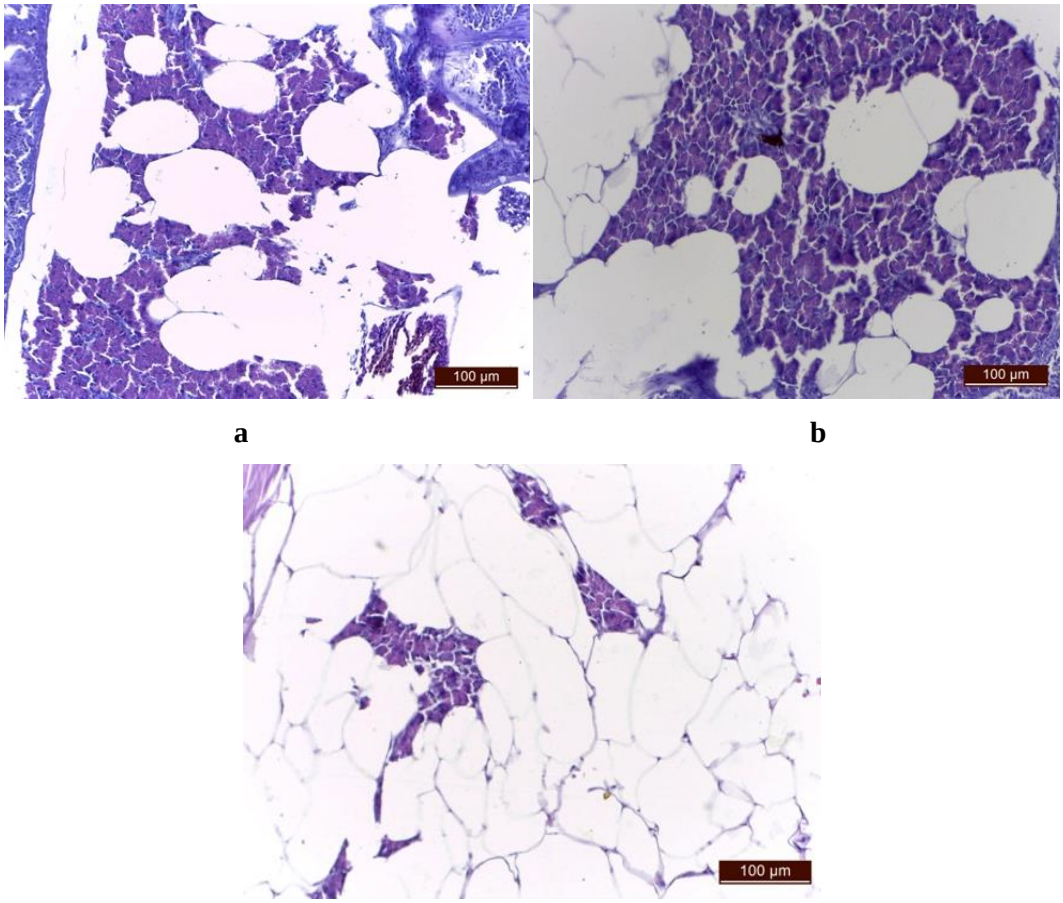
At concentrations of 100 µg/mL - 2.5 mg/mL (100 mg/L - 2.5 g/L), kojic acid led to pericardial edema and lowered the heart rate of zebrafish embryos (Veselinovic´ et al. 2017).

From these studies it results that the kojic acid doses ranging between 100 mg/L - 2.84 g/L, have effects on the heart rhythm of *Danio rerio* embryos, but these effects do not intensify in proportion to the dose of toxin.

An *in vitro* study (Chaudhari et al. 2018) showed that kojic acid (56.8 mg/L) did not affect the viability of human cardiomyocytes, but led to decreased ATP levels, which can lead to impaired cellular functions, including contractility, which involves reducing the heart rate and the amplitude of heart contractions.

Effects on the pancreas

At 100 mg/L kojic acid, the exocrine pancreas exhibited an interstitial lipid infiltration and compression of the acini (Fig. 3 a).



a **b**

c

Fig. 3 - Kojic acid effects on the pancreas: a – 100 mg/L; b – 204 mg/L; c – 284 mg/L. Masson's trichrome stain

The pancreas of rodents exposed to kojic acid producing fungi, exhibited degenerative lesions and hemorrhages in the Langerhans Islands (Kinosita et al. 1968).

In the case of chicken, the pancreas is also affected by kojic acid, its mass increasing following birds exposure to the toxin (Giroir et al. 1991).

Unlike patulin, a mycotoxin with a molar mass close to that of kojic acid but whose toxicity is higher, kojic acid has affected the exocrine pancreas of zebrafish.

ISSN 2394 - 7780

The increased lipid infiltration of the exocrine pancreas led to the disorganization of its architecture, the pancreatic acini being compressed by the significant lipid deposits (Fig. 3 a).

Another mycotoxin, Ochratoxin A, whose toxicity exceeds that of kojic acid, led to tissue alterations of the exocrine pancreas and to a body weight decrease in the case of a catfish species (*I. punctatus*) (Manning et al. 2003). By affecting the exocrine pancreas at the same time as reducing body weight, we conclude that ochratoxin A has caused malabsorption, similar to the case of kojic acid-exposed fish.

According to literature, kojic acid mainly affects the endocrine glands: increases the mass of the adrenal glands of rodents (Kariya et al. 1979 cited by Burnett et al. 2010), leads to the appearance of adenomas and proliferative lesions in the thyroid of rodents (Kynoch & Lloyd 1977 cited by Burnett et al. 2010), induces thyroid hyperplasia in rats, proportionally to the dose of the administered toxin (Fujimoto et al. 1999).

Our results on zebrafish show that this mycotoxin can affect a mixed gland, such as the pancreas.

Following exposure to 204 mg/L kojic acid, the severe lipid infiltration of the exocrine pancreas is followed by compression of the acini (Fig. 3 b). Pancreatic acini are isolated by the lipid deposits. Stromal lipid infiltration leads to the exocrine pancreas atrophy.

At 284 mg/L kojic acid, due to the severe lipid infiltration of the pancreatic interstitium, the exocrine acini are isolated by the lipids accumulated in the stroma (Fig. 3 c).

The lipid infiltration of the exocrine pancreas is followed by acinar compression and atrophy.

Lipid infiltrations and acini atrophy will negatively affect the production of pancreatic digestive enzymes: amylases, lipases, proteases. Nutrient digestion will be deficient, contributing to malabsorption.

CONCLUSIONS

1. The kojic acid effects on the intestines, heart and pancreas of zebrafish demonstrate an increased accumulation of the toxin in these organs. Following exposure to kojic acid, tissue damage increases progressively in all three groups, as the kojic acid dose increases.
2. The shortened villi of the fish exposed to the high kojic acid doses (204 mg/L, 284 mg/L) can lead to malabsorption, decreased energy reserves of the body, impaired cellular structure and function, impaired synthesis of the hormones, enzymes and nucleic acids.
3. The effects of the kojic acid on the zebrafish heart can decrease the heartbeat rate and the amplitude of heart contractions.
4. The exocrine pancreas is severely affected, the pancreatic lipid storage reflecting a lipid metabolism disorder. The lipid infiltration and acinar atrophy will adversely affect the production of pancreatic digestive enzymes, contributing to malabsorption.
5. All 3 kojic acid doses exhibit an increased toxicity on zebrafish, altering the physiology of the whole organism. The exposure to kojic acid affects the zebrafish quality of life, decreasing the survival chances of the individuals and the species.

The obtained results proved that kojic acid causes strong negative effects on the ichthyofauna, implicitly on the whole habitat balance.

REFERENCES

1. Abdu, F.B., Abu-Zinadah, O.A., Rahmy, T.R., Omran, M.A.A. (2013): Subacute treatment with aflatoxin b1 induces motility, histological and ultrastructure alterations of mice colon. *Egyptian Journal of Natural Toxins* 10(1,2): 1-32.
2. Bianco, G., Fontanella, B., Severino, L., Quaroni, A., Autore, G., Marzocco, S. (2012): Nivalenol and deoxynivalenol affect rat intestinal epithelial cells: a concentration related study. *PloS one 7*(12): p.e52051.
3. Burdock, G.A., Soni, M.G., Carabin, I.G. (2001): Evaluation of health aspects of kojic acid in food. *Regulatory toxicology and pharmacology 33*(1): 80-101.
4. Burnett, C.L., Bergfeld, W.F., Belsito, D.V., Hill, R.A., Klaassen, C.D., Liebler, D.C., Marks, J.G., Shank, R.C., Slaga, T.J., Snyder, P.W., Andersen, F.A. (2010): Final report of the safety assessment of kojic acid as used in cosmetics. *International journal of toxicology 29*(6_suppl): 244S-273S.

5. Chaudhari, U., Nemade, H., Sureshkumar, P., Vinken, M., Ates, G., Rogiers, V., Hescheler, J., Hengstler, J.G., Sachinidis, A. (2018): Functional cardiotoxicity assessment of cosmetic compounds using human-induced pluripotent stem cell-derived cardiomyocytes. *Archives of toxicology 92*(1): 371-381.

6. Choi, T.Y., Kim, J.H., Ko, D.H., Kim, C.H., Hwang, J.S., Ahn, S., Kim, S.Y., Kim, C.D., Lee, J.H., Yoon, T.J. (2007): Zebrafish as a new model for phenotype-based screening of melanogenic regulatory compounds. *Pigment cell research 20*(2): 120-127.

7. Ciornea, E.T., Dumitru, G., Coprean, D., Mandalian, T. L., Boiangiu, R.S., Sandu, I., Hrițcu, L. (2019): Effect of Micotoxins Treatment on Oxidative Stress, Memory and Anxious Behavior in Zebrafish (*Danio rerio*). *Revista de Chimie* 70(3): 776-780.

8. Diaconiţă, Gh., Eskenasy, Al., Hagi - Paraschiv, A., Iliescu, G., Mureşan, Aug., Nicolescu, P., Repciuc, E., Roşca, V., Teitel, A. (1953): Tehnica histopatologică, Editura de Stat pentru Literatura Ştiinţifică, Bucureşti.

9. Fitzpatrick, J.M., Hirai, Y., Hirai, H., Hoffmann, K.F. (2007): Schistosome egg production is dependent upon the activities of two developmentally regulated tyrosinases. *The FASEB Journal 21*(3): 823-835.

10. Fujimoto, N., Onodera, H., Mitsumori, K., Tamura, T., Maruyama, S., Ito, A. (1999): Changes in thyroid function during development of thyroid hyperplasia induced by kojic acid in F344 rats. *Carcinogenesis 20*(8): 1567-1572.

11. Giroir, L.E., Huff, W.E., Kubena, L.F., Harvey, R.B., Elissalde, M.H., Witzel, D.A., Yersin, A.G., Ivie, G.W. (1991): The individual and combined toxicity of kojic acid and aflatoxin in broiler chickens. *Poultry science 70*(6): 1351-1356.

12. Kim, T.Y., Jang, J.Y., Jeon, S.J., Lee, H.W., Bae, C.H., Yeo, J.H., Lee, H.B., Kim, I.S., Park, H.W., Kim, J.C. (2016): Nematicidal activity of kojic acid produced by *Aspergillus oryzae* against Meloidogyne incognita. *Journal of Microbiology and Biotechnology 26*(26): 1383-1391.

13. Kinosita, R., Ishiko, T., Sugiyama, S., Seto, T., Igarasi, S., Goetz, I.E. (1968): Mycotoxins in fermented food. *Cancer Research 28*(11): 2296-2311.

14. Kolf-Clauw, M.; Castellote, J.; Joly, B.; Bourges-Abella, N.; Raymond-Letron, I.; Pinton, P.; Oswald, I.P. (2009): Development of a pig jejunal explant culture for studying the gastrointestinal toxicity of the mycotoxin deoxynivalenol: Histopathological analysis. *Toxicol*ogy *in Vitro 23:* 1580–1584.

15. Manning, B.B., Ulloa, R.M., Li, M.H., Robinson, E.H., Rottinghaus, G.E. (2003): Ochratoxin A fed to channel catfish (*Ictalurus punctatus*) causes reduced growth and lesions of hepatopancreatic tissue. *Aquaculture 219*(1-4): 739-750.

16. Minaiyan, M., Mostaghel, E., Mahzouni, P. (2012): Preventive therapy of experimental colitis with selected iron chelators and anti-oxidants. *International journal of preventive medicine 3*(Suppl1): p.S162.

17. Mohamad, R., Mohamed, M.S., Suhaili, N., Salleh, M.M., Ariff, A.B. (2010): Kojic acid: Applications and development of fermentation process for production. *Biotechnology and Molecular Biology Reviews 5*(2): 24-37.

18. Șincai, M. (2000): Tehnici de citohistologie normală si patologică. Ghid practic, Ed. Mirton, Timișoara, pp. 6

19. Service, M. (2012): Medical Entomology for Students. Cambridge: Cambridge University Press, pp. 57, 58, 60, 67-72, 75.

20. Spence, R., Gerlach, G., Lawrence, C., Smith, C. (2008): The behaviour and ecology of the zebrafish, *Danio rerio*. *Biological reviews 83*(1): 13-34.

21. Veselinović, J.B., Veselinović, A.M., Ilic-Tomic, T., Davis, R., O'Connor, K., Pavic, A., Nikodinovic-Runic, J. (2017): Potent anti-melanogenic activity and favorable toxicity profile of selected 4-phenyl hydroxycoumarins in the zebrafish model and the computational molecular modeling studies. *Bioorganic & medicinal chemistry 25*(24): 6286-6296.

22. Watanabe, T., Mori, T., Okamura, M., Kashida, Y., Mitsumori, K. (2005): Induction of hepatocellular proliferative lesions in CBA mice by a 26-week dietary administration of kojic acid. *Journal of Toxicologic Pathology* 18(3):159-165.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

PROBLEMS AND ISSUES OF COAL MINE WATER FOR DRINKING PURPOSE IN RANIGANJ COALFIELDS

Satrughan Kumar Singh* and Jainath Yadav
Department of Computer Science, Central University of South Bihar, Gaya – 824236, Bihar, India

ABSTRACT
People in coal mine areas are severely suffering from inadequate and polluted water. Underground mine water is being discharged out from the mines for safe workings. Quality of drained out coal mine water and pit water are quite considerable. Coal mine water may be turned into whole sore one by conservation of water, resource management and proper treatment of the water available. This will improve not only the health of the industrial workers but also the production and productivity of the industry, agricultural areas and the quality of life of the community.

Keywords: Mine water; Raniganj coalfields, resource management; quality of mine water;

1. INTRODUCTION

Reasonable access to water is the first requirement for the living beings. Many ancient civilization flourished because or of poor quality. About 2300 years ago (322-398 B.C.) – Kautilya in his economics suggested to the king that any one polluting water should be punished financially. In the beginning of 15th century, king charls IV – of France declared that, polluting river or any usable water by anyone, in any form, was a punishable crime. Generally, villages or towns are situated on or nearby banks of some rivers, seas or waterbodies for the last thousands and thousands of years ago. Even now about 142 small and big towns are situated on or nearby banks of different rivers and watebodies in our country. This is because without water production and growth are impossible. Water cannot be separated from lives of the living creatures. Human body itself contains about 70% of water. A healthy human being can live for a month without food, but will die in less than a week without water. Water is the means to develop energy, drive industry, promote trade & transport, enjoy recreation and finally remove and dispose of the impurities and by-products produced by various activities of the human being.

2. RESOURCES

Water resources on this earth are very scarce. 97% of the planet water is sea water, 2% is in the form of ice cap and glacier. Only 1% or less is usable in the forms of underground water, rivers, lakes, streams, etc. In coal mining areas, main sources of water are underground mine water, river water and rivulets available in the areas. Underground mine water is available in considerable quantity in mine areas quenching the thirst of the population including adjacent rural villages. Due to coal mining activities, water level goes too deep to be economically tapped. Mapping many times the surface hydrology around mining areas gets polluted due to mine waste and associated industrial outlets accessing surface water sources. About 10% of the discharged out coal mine water is utilised for industrial purposes, 40% for domestic purposes (including drinking in raw conditions), and 505 or more of the quantity goes waste in want of proper management and processing. Because of storage of drained out coal mine water, ponds are formed on the surface. These ponds are used by the dwellers for all purposes with the washing of animals too. Number of wells and borehole hand pumps are very less in coalfield areas. Available wells or borehole hand pumps up to 10-20 feet deep are generally filled with mine water which is generally used by the population there. Rivers and rivulets available in coal mines areas are very helpful to the people residing at a certain distance from the same. But in summer season, rivulets dry up completely and rivers take the forms of slow running rivulets (or nallas) in general.

3. PROBLEMS

The problems are different in arid regions, mountainous regions, coastal regions, mining areas, and many. The contamination of water in coal mines areas basically arise because of coal mining activities. In order to meet the requirement of coal and minerals for national development it becomes essential to have underground and surface mining operations and activities for the exploitation of minerals and their depth on an average may range between 0 and 100 m, 100 and 300 m, and exceptional cases very deep. Consequently, the underground aquifer layer gets disturbed causing lowering of water table. This in turn makes it difficult for the population living in mining areas to fetch water throughout the year for various domestic and agriculture purposes. At the same time, large quantities of water have to be pumped out from underground coal mines and drained out as industrial waste, purely from the point of view of sustaining mining activities. Peoples of the coal mines areas are compelled to use mine water pumped out from the underground mines as there is no other sources of water to be utilised.

ISSN 2394 - 7780

4. QUALITY OF THE MINE WATER

Raniganj coalfields is very old and one of the most important coalfields of the country located in West Bengal having more than 40 lakhs people's population. The geolocation details of different sampling points have been presented in Table-1. Majority of the peoples in coalfields depends on mine water. Supply of whole some drinking water by the government agencies or sectors in mine areas is restricted to certain localities and very irregular. Sometimes people do not get supplied water for week together. Several samples of the coal mine water used for drinking collected from different geolocation points have been analyzed and tested. Analysis took place as per standard methods (see Table-2). Physically, mine water is acceptable as its colours and odour are not objectionable. Its turbidity is negligible. pH of most of the samples is in drinking range. It contains dissolved solids a bit more at a few places. In general, coal mine water is hard but not very harmful. Hardness can be managed easily utilising simple procedures or methods or techniques. A few samples contain iron slightly higher than the desirable limit. But the most important from drinking point of view is microbial pollution which is present in coal mine water. Almost all the mine water samples contains a good number of coliform organisms which is the indication of fecal pollution of water. Unwanted phytoplankton and zooplankton are present in mine water degrading the quality and making it deficient in oxygen. The presence of coliform bacteria and parasitic protozoa indicates towards the prevalence of water borne and other diseases among the consumers. Rivers and rivulets are polluted not only due to human nuisances but due the effluents discharged out by bthe industries situated on the banks too. An effluent consists of coal and other dust particles, oil & grease, different types of chemicals, ash and some more irritable materials. Because of the effluents, too thick siltation about 10-20 feet took place reducing the catchment of the rivers. At some place river water contains microbial growths.

5. ISSUES

Inadequate and contaminated water consumption for maintain a personal hygiene is indicative of poor hygienic condition. The use of quantity and quality of water could be taken as the indicative of hygienic situation of the community. Coal mining and adjacent rural community is no exception in this regards. The United States uses three times as much water a day, 1300 gallons per person as the average European country and astronomically more water than most developing nations. Comparatively, in Indian coal mines areas, water consumption per person is only 12 gallons in a day (see Table-3), which is very less than all other developing countries. Housewife of miners and others in coal mine areas cover a distance of more than 3-4 kms in procuring drinking water from different sources. When water resources are not managed properly the seasonality of water is more acute, floods become more frequent, and frequency of drought during dry or low rainfall periods increases. Unfortunately, water is a good carrier of pathogens. Water borne diseases such as typhoid, dysentery, diarrhoea, jaundice, worm infections, constipation, different skin infections (including leprosy) are prevailing among the consumers of the mine water are presented in Table-4. Working capacity of the workers decreases and senility grows earlier due to the water related diseases. Because of the sufferings absenteeism, increases at working sites lowering the manpower. Due to the above facts, production and productivity of the industry are retarded. Coal mines areas are not sound agriculturally in want of proper irrigational facilities. Peoples are to depend upon a single crop i.e. paddy, if rain is good. Multiplication of drops may improve the financial condition of their villagers which in turn may prove helpful in improving the life quality of the community.

6. CONCLUSION AND SUGGESTIONS

In summer season, situation of water is worst in coal mines areas. People try to procure water from wherever it is available irrespective of its quality. Ponds containing drained out mine water dry up completely and famine viz., situation crop up in the localities. No doubt, on the surface, coal mine water is polluted, but in mines it is polluted coming in contact with the miner workers, machines, iron chains, wire ropes, hooks, oil & grease, wooden logs, rubber, planks and leather belts, and many others. Pollution due to human activities is most dangerous. The study reveals that the mine water used for drinking purpose contains different parasitic protozoa responsible for destroying the quality of water and to create amoebiasis or other diseases among the consumers. Besides protozoa, different pathogenic bacteria are also available in the drinking water of the coal mines areas. It is clear from the study that residents of coal mining industrial areas are severely suffering from inadequate and polluted water either in one way or another way. To improve the health of the consumers of coal mine water, production and productivity of the industry and quality of life of the community as a whole, water problems should be solved properly supplying them whole some water to drink and to use for all essential purposes. To manage these all problems, water conservation, resource management and proper treatment plan are necessary for well implementation. After successful management of these problems, mitigative measures are adopted and adequate quantity of portable water as well as water for agriculture can be supplied to the doors of the consumers. In fact, drinking water and bathing water are also to be supplied after proper treatment to the

ISSN 2394 - 7780

house of the consumers and miners of the mining areas. Several steps may be taken effectively for strategies of drinking water and resource management for better quality of life in coal mining areas are:

a) Discharged out coal mine water from underground mines may be diverted to a settling pond, constructed centrally between three to five mines.

b) Existing ponds, defunct OC (opencast) or open pits in the coal mines areas may be utilised as settling ponds or tanks after slightly modification in the desired manners.

c) Treatment of water may be done by using chemicals as less as possible.

d) Fishing may be done profitably under proper supervision.

e) Through concrete canals river water may be taken to the agricultural areas for irrigation and improved cultivation.

f) Construction of water treatment plant is essential at the banks of the settling tanks or ponds to cater whole some water to the consumers of the localities.

g) De-siltation of the river beds in the areas is important and compulsory to improve the catchment and the flow of the river and to avoid floods in the localities.

h) Touching localities to the canals will have river water for drinking purposes and other uses.

i) A certain amount of water may be diverted to the nearby areas or fields for satisfactory irrigation from the settling ponds or tanks.

j) Boost up the morals of the communities, socio-economic conditions of the society as a whole and have faith in the workings of the management.

k) Mass education in coal mines areas and rural villages are very essential for the environmental awareness indicating the benefits of the proper and economic use of water and good sanitations.

l) Watch over the good results in the mining industrial areas and follow up study programmes is necessary.

REFERENCES

[1] "International standard for drinking-water", WHO, Geneva, 1958.

[2] Edwin W. Taylor, "The examination of waters and water supplied", London, 1958.

[3] Satrughan Kumar Singh and Jainath Yadav, "POLLUTION MONITORING AND THEMATIC MODELING IN AND AROUND MINING AREAS USING GIS & SATELLITE REMOTE SENSING APPLICATION", Science, Technology and Innovation, ISBN: 978-81-949278-5-3, pp. 100-106, 2020.

[4] "Standard methods for the examination of water and wastewater", APHA, AWWA, 1999.

Table-1: Geolocation details of the sampling points

Sampling code	Name of the sampling point	Latitude	Longitude
S1	Parasia	23° 39' 5.616" N	87° 9' 48.168" E
S2	Kajora	23° 37' 4.116" N	87° 11' 8.556" E
S3	Ratibati	23° 39' 16.74" N	87° 1' 52.428" E
S4	Lachipur	23° 40' 8.256" N	87° 3' 51.372" E
S5	Ghanshyam	23° 36' 53.748" N	87° 6' 46.188" E
S6	Amritnagar	23° 37' 14.232" N	87° 5' 20.688" E
S7	Mahabir	23° 36' 50.436" N	87° 6' 34.308" E
S8	Khandra	23° 38' 28.392" N	87° 13' 23.772" E
S9	Searsol	23° 38' 52.548" N	87° 5' 16.692" E
S10	New Satgram	23° 39' 44.784" N	87° 3' 57.168" E
S11	Madhujore	23° 36' 45.72" N	87° 12' 29.664" E
S12	Kanustoria	23° 39' 4.968" N	87° 7' 48.972" E

ISSN 2394 - 7780

Table-2: Characteristics of different parameters of mine water of the sampling points

Sampling code ⇨ / ⇩ Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
pH	8.1	8	6.8	8.3	8	8.32	7.5	8.2	7.5	7.8	8.2	8
Temp	27	29	28	29	28	30	29	28	30	29	27	29
TSS	8.3	8.5	8.4	8.5	10	8.2	4.75	3.5	2.5	11	2.5	8.5
TDS	602	503	584	503	348	530	467	355	498	730	811	503
TH	240	368	1016	368	263	228	336	476	280	448	456	368
Iron	0.04	0.15	0.05	0.15	0.14	0.02	0.18	0.20	0.17	0.20	0.31	0.15
Nitrate	3.64	3.10	6.24	3.10	2.15	5.12	3.80	5.15	2.35	3.75	5.20	3.10
Phytoplankton	7	9	8	9	5	9	8	8	3	7	6	9
Zooplankton	3	4	5	4	-	2	2	3	-	2	3	4
MPN coliform	1032	1600	870	1600	180	1148	240	920	920	140	1600	1600

Table-3: Quantity of mine water daily used by an individual in coal mines areas

S.No.	Purpose	Recommendation by WHO (Litres/day)	Quantity used (Litres/day)
1.	Drinking & Cooking	15	8.5
2.	Bathing & Vehicle washing	60	12
3.	Cloth washing	20	7.5
4.	Utensils washing	15	5
5.	Flushing or refuse disposal	60	15
6.	House cleaning	10	5
7.	Gardening	10	70
8.	Wastage or other use	20	7

Table-4: Prevalence of mine water related to different diseases in coal mines areas

S.No.	Disease	Range of % of victim
1.	Dysentery	40-60
2.	Diarrhoea	10-20
3.	Constipation	25-35
4.	Skin infections	30-50
5.	Leprosy	5-8
6.	Typhoid	2-5
7.	Jaundice	5-15
8.	Worm infections	20-35

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

MAN-WOMAN RELATIONSHIP IN KAMALA MARKANDAYA'S *THE COFFER DAMS*

[1]Dr Shashikant R. Mhalunkar and [2]Ms Hemangi N. Saindane
[1]Research Guide Department of English, University of Mumbai
[2]Research Scholar, Department of English, University of Mumbai

ABSTRACT
Kamala Markandaya is one of the most dexterous Indian novelists in English who articulates her concerns about Indian culture, cultural dichotomies, East-west cultural clash and the altering man-woman relationships with the shift in space, culture and environment. The Coffer Dams delves deep with the ecological issues in Malnad and the resultant change in man-woman relationship. Helen, the young wife of Howard Clinton finds no love in the company of her technocrat husband, who, therefore, finds love in the arms of Bashiam, a worker from the settlement in the jungles of Malnad. Helen explores herself in the company of Bashiam, temporally pushing aside her marital knot, but, in the company of Bashiam also she finds herself pushed into secondary status. The present paper attempts to examine conjugal relationships, sex and extra-marital relations evident in the narrative. Liberty and industrial development trigger extra-marital relationships whereas the same defeat the institution of marriage.

Keywords: man-woman relationship, extra-marital relations, sex, marriage.

INTRODUCTION:

Kamala Markandaya's *The Coffer Dams* (1969) brings to light the dichotomies of British and Indian culture and the unstable man-woman relationships as both men and women shift their spaces. No doubt, the novel focuses on the intervention of human beings in the environment, ecology and nature, but it also deals with the altering man-woman relationships. The novel highlights the hardships of the marital relationship of Howard Clinton and Helen and the temporal emotional bond between Bashiam and Helen. In other words, Kamala Markandaya underlines the emotional attributes of Helen's character juxtaposing to the physical and sexual relationship of men wherein she finds both men emotionally dry who approach her for satisfying their sexual desire.

Illustration: *The Coffer Dams* is narrative that constructs the coffer dams in the river of Malnad, and, symbolically, it attempts to construct a dam between two cultures-East and West, urban and rural, technology and ecology, and men and women. Howard Clinton, the owner of The John Day Company with his young wife Helen and the partners and engineers in his company arrives in India. His wife is half of his age but still they love each other. In the initial stage of their marriage, they accept the age difference between them. In the opening pages of the novel Markandaya vocalizes how desperately Helen loves Clinton. Helen is a common woman with a common expectation of love and companionship of her husband. The author narrates:

It was no place for Helen either, Clinton often thought. But the prospect of being separated from her, newly married as they were, a year at a time, was so bleak that he was glad when she forced his hand. She was in love with him, she wanted to be with him: it was as simple as that. Surveying the wilderness to which he was bringing her, he had not been too happy; but he comforted himself with the thought that civilisation, such as India could offer, was not too far away. (TCD 6-7)

The novel is all about the construction of the coffer dams. Clinton comes to independent India for the construction of coffer dams, not as a coloniser but as the contractor of the construction company. Therefore, his prime concern is the construction of the coffer dams. Even he never remembers any names of the Indian workers who work on the dams. Kamala Markandaya portrays a mismatch through Clinton and Helen, who are married to each other with a huge age gap. For Helen, age is just a number. It is a mental condition. As a result, she crosses all the borders of age, race, identity, social ghettoism and nationality. She is the true child of nature. On the other hand, Clinton is aware of all these aspects. He is a complete opposite of Helen. He is always aware of his age, gender, nationality, skin and status. These contradictory views of husband and wife are evident when the writer equivocates:

Helen, his wife, had no such blocks. Was it, he wondered, because she was half his age? When he asked her she laughed. 'It's nothing to do with age. I just think of them as human beings, that's all.' He frowned at the equivocal statement, and she added seriously, trying to help: 'You've got to get beyond their skins, darling. It's a bit of a hurdle, but it is an essential one.' (TCD 6)

Kamala Markandaya documents how the British people still live in the Colonial culture exhibiting lavishness and Western cultural supremacy as they are busy in the late night parties, drinking, smoking and laughing. For

ISSN 2394 - 7780

instance, Bailey organises a party at his house and all his friends are invited to attend the party. Helen and Howard Clinton attend the party. Howard is extremely happy with the presence of Helen. For the first time, Clinton feels glad in the company of Helen, after bringing her to this primitive frontier town that they are roughly hewing into existence. The conjugal relationship between husband and wife does not exhibit the intimate relations. They are in a strange place, among strange and uncivilized people around them. The place is unromantic that fails to hold Helen and Clinton together. In addition to this, the author is smartly indicating the addressing strategies through her narrative as she addresses Helen with her first name that indicates her personal and independent identity whereas Howard with his family name that highlights his profession and social identity which has lost conjugal warmth. Still, Clinton and Helen are tied by the bond of marriage. They live casually, without thinking much, without articulating love. The following excerpt showcases the distinct inclination of their relationships:

'I have you', she answered him, her body bare and cool under the sheets, lying close to his.

'By day', he said, 'when you can't have me.'

'It's awful then.'

'I've watched you,' he said. 'It's nothing to do with that.'

'What is it then?'

'I wish I knew.'

'There are so many things,' she said. She was half asleep.

He shook her, careless of whether or not she wants to wake.

'What kind of things?'

'Oh…people –all kinds of things.'

'Men?'

'Darling. no.' he had roused her at last. 'There are no men.'

'The place is crawling,' he said, 'full of men. Altogether too many sods.'

'Then you've nothing to worry about, have you?'

They fell asleep laughing, as closely together as if they were one. (TCD 9)

Further, Kamala Markandaya projects Helen as the most versatile and vibrant character who breaks her conjugal and cultural rigidities. She meets the tribal people of Malnad by visiting them at their settlements which is very much unexpected of a White woman. Helen does not love her routine life which Clinton admires. She is busy attending friends' marriages instead of maintaining her wifely responsibilities. Helen is the child of Modernism, who believes more in the independent identity as a human being than a wife. Markandaya portrays Helen as the free spirit, developing her nexus with the mythical Greek character Helen of Troy who abandons her husband Menelaus, the king of Sparta and she elopes with Paris to Troy. Kamala Markandaya makes Helen a rebel against the institution of marriage, who does not adhere to her wifely status but rather prefers to be a human being with free spirit. Markandaya explicates:

Helen had no great love for routine either, which was one of many things Clinton found admirable in his wife. She did not wave him off tritely from the doorstep each morning, or welcome him back with a peck each night—attentions over which he had endured vicarious excruciation during the long years of his bachelorhood. Nor did she pretend a solicitous interest in her husband's work: marrying later than most, her cool gaze trained upon her friends' marriage customs, she made, and humanely suppressed, her own acid little comment on these wifely attitudes. (TCD 20)

Markandaya proliferates how Helen, as the child of nature, consciously takes interest in tribal people's life and their culture. Often times she visits the settlement of tribes and spends ample time comprehending their life. This certainly points out the marital discord between Helen and her husband. Howard Clinton is an aged man matched with young and vibrant Helen. He is continuously busy in dam construction work. And at the same time, he does not like Helen spending time with the primitive people. For him, India is a country of wild animals and primitive people, "He warned her not to drink their polluted water, reminded her they were in tiger country..." (TCD 20) But Helen does not pay any attention to his advice; she prefers to maintain her individual identity by becoming one with the primitive people. No doubt, in this instance, Clinton's care for his wife is

ISSN 2394 - 7780

evident, but it underlines the discord in their relationship. The relationship between Helen and Clinton is not healthy as that of healthy couple. Both enjoy their personal spaces independently. Similarly, they also respect each other privacy and space. Clinton is an aged man coupled with young and vibrant Helen. Helen, often times, is laid by her whims. She is unpredictable and obscure like nature. The author brings to light the temporal excitement and urge for partner evident in the character of Helen:

Unpredictable Helen. Clinton smiled as he came in sight of the bungalow. Sometimes, she vanished into the jungle, not even a note for him on the table. At other times she pelted out of the house, hugging him tightly in full view of interested bearer and cook, her eyes dark with the misery and memory of their many separations. On what she called her randy days she simply lay in bed and waited for him, peremptorily dismissing the servants so that later, ravenous, they had to get up and cook. (CD 21)

On the contrary, Clinton is a modern man, an engineer, a technocrat. For him construction of dams is more important than the natural settlements and ecological set up. He dislocates the primitive settlement by making them to move into the deeper part of jungles of Malnad, away from the river. This act of Clinton hurts Helen as he dislocates the natives. This makes her to dislocate from him. She distances herself more from her husband. The following discussion throws light upon the dichotomy of views of husband and wife on the displacement of the tribal settlements:

'What happened to them?'

'They moved'.

'Where to?'

'No idea. Just got up and went, like animals. No moving problems there - I wish to God we travelled as light, we could have done this job in half the time'.

Helen said: 'But they lived here, didn't they? They didn't ask to move'.

'No. We persuaded them!'

'Why?'

'Why?' Clinton repeated irritably.

'Because they occupied a site we needed'.

'Were there no other sites?' (CD 23)

In the initial pages of the novel, Kamala Markandaya projects Clinton and Helen as a happily married and settled couple. Clinton is a chief of the dam construction site and at home also. He is dealing with the dogma of professional and personal identity. This highlights that there is no personal life for the technocrat. Being with machines, he has turned mechanical. Even his sexual acts are mechanical, with no adoration, intimacy, curiosity and love for Helen. The noise of machines at the construction site makes him aggressive and dry, as he argues with Helen when he is home. The writer goes to the extent to portray that Clinton dreams about dam and Helen. "Clinton dreamed as he slept, sometimes of Helen and sometimes of the dam, and to both the river was accompanist." (TCD 27) This instance shows how marital life becomes stressful for Clinton and he is not trying to cope with it. Clinton spends most of the time on the construction site whereas Helen lives at home alone. Whenever she feels restless she goes to spend time with the tribals of Malnad. Often times, Helen feels that they both are tied in an uneasy marriage relationships because they are busy with their own work. Helen feels that her marriage has brought her the notion of captivity. For her marriage is a prison. She feels like an animal in captivity. The following excerpt shows that how the Clinton and Helen unconvinced with their relationships:

'I ought to take more care of you. Lock you up, as wise men would.'

'But locked up things go mangy, like captive animals', she said and he thought, anxiously, we're double talking, she doesn't mean what she says, she means something else and she knows I know, we're like people tied in an uneasy marriage…'(TCD 77)

Gradually, Helen develops a concord with Bashiam and the tribesmen. She accompanies him in the forests and stays with him in worn out tatters happily. Bashiam succeeds in providing comforts which Clinton fails to provide her. Like a wild animal or a primitive woman, Helen goes into the forest along with the tribesmen to watch the early morning birds. This instance underlines the confidence Bashiam has installed in Helen. Further, Helen throws away her gauge of Memsahib and not only stays with the Junglywallah but she enjoys sexual

ISSN 2394 - 7780

pleasures with him with all his roughness. This darts at Helen's extramarital relationships with Bashiam. Kamala Markandaya not only reverses Diaspora, but she goes to an extent of projecting a White woman establishing a natural tie with a tribal person. This also shows the fall of Colonialism and Imperialism as Helen carelessly moves away from Clinton. This man-woman relationship goes beyond sexual relationship, as sex is temporal in Helen-Bashiam relationship. The relationship between Helen and Bashiam is like the natural nexus between two individuals, naturally brought together. Similarly, Bashiam tries to protect her by offering a shawl. Bashiam said:

'Are you cold?' and without waiting for an answer put a shawl around her, draping it over her head and shoulders. A heavy dew was falling, chill and clammy, she was grateful for the rough warmth. When they moved off she felt better. The bird catcher led the way with the lantern. He had a thin black cord looped over his wrist in coils which he paid out as he walked; it did not rope them together but acted as a guide line which she found she needed despite the radiance of the lantern swinging ahead of them. (TCD 84)

The husband-wife relationship between Clinton and Helen turns mechanical that has lost the zeal and love. The author narrates symbolically the hardness that enters Helen which she never desires. This hardness signals the strangeness in their relationship that has lost the warmth of love, adoration and craving. The hardness also darts at the sexual performance as a ritual and not as a celebration of two true minds. Markandaya narrates, "Later that night after their party, she thought she would tell Howard, but he spoke of other things and after a while lying under the pale-pink net watching and listening she felt a hardness come into her and she no longer wanted to." (TCD 83)

Further, Kamala Markandaya brings to light another instance of the estrangement in the conjugal relationship of Helen and Clinton. The warmth of love in their relationship is lost. The aged Clinton is still a colonizer who ravishes his wife. The bond of marriage becomes bondage for Helen. She does not desire to be with Clinton, as she attempts to go out of his bed, he pulls her into the bed and rapes her against her will. Her response, the author states, is lifeless. Helen does not celebrate her conjugal relationship:

She rose to go and he seized her wrist, 'Stay away', he said, passionately, and the feel of her flesh twisting inflamed him and he bore down on her until he prevailed. Then he carried the listless body to his bed.

He woke soon after. His body felt sated but his mind was cloudy. For minutes he could not remember. He lay staring into the black opal night, probing delicately for the roots of the oppression that weighed him down. Presently he knew. He had raped his wife,...(TCD 130)

The author showcases how Clinton is possessive about Helen. He attempts to claim Helen not as his wife but as his property. He disdains Helen for joining the tribal and the natives of Malnad. He says, "She is mine, he said, stubbornly; why should I let her go? What I have I hold." (TCD 130) As time passes, Clinton becomes more brutal and careless in his treatment towards Helen. Helen is shocked; she becomes an emotionless, dry effigy. Now for her, their relationship has also become impassive. Kamala Markandaya elaborates the ruined beauty of Helen, as Clinton usurps it every time. The author amplifies the loss of love, care, delicateness and togetherness that Helen feels. The elaborate narratives never present the care and intimacy between Helen and Clinton. In the subaltern and negligible rural space of Malnad, Helen is ravished and exploited by Clinton as the colonizer. The writer aptly captures the dry and cold bodies of them that have left no warmth of love:

Next to him Helen lay, awake, inert. Suspended, it seemed, in darkness, but now and then becoming aware of parts of her body; her lips, which were cracked, and her thighs upon which he had spilled at first touch, not even completing. Now and again she moved, tongue over blistered skin, tips of fingers over the scales into which the wetness had dried. Burning, or seared, but cold, the two of them cold, and the breath that should have warmed rising in lone chill columns in the silence. (TCD 130)

The author touches upon the gradual decline of intimacy between Helen and Clinton. As time passes, the novelty and attraction declines. The relationship becomes mechanical. The feeling of love converts into lust for Clinton, wherein Helen remains unsatisfied. In the beginning of the novel, Helen who is extensively affiliated with Clinton now becomes dissatisfied with their bond. Helen realizes that she is no more a partner to Clinton but an object to satisfy his demand for sex and lust. Kamala throws light upon the objectification of a White woman in the company of a White man, as their marriage goes for a toss:

And increasingly the sense that all was not right: becoming afraid, aware of the eyes that she turned upon him, probing, asking for something that he could not give… withdrawing when he could not, the tranquillity shot with terrifying strands, its centre a spinning core of restless that took her away from him, led her into this and that. Dabble in everything, get your hands muddied. Hands that belonged to him, whatever. So holding her

ISSN 2394 - 7780

down, physically, enjoying the leap and twist under him and thrusting deeper and coming to nothing, spirit gone and womb closed, only a paper thing in his arms. (TCD 147-148)

Subsequently, Howard Clinton finds a silence between him and Helen. The writer shows how the bed becomes a silence zone where the husband and wife sleep without talking to each other. The tension between their relationship is evident as Markandaya observes, "In a way if she had he would have despised her. Knowing they were matched in this, that neither would choose the easy way out unless it happened to be valid. He waited a little, though he could not say why. But no words came, nothing that would do, and presently, heavy eyed as if pennies had been laid on his lids, he went in to sleep." (TCD 149)

Similarly, Bashiam also gives more important to the construction work like Clinton. Helen finds Clinton in Bashiam as Bashiam is more inclined towards the construction of the coffer dams than her. Like Clinton, he represents the destroyer of ecology and Helen. Clinton disregards Helen by raping her, Bashiam disregards Helen by leaving her in the dark to go for the dam work. Thus, Bashiam and Clinton place Helen on secondary status. Both men in her life prove to be machos who establish sexual relationship with her for their sexual desire and not for love. Both men prioritise their work. The author narrates how men are techno savvy who are possessed with work than human bond:

'Which is the central thing.'

'It is the central thing.'

It sounded to her like Clinton, or Rawlings, or Mackendrick, or anyone who was part of Clinton Mackendrick. What they lived by, what they said. The central thing. The hub, round which the others, even living and loving, revolved. (TCD 143)

Gradually, Markandaya projects the widening gap between husband and wife-Clinton and Helen. They are married to each other but in the foreign land of Malnad, their artificial connectivity goes for a toss. No doubt, they are tied by the sacrosanct marriage but their relationship does not continue with love and care. Clinton remains busy with his work of coffer dams' construction. Gradually, Helen finds herself lonely and forsaken in her own bedroom. Though they share the room, they are not together. They are puzzled about each other's behaviour. Kamala narrates the dry relationship between Helen and Clinton, their obscurities and alienness:

For they shared a roof, and bed and board, and the services of Das, though this was less evenly distributed. Only the selves remained apart, not by will alone, but by an irresistible process of drift. So that the distance between them widened, whose presence Clinton had decreed and precisely defined as essential to him, passing out of the control of both.

…I do not know her, said Clinton, and looked at the thick smooth brows, above those fallen concealing half-moons. I do not know this woman, is my wife. But he tried, putting out a few tenuous filaments. (TCD 185)

Kamala Markandaya projects the eternal triangle of love by placing Helen between two men—Clinton and Bashiam. As husband, Clinton fails to nurture the warmth of love in his wife. Gradually, as time passes, affection gets affected. Similarly, the author draws parallelism by placing Clinton and Bashiam as temporal lovers who do not rise beyond their status as men. They consider Helen as an object for satisfying their sexual urge. Helen, on the other hand, approaches both men with the expectation of love which she fails to get from them. They burn with desires like the kiln which is burns from inside, cracking them. As soon as the lust is satisfied, they turn away from Helen. Helen moves on as she does not have the option. Markandaya amplifies the thoughts of Bashiam who is marginalised subaltern subject that grows within the shadow of Clinton—the technological colonizers in the Postcolonial era:

...but that the shadow fell that was Clinton's, whose wife he had taken, to whom a debt was owed.

Though she came to me, he said, and blew out his cheeks to relieve his mouth, whose walls had cracked as if dried in a kiln. She came to me. But the act, which was ours. It has delivered me to him, he said, and felt the tightness in him and round his body, like bonds. Wetted rattan thongs, which would contract when the moisture was gone, as it would soon do form the fever that afflicted him, and begin to eat inwards. (TCD 192)

The author brings to light the lost faith of marriage beneath the veneer of social customs. Kamala shows how Clinton and Helen know that their marriage no more prevailing as a marriage of true minds but a mere physical concord for social prestige and identity. Both of them lie to each other in their conversation as they have lost interest in their marital relationship. Markandaya underlines the hollowness of the marriage between Helen and Clinton:

ISSN 2394 - 7780

'I had not noticed,' said Clinton, speaking obliquely to his wife as he had fallen into the habit of doing. Since the straightness was gone from their marriage. Which had reformed to enable them to continue, providing falsetto voices and gestures to tide over every occasion, while the empty centre expanded, whittling away at the watery rims of substance that remained. (TCD 211)

The Coffer Dams proliferates the basic theme of Paradise Lost; as Malnad is the paradise, far away from the urban mundane life. This paradise of Malnad is lost due to the fruit of Knowledge-the coffer dams' construction which is against will of god. The construction of the coffer dams is the destruction of Nature, the Law of Universe, or god. Markandaya also draws another parallelism by projecting Clinton and Helen as a couple brought in the serene place of Malnad who also lose their marital harmony due to the construction of the coffer dams. The marital discord between them is because of the construction. In other words, construction deconstructs marriage and faith. Helen and Clinton become lonely and lost in their own home. They fail to share secrets, as they demark themselves in their separate territories on their own bed which they share but separately. The author observes:

Sometimes**,** after they had eaten, and long before they could decently take to the separate halves of their bed, and rain had blotted out the separate lives they had etched for themselves, they had nothing at all to say to each other. Then Clinton would sit, and fidget, and drink his scotch, and watch the thin smoke ascending from the pungent green mosquito coils, until finally his mind would baulk, as if at some stony, dried up river bed it had been asked to negotiate, and turning away flow relievedly down easier channels. (TCD 212)

Markandaya's *The Coffer Dams* enunciates the fall of the institution of marriage and faith very sternly. The novel documents how Western culture, institutions, relations and statuses collide in the Postcolonial period. Women writers are more concerned with the conjugal relationships in international space. Markandaya pinpoints how Clinton and Helen have lost the meaning in marriage. They are on the very verge of breaking their relations. Marriage has reached to the extreme line of breaking. Emotionally they are divorced. The author captures:

'Are you,' he asked his wife, 'are you not with me?'

She did not reply. There was not the strength for replies which ended lives. But gathered her reserves for the question which still remained, which had to be put, and answered.

'Is there to be,' she said, 'no line drawn, at which one stops?'

Which needing strength, Clinton could not answer.

I am exhausted, he said. Physically exhausted, that is all. So he turned to his will, which was clad in iron, to serve him.

'No lines are possible,' he said. (TCD 230)

CONCLUSION:

Kamala Markandaya's *The Coffer Dams* chronicles the serious issue of man-woman relationship that goes for a toss in the alien land of Malnad, a remote village. The sacrosanct tie of marriage does not prevail in the course of time. Marriage turns into a provision for sexual satisfaction for Clinton; whereas Helen remains in search of love, being exploited by her husband and her lover. In search of love, Helen approaches Bashiam, who also turns to be a copy of Clinton. Helen craves for love, crosses the line of marriage, but unfortunately, fails to get love. The writer projects men as hungry for sex and work whereas, Helen is hungry for love which she does not get. All the characters in the narrative, accept the rigidities of life, social realities and their unalterable roles, with which they continue to live.

REFERENCES:

1) Markandaya, Kamala. *The Coffer Dams*. John Day Co., New York, 1969. Print.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

A REVIEW ON RECYCLING OF TEXTILE WASTE AND COMPOSITES BASED ON NATURAL FIBER

M. Sindhu[1] and Dr. J. Banu Priya[2]
[1]Ph.D. Research Scholar, Department of Costume Design & Fashion, PSG College of Arts & Science, Coimbatore
[2]Supervisor and Assistant Professor, Department of Costume Design & Fashion, PSG College of Arts & Science, Coimbatore

ABSTRACT
This paper review of study environment impact of textile reuse and recycling of provided and current knowledge and point out areas further research, many areas due to avoided of new productions or products. Benefits not occur in cases with low replacement rules of if the avoided production process relatively clean. Most of author assume the textile sent to recycling are waste free environmental burden. The recycling products are made from recycled material replace products made from virgin fibers. Fiber reinforced composites are gaining interested because of aseptic properties such as low weight, high stiffness and low cost strong and durable material. Which are seeing increasing adoption in the transportations and constructions are many other markets.

Keywords: Environment, sustainability, Reuse, Natural fiber,Recycle.

INTRODUCTION
Every year a minimum of hundred new textile products with sustainability as a focal point. Textile waste is one type of municipal solid waste growing rapidly in recent years. textile waste which includes the waste generated from stems of fiber, textile and clothing manufacturing process, commercial service and consumption has raised increasing concerns worldwide in developing novel circular textiles approach. In fact, disposal of textile waste and their management have increasing global concerns in the recent years of textile.

Major recycling option for textile waste include only second hand over trading energy recovered. the short lifecycles of apparel product due to rapid fashion cycles and increased buying power of consumers in urban areas is resulting in significant amounts of postconsumer textile waste in the form of used clothing or even second–hand cloth. Post–consumer textile waste mainly originates from the household sources and other consists of textiles which the owner no longer needs as it was. Currently, for textiles which are ripped or stained and are no longer wearable, and disposal commonly consists of landfill or incineration as there are no other valorization routes available. This waste is after that made up of resources, which could be recycled and used.

In recent years the world has been involved with environmental issues related to the continuous use of natural resources, including the textile waste several proposed solutions involve the use of natural, renewable and recyclable materials.

A successful example being investigated and industrially applied since the past decade. In particular, the lingo cellulosic fiber obtained from plant based are increasingly being considered as reinforcement of composite for engineering applications, especially in automobile components. Therefore, applications of natural–reinforced composites materials (with mixture of particle, fiber and textile structures) are expected to have a significant positive environmental impact. The availability of the technologies for producing of natural–reinforced composites materials and its high socio–economic value are solid arguments in favor of the future development of this product and can find a wide application as a substituted for non–biodegradable or non–ecological products' fibers (flax, hemp and jute), for their versatility, rightfully deserves to be branded as the "fibers for the future", being natural option for a cleaner environments. Among all the natural fibers, best fibers such as jute, flax, hemp, sisal and ramie appears to be a promising, fibers and constitutes large area of investigation due its good mechanical properties compared with other natural fibers. Recently, cellulose fibers began to be used as a fiber–reinforcement material, especially in conjunction with polymers in fiber-reinforced composites, to their similar properties to engineered fibers.

A small amount of these fibers is wasted and is gone to landfilled every year, either in the form of textiles resulted from manufacturing of fabrics or in the form of used cloths after the end–of–life of the bags. In fact, bast fibers and their wastes can be used not only in its traditional materials, but also for the production of other value–added products such as geotextiles or composites. Concern for the environment, both in terms of limiting the use of finite resources and the need to manage waste disposal, has led to increasing pressure to recycle materials at the end of their useful life. As well known, the bags at the end of their longevity will be as waste materials. Moreover, the waste fabrics are not yet reused efficiently. Therefore, several attempts were carried

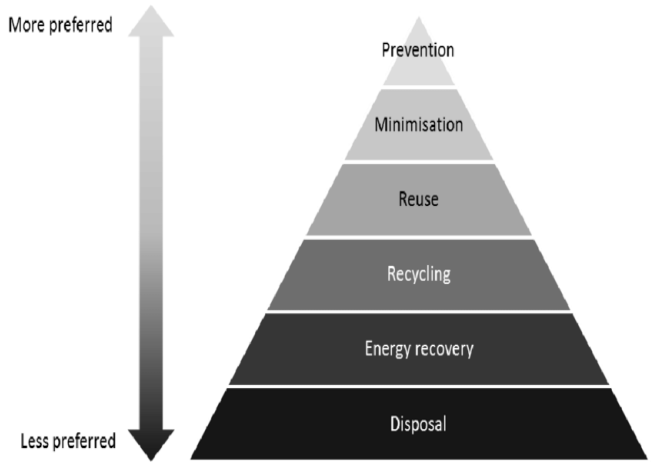
ISSN 2394 - 7780

out in our previous research to use the above–mentioned valuable properties of bast fibers, to reuse the wasted textiles, to recycle the end–of–life fibre bags for fabricating valuable reinforced textile/polymer composites or textile sandwich composites. The textile industry needs to find imaginative solutions to produce environmental improvements. One of the main environmental concern in the textile industry is about the solid wastes, coming from the packaging of raw textile material of different nature (in form of fibers, yarns or fabrics) or paper packaging wastes (boxes, bags, cardboard), considered as non–dangerous wastes. Recycling the waste for environmental protection has been an important challenge for the mankind.

The fibrous textile industry accounts for approximately 15% of the amount of fiber products used. The clothing and textile can be reused and recycled of 95% of used clothing's household textile and commercial linen textile can be reused and recycled, this is only items that are wet or the have used with a solvent -type liquid cannot be recycled. nearly 100% of all used clothing and household textiles can be sort and grade the used clothing's based on quality, conditions, and type, re-used or recycled in one of the following manners.

Secondary textiles from source to treatment

Large textile type material lost in landfilling or incineration are unavoidable in the currently wasteful, linear system which creates negative impact on the environment. Its important to find innovative solution for various waste of textiles. Ensuring there are markets for the secondary textiles to be processed reduces the amount of textiles which end up deposited in land filing or simply incinerated ,hence improving the circularity of these valuable time.as the quality of secondary textile decreases, the options available become of less value, as highlighted this strategy of textile waste management must give priority in the first place the waste prevention, in the second place recycling, reusing and revalorization of different textile and finally their dump depositions.



Different clothing and household textiles are a complex input material for the textile wastes recycling process due to the variation in their composition, their quality at the point of disposal in landfills and the existence of alternative markets for textiles which have been recovered.

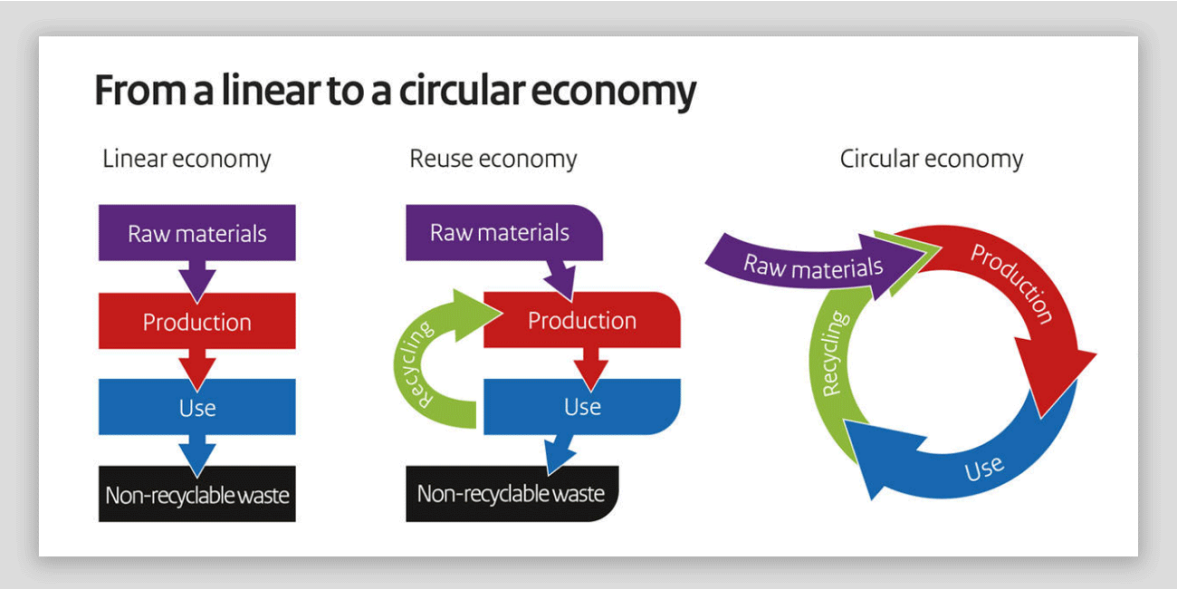
Discussion is based on environmental responsibility and circular economy

Due to the development trend of environmental responsibility and circular economy, many garment practitioners and government department have realized the necessity of sustainability and provided corresponding measures and programs. The author discussion the advantage and disadvantages of recycling technology in order to understand the defect of waste -clothing recycling to the social values and market value from the perspective of environmental responsibility and circular economy.

The recycling in practice

The valorization of waste for useful materials production is a current practice, with particular focus on environmental indicators and sustainability goals and it is part of the larger endeavor of the circular economy Outside of well–established reuse markets and mechanical recycling processes (where capacity limits exist), there remains a large quantity of low– value materials for which there is no market pull to utilize. The move to a circular economy is becoming more widely discussed and adopted, largely thanks to its benefits. A circular economy approach to textiles involves moving away from our traditional "take, make and dispose" model and working to achieve a model whereby fibres or/and fabrics are kept in use and at their highest value. The ability to recycle used textiles – by use waste textiles to back into make new products – is of particular interest.

ISSN 2394 - 7780



From linear to a circular economy (from waste to resource) (a) linear economy; b) reuse economy; (c) circular economy

Characterizing the linear economy, the economy with feedback loops, and the circular economy summarize the potential, and in some cases already proven, advantages of the circular economy approach in terms of three major categories.

the production processes in this setup require significantly less newly produced or mined raw materials. Consequently, these processes become less sensitive to the growing need of many raw materials,

the circular economy has the potential to generate innovations and new employment opportunities in the so called eco–industry, based on the development and application of eco–technology,

the reduction of environmental damage due to less extraction of raw materials and significantly smaller waste disposal problems. Products which have lost their functional value generally tend to form part of material left for recycling. Considering the impact of different measures, it appears that the greatest potential is to be found in the development of new technology. The challenge here is to develop value adding features. We all know what the basis of recycling is a practice that takes an item and targets it for reuse, returning it back to the cycle of daily contribution to society rather than discarding it to trash, meaning treat or process used or waste materials so as to make suitable for reuse, alter or adapt for new use without changing the essential form or use again in the original form or with minimal alteration.

Therefore, any recycling process is a first step in reaching a more sustainable solution of the waste management that can eventually limit the amount of new and virgin materials that need to be produced. In fact, recycling is undoubtedly useful, and is a conscious means for extending the useful lifetime of used materials. Therefore, any recycling process has simply prolonged the inevitable by stretching out waste stream and made the lifecycle costs of the material a bit less.

The circular economy has seen a significant increase in interest over the past few years, having several key elements as strategies,

can prioritise the regenerative natural resources, and therefore the renewable and reusable resources are used as raw materials in an efficient way,

can preserve and extend what is already manufactured, and, while resources are in–use, repair and upgrade or remanufactured them to maximise their lifetime and give them a second life through take back strategies when applicable,

use the existent waste as a new resource, using waste streams as a source of secondary resources and trying to recover waste for reuse and recycling.

ISSN 2394 - 7780

The recycling in practice: (a) recycling; (b) upcycling; (c) downcycling

materials destined for landfills or incineration can be recycled in scope to produce something completely different. The process where waste products are converted into a new material of better quality and a higher environmental value is the upcycling i.e. remaking of textile material wastes to something new of greater value, like reinforcements in a composite material. Upcycling involve creative ways of reuse old materials by using different

pre–consumer or post–consumer waste or a combination of the two. In fact, the upcycling becomes dually important,

first, the practice reduces the amount of waste that we produce and ultimately goes into the ground for longer than any of us will be around.

secondly, it also reduces the need for virgin material to be harvested as feedstock for new generations of product.

Upcycling represents a truly cyclical, balanced process that all industries and companies should be aiming towards. All of products could be drastically changed if the beginning of their design started with the goal of not having them end up in a landfill, as is been thinking in the circular economy. A number of ways could be utilities to train the economy into an inherent practice of reuse. Upcycling is a process that can be repeated in perpetuity of returning materials back to a pliable, usable form without degradation to their latent value–moving resources back up the supply chain. Upcycling is described by some as reusing a material without degrading the quality and composition of the material for its next use. As a result, these usually become products that will eventually also become trash. In fact, upcycling is equivalent in material terms to the "reuse" step in the classic waste hierarchy (reduce–reuse–recycle), though rather than being direct reuse of the same product, its reuse of the materials in an equally useful way. Therefore, upcycling is a process where waste or useless products are converted into new materials or products of equal or better quality or a higher environmental value. Moreover, by making use of already existing materials the consumption of new raw materials for new products is reduced. Hence, upcycling is an even greener way of recycling, better environmentally and cost efficiently

Advantages and disadvantages of waste clothing recycling technology
Research shows that the intelligent recycling system of waste clothing formed by:

Internet and data analysis can effectively classify and manage waste clothing and allocate resources for reuse. In addition, automatic sorting can improve the production process, production efficiency, and the number of recycled textiles. Never the less, the recycling technology of waste clothing has technical limitations, such as the lack of fine classification of textile waste. Moreover, most existing methods cannot separate dyes and other pollutants from raw fibers. The process of redesigning used clothing using physical techniques can result in much higher waste, due to the limitations of the original shape of the clothing being dismantled for use. We question how we can minimize the waste and carbon emission of the whole process, in addition of how to make the best use of disassembled parts and sewing thread and other waste. If a solution to the above problems is proposed, can the solution be universally applicable in the closed-loop supply chain environment, Does the optimized solution benefit the enterprise practice, how can we make it work in practice to benefit all participants in the industry? Researchers, policy makers and practitioners need to think deeply in order to explore these issues.

CONCLUSION
In this paper, the recycling mode and classification management of waste-clothing

ISSN 2394 - 7780

recycling and reusing are studied. According to the existing literature, there are differences in the understanding and measures of the producers, governments, and consumers, regarding waste-clothing recycling. Some producers are deeply aware of the necessity of waste-clothing recycling, whereas consumers' recognition still needs to be improved. The results showed that consumers' recognition of waste-clothing recycling was affected by various factors, such as the obstacles of recycling knowledge and recycling channels. Compared with other successfully recycled materials, there is a certain research gap in waste-clothing recycling management. Based on the recognition and actions of producers, governments, and consumers, the changes and complexities of waste-clothing recycling and Sustainability its reuse management classifications have been observed in different studies. It was found in this study that the establishment of policies had a great driving force for waste-clothing recycling, but due to consumers' weak cognition of policies, or lack of understanding, there were differences in the efficiency of waste-clothing recycling in different countries. In future research, the classification management and recycling of clothing fabrics and accessories can be considered, including the waste zippers manufactured by various materials, the new trend of button recycling, and the refined classification of various waste clothing fabrics by innovative technological development.

REFERENCES

1 WRAP. Why We Should Be Focusing on Clothing as Well as Plastics? Available online: https://wrap.org.uk/blog/2018/11/whywe- should-be-focusing-clothing-well-plastics (accessed on 10 August 2021).

2. How to Make the Clothing Sector Fit for a Net Zero World? Available online: https://wrap.org.uk/blog/2020/01/how-makeclothing- sector-fit-net-zero-world (accessed on 1 September 2021).

3. WRAP. Clothing. Available online: https://wrap.org.uk/resources/guide/textiles/clothing (accessed on 2 September 2021).

4. WRAP. Textiles. Available online: https://wrap.org.uk/resources/guide/textiles (accessed on 5 September 2021).

5. Watson, D.; Palm, D.; Brix, L.; Amstrup, M.; Syversen, F.; Nielsen, R. Exports of Nordic Used Textiles: Fate, Benefits and Impacts; Nordic Council of Ministers: Copenhagen, Denmark, 2016.

6. United Nations. Available online: https://www.un.org/en/actnow/facts-and-figures (accessed on 10 October 2021).

7. Wagner, M.M.; Heinzel, T. Human Perceptions of Recycled Textiles and Circular Fashion: A Systematic Literature Review. Sustainability 2020, 12, 10599. [CrossRef]

8. Filho, W.L.; Ellams, D.; Han, S.; Tyler, D.; Boiten, V.J.; Paço, A.; Moora, H.; Balogun, A.-L. A review of the socio-economic advantages of textile recycling. J. Clean. Prod. 2019, 218, 10–20. [CrossRef]

9. Sandin, G.; Peters, G.M. Environmental impact of textile reuse and recycling—A review. J. Clean. Prod. 2018,184, 353–365.

10. Hole, G.; Hole, A.S. Recycling as the way to greener production: A mini review. J. Clean. Prod. 2018, 212, 910–915. [CrossRef]

11. Rotimi, E.; Topple, C.; Hopkins, J. Towards A Conceptual Framework of Sustainable Practices of Post-consumer Textile Waste at Garment End of Lifecycle: A Systematic Literature Review Approach. Sustainability 2021, 13, 2965. [CrossRef]

12. Gr˛ebosz-Krawczyk, M.; Siuda, D. Attitudes of Young European Consumers Toward Recycling Campaigns of Textile Companies. Autex Res. J. 2019, 19, 394–399. [CrossRef]

13. Zhang, L.; Wu, T.; Liu, S.; Jiang, S.; Wu, H.; Yang, J. Consumers' clothing disposal behaviors in Nanjing, China. J. Clean. Prod. 2020, 276, 123184. [CrossRef]

14. Zhou, J.; Jiang, P.; Yang, J.; Liu, X. Designing a smart incentive-based recycling system for household recyclable waste. Waste Manag. 2021, 123, 142–153. [CrossRef]

15. Li, C.; Mak, S.L.; Tang, W.F.; Wu, M.Y.; Lam, S.K. Development of IoT-based Smart Recycling Machine to collect the wasted Non-woven Fabric Face Mask (NFM). In Proceedings of the 2020 IEEE International Symposium on Product Compliance Engineering-Asia (ISPCE-CN), Chongqing, China, 6–8 November 2020.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022

ISSN 2394 - 7780

ONIONS, GARLIC, AND GINGER: A COMPREHENSIVE ETHNOPHARMACOLOGICAL REVIEW

KM Renu Singh*, Sanjita Das, Shivani Shrivastava, Shrutidhasmana and Irfan Khan
Noida Institute of Engineering & Technology, 19, Knowledge Park-II, Greater Noida, Uttar Pradesh

ABSTRACT
It is a therapeutic aspect of medicinal herbs present in the kitchen for immediate treatment. Herbal plants can treat various diseases and ailments. It would be of great benefit in medical and surgical treatment. The promotion of the health system is easier, with medicinal plants than synthetic drugs. The health advantages of onions, garlic, and ginger are well-known. Centuries of scientific investigation have proven that these common plants may provide some illness prevention. Using those might also be beneficial for human health. These regularly used spices are significant in medicine, according to the current review, since they contain various bioactive components and nutrients. This study reviewed the medicinal properties of some of important spices generally found in every kitchen; onion, ginger and garlic. These commonly used spices are important in medicine due to the presence of many bioactive constituents and nutrients. Some chemical constituents of these medicinal plants have been reported in various literatures to contribute to the prevention and treatment of various diseases and ailments. In literatures, some of the documented properties of onion, garlic and ginger include antioxidant, anti-inflammatory, rheumatologic, blood circulation and anticramp, anti-ulcer, anticholinergic, analgesic, antimicrobial, anti-stress, anti-cancer, immunity booster, anti-diabetic, regulation of blood pressure and treatment of cardiovascular diseases. The use of these medicinal plant materials as potent neutraceuticals will aid the promotion of human health system in socioeconomic aspects.

Keywords: Ginger; antioxidants; garlic; onion; therapeutic activity; bioactive constituents.

INTRODUCTION
Herbal origins are always the source of promising treatment and control of wide range of diseases. There are numerous plants used in the world for various medicinal purposes [1]. Besides using spices in food processing, they can also be used animal health treatment due to their therapeutic functions. Currently, there is much therapeutics being tested for their medical potentials. In previous research, spices have been found to possess medicinal properties [2]. The greater demand for alternatives to traditional medications is primarily due to the declining quality of conventional medication and their prohibitive cost for many customers—natural substances[3] .This species has been found in warm climates (Taiwan, India, Nigeria, and Bangladesh)[4.] Ginger has been highly used in herbal medicine for many years. The ginger has been utilized by Chinese medicine for its anti-inflammatory properties. It is thought to help treat baldness, snakebites, toothaches, and respiratory disorders [5]. In addition traditionally garlic and inion are used for the ailment of numerous diseases.

Onion (*Allium cepa)*: The onion is a herbal plant that has medicinal properties. The scientific name of onion is *Allium cepa L.* which belongs to the *Liliaceae* family. Onion is a bulbous plant that is widely grown in all over the world [6.] The onion bulb is used as a vegetable as well as flavouring. The bulb may be consumed raw or roasted. The plant's leaves and flowers are also nutritious and are commonly used in salads [7.] In nearly all ethnic areas, onions are used as a vegetable and spices. The onion is rich in many phytochemicals that are considered important in a balanced diet, but it has also been studied for its biological properties and potential role in the treatment and prevention of a range of diseases. *A. cepa* is high in sulphur amino acids and contains many vitamins and minerals [8].

Pharmacological effects of onion
Anti-diabetics effects: In various studies, onion has shown hypoglycemic properties [9-11]. Besides Allium cepa crude hydro alcoholic extract increased blood sugar. It also caused an improvement or regeneration of pancreatic β cells. Moreover, the purple skinned onion has several positive health effects on the circulatory system and used as a diuretic to decrease swelling, reduce blood cholesterol levels along with development of blood clots, treat diabetes. is supposed to lower blood sugar levels [12]. Some literature stated that Allium cepa is a hypoglycaemic agent because it acts directly on some tissue such as the liver and controls glycolysis, muscle, and so on.

Antioxidant effects: Onions may be effective for managing cardiovascular and degenerative diseases. Because of their inability to meet consumer expectations, 10% of onions are thrown out and not sold[13-14]. It shows that demand for quality assurance has made sorting and testing even more important (irregular shape, injured parts, non-commercial sizes). Garbage coming from the onion industry is a significant concern for consumer suppliers

ISSN 2394 - 7780

[15-18]. First, cattle feed can make neither phytopathogenic nor a fertilizer because of pungent smell and rapid production of pathogenic agents, such as Sclerotium Cepivorum[19-20].

Anticancer effects: Organosulfur substances present in onions inhibit the growth of six different cancer cells [21]. Allium produces the flavonoid Quercetin, which has been shown to have anticancer properties. The flavonoid Quercetin contained in allium has been shown to have anticancer properties. It has the ability to stop cancer cells from multiplying. By inhibiting the NF-kB and MMP-2/-9 signalling pathways, Quercetin prevents the proliferation and migration of SAS human oral tumour cells [22-23].

Hepatoprotective effects: The A. cepa L. test was used to assess the cytogenotoxic activity of a cool aqueous extract from Achyrocline satureioides [24]. Onion extract were found to have Hepatoprotective properties against cadmium-induced oxidative damage [25]. Onion extracts had a dose-dependent Hepatoprotective effect, preventing and protecting against cadmium-induced neuroinflammation. Hepatoprotective efficacy of onion extracts (aqueous extract) ethanol-induced hepatotoxicity [26].

Anti-inflammatory effect: Since the flavonoid quercetin is present in onions, it has anti-inflammatory properties. Onion is used in arthritis disease [27]. Allium contains ajones that has anti-inflammatory effect [28]. The mechanism of action for onion extract is the control of the local inflammatory response, which helps to prevent atherosclerosis [29,30].

Garlic *(Allium sativum)*:Garlic is grown all over the world; it is believed to have arisen in Central Asia and later spread around the world [31]. Allicin is the active ingredient in garlic [32]. Garlic was used to cure stomach pain, rheumatism, cough, and dermatitis, lack of appetite, fever, epilepsy, cancer and snake bites, and antispasmodic in ancient time [33].

Pharmacological effects of Garlic

Antioxidant, anti-inflammatory and antistress effects: Garlic extract has been shown to have powerful antioxidant properties and to boost the levels of two antioxidant enzymes in the blood: catalase and glutathione peroxidase [34]. Garlic Organosulfur compounds were also thought to be able to inhibit glutathione depletion. Garlic intake can benefit patients whose liver function is being harmed by an increase in reactive oxygen species [35,36].

Anticancer effects: The ingestion of garlic will minimize the incidence of oesophageal, stomach and colon cancer. One of the advantages of Allicin is that it reduces the formation of the compounds that cause cancer in the digestive system. There was also a reduction in the risk of urinary tract cancer for physically active men. Prostate-specific antigen (PSA) levels dramatically decreased at four weeks [37-40].

Cardiovascular effects: Several studies have shown a high association between garlic consumption and improved heart health. In these cases, garlic may protect against heart disease and high cholesterol [41-43].

Antidiabetic effect: Some animal research suggests that garlic decreases blood glucose levels and alloxan (in some types of mice) induced diabetes. It was being reported that the diabetic effect of garlic is more effective than glibenclamide [44].

Action on Immunity booster: Garlic root is alleged have antioxidants that enhance the body's immune function. It is a significant part of the immune system as it makes the cells called killer cells more active. It has been shown that garlic is very effective for fighting off disease. There is an outstanding amount of germanium occurring in this substance [45-48].

Activities on Regulation of blood pressure: For decades, garlic has also been regarded as the most common spice to regulate blood pressure and hypertension [49-55]. In vitro research suggests that garlic has vasoactive properties and that organic garlic polysulfide enable endogenous cardio protective mediators' development.

Antimicrobial effects: Garlic is known to be safer than standard drugs as a result of fewer side effects. Ajoene has been reported to be an effective topical antifungal agent [56]. Amoeba is killed by levels that are just 30µg/ml of Allicin. At very low concentrations, Allicin exhibited antileishmanial activity [57-60].

Ginger: *Zingiber officinale* belongs to the genus *Zingiberaceae*. The ginger gene is found all over the world. Ginger to relieve nausea and to treats stomach aches. In medicine, ginger is considered an aphrodisiac. Also, ginger has been used to repel mosquitos. Oil from ginger is known to be therapeutic [61].

Pharmacological effects of ginger

Anti-ulcer and anti-cholinergic effect: Ginger affects various agents that could affect gastric mucosa and has antioxidant properties. Prostaglandin has both advantages and disadvantages, such as preserving gastric

ISSN 2394 - 7780

integrity and promoting a balanced intestinal function. Ginger has good antiemetic properties, which helps alleviate nausea and vomiting [62].

Antioxidant, anti-inflammatory and rheumatologic effects: Ginger modulates biological processes which are related to genetic stability and suppression of tumour cells. Studies have reported strong anti-platelet and COX-I inhibitory properties from Gingerols and paradol [63]. It reported that ginger works by preventing the underlying causes of Inflammation, such as leukotriene biosynthesis, and by reducing inflammation through prostaglandin biosynthesis inhibition. Sun Simulator is known to support rheumatic conditions [64].

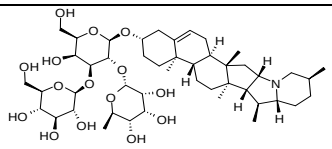
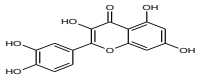
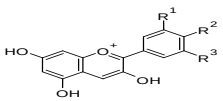
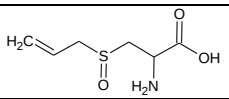
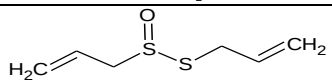
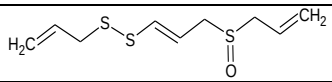
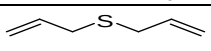
Analgesic effect: Gingerols, which are the primary ingredient of ginger, were shown to have some interesting pharmacological effects. It is a commercially available drug, and its use is endorsed in clinical trials. This action is likely to result from the increases of serotonin receptors such as 5-HT3. Ginger can relieve a headache and reduce unpleasant symptoms. The real result of this study is assumed to be through the prevention of annoying prostaglandin synthesis [65-66].

Effect on blood circulation and anti-cramp effect: Ginger was evaluated to improve blood serum supply by stimulating the heart muscles and diluting the body's circulating blood. For this purpose, gentle exercise will deliver good results [67].

Cholesterol regulatory and hypo-tensive effect: It is known that ginger is effective in lowering blood glucose level, when taken in dried form then lowers the cholesterol level in the body [68]. Long term use of statins results in elevated HDL cholesterol concentrations. There is scientific evidence that ginger has a hypotensive effect. Magnesium sulphate binds to antithrombin III and prevents it from binding to its substrates. Studies suggest that ginger extract can enhance insulin sensitivity in the body. By eating ginger, the user can recover energy [69].

Antimicrobial effects: Several phenols in ginger have shown. Ginger root is used around the world for the preservation of foods. Ginger is protective against parasitic infection. Several studies showed the ingestion of crude or methanolic extract of Zingiber officinale against trypanosomiasis [70]. There are various fungal species in that ginger is effective. There is a study stating that ginger has a powerful antiviral effect. Medicinal plants are cultivated in [71].

Table 1 Brief biological detail of onion, ginger and garlic [45, 50, 56, 60-72]

Name of the plant	Name of chemical constituent	Chemical structure	Therapeutic uses
ONION	Saponin		Anti-inflammatory Anti-arthiritis
	Quercetin		Anticancer, Antidiabetic
	Anthocyanin		Anti-inflammatory, Anti-obesity, Antidiabetic
GARLIC	Allin		Antioxidant, Antimicrobial
	Allicin		Antifungal
	Ajoene		Anticancer, Antimicrobial, Antioxidant, Cardioprotective
	Allyl sulfide		Anticancer, Antimicrobial, Antioxidant, Antithrombotic

ISSN 2394 - 7780

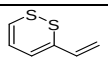
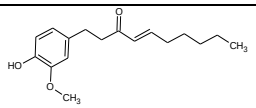
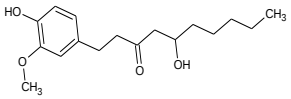
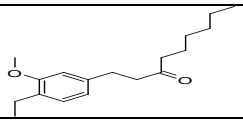
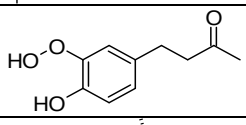
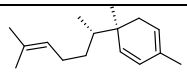
	1,2-vinyldithiin		Antimicrobial, Antioxidant, Antithrombotic
G I N G E R	Shogaol		Anti-inflammatory, Anticancer
	Gingerol		Antineoplastic , Anti-ulcer, Anti-cholinergic, Antibiotic
	Paradol		Antitumor, Antioxidant
	Zingerone		Anti-inflammatory, Antidiabetic,Antidiarrhoeic, Antilipolytic, Antispasmodic
	Zingiberene		Antiemetic, Gastro protective, Anti-ulcerative, Epigastric discomfort, Dyspepsia, Stomach aches
	Phellandrene		Antibacterial, Antidepressant, Diuretic

Table 2 Bioactive constituents of onion, ginger and garlic [68-72]

Type of biological specification	Name of the plant		
	Onion	**Ginger**	**Garlic**
Botanical name	Allium cepa	Zingiber officinale	Allium sativum
Family name	Amaryllidaceae	Zingiberaceae	Amaryllidaceae
Character	Monocot	Monocot	Monocot
Shape	Spherical shape.	Irregular	Phallic
Size	Height is approx. 75 to 180cm	2-3 feet	Height is approx. 60com
Colour	Red, white.	Carrot, orange	White, purple

CONCLUSION

Based on literary evidence, onion, Ginger, and garlic have significant medicinal effects to manage different ailments. In different scientific research on all three medicinal plant extracts for antimicrobial activity proved high but varied efficacy can be used in controlling infection. The extensive literature survey concluded that ginger, onion and garlic exhibit certain important therapeutic properties such as antioxidant, anti-inflammatory, rheumatologic, blood circulation booster, anti-cramp, anti-ulcer, anti-cholinergic, analgesic, antimicrobial, anti-stress, anticancer, immunity booster and anti-diabetic. On the other hand they are also found to have effective in blood pressure management and treating heart disorders. These herbs are rich in major bioactive components which contribute vital roles in regulation of blood pressure and treatment of cardiovascular diseases. The important bioactive constituents in garlic allicin and sulphur are recommended for prevention and treatment of cardiovascular and other metabolic diseases such as atherosclerosis, hyperlipidemia, thrombosis, hypertension and diabetes. The important bioactive component of onion quercetin provides protection against cataracts, cardiovascular disease and cancer. The use of these medicinal plant materials will aid for human body development and the promotion human health system. Based on this study, garlic and ginger could be used for therapeutic purposes and useful in the pharmaceutical industries. The purpose of the study satisfies by providing confidence among the users of ginger, garlic and onion from the kitchen for the immediate remedy of the mentioned diseases. The study will be beneficial for further scientific research on their active bio moieties for more potent formulation with less lesser side effect for multidimensional disease management.

ISSN 2394 - 7780

REFERENCE:

1. Imo, C., Arowora, K. A., Awache, I., & Abdullahi, Z. R. (2016). Haematological Effects of Ethanolic Leaf, Seed and Fruit Extracts of Datura metel on Male Albino Rats. *FUW Trends Sci. Tech. J*, *1*(2), 509-512.
2. Imo, C., & Uhegbu, F. O. (2015). Phytochemical analysis of Gongronema latifolium Benth leaf using gas chromatographic flame ionization detector. *Int J Chem Biomol Sci*, *1*(2), 60-68.
3. Everett, T. H. (1982). *The New York botanical garden illustrated encyclopedia of horticulture* (Vol. 10). Taylor & Francis.
4. Moghaddasi, M. S., & Kashani, H. H. (2012). Ginger (Zingiber officinale): A review. *Journal of Medicinal Plants Research*, *6*(26), 4255-4258.
5. Afzal, M., Al-Hadidi, D., Menon, M., Pesek, J., & Dhami, M. S. I. (2001). Ginger: an ethnomedical, chemical and pharmacological review. *Drug metabolism and drug interactions*, *18*(3-4), 159-190.
6. Marrelli, M., Amodeo, V., Statti, G., & Conforti, F. (2019). Biological properties and bioactive components of Allium cepa L.: Focus on potential benefits in the treatment of obesity and related comorbidities. *Molecules*, *24*(1), 119.
7. Lim, T. K. (2012). Quercus infectoria. In *Edible Medicinal And Non-Medicinal Plants* (pp. 16-26). Springer, Dordrecht.
8. Teshika, J. D., Zakariyyah, A. M., Zaynab, T., Zengin, G., Rengasamy, K. R., Pandian, S. K., & Fawzi, M. M. (2019). Traditional and modern uses of onion bulb (Allium cepa L.): a systematic review. *Critical reviews in food science and nutrition*, *59*(sup1), S39-S70.
9. Dorant, E., van den Brandt, P. A., & Goldbohm, R. A. (1996). A prospective cohort study on the relationship between onion and leek consumption, garlic supplement use and the risk of colorectal carcinoma in The Netherlands. *Carcinogenesis*, *17*(3), 477-484.
10. Galeone, C., Pelucchi, C., Levi, F., Negri, E., Franceschi, S., Talamini, R., & La Vecchia, C. (2006). Onion and garlic use and human cancer. *The American journal of clinical nutrition*, *84*(5), 1027-1032.
11. Hsing, A. W., Chokkalingam, A. P., Gao, Y. T., Madigan, M. P., Deng, J., Gridley, G., & Fraumeni Jr, J. F. (2002). Allium vegetables and risk of prostate cancer: a population-based study. *Journal of the National Cancer Institute*, *94*(21), 1648-1651.
12. Steinmetz, K. A., Kushi, L. H., Bostick, R. M., Folsom, A. R., & Potter, J. D. (1994). Vegetables, fruit, and colon cancer in the lowa women's health study. *American journal of epidemiology*, *139*(1), 1-15.
13. Bordia, A. M. K. H. (1981). Effect of garlic on blood lipids in patients with coronary heart disease. *The American journal of clinical nutrition*, *34*(10), 2100-2103.
14. Yeh, G. Y., Davis, R. B., & Phillips, R. S. (2006). Use of complementary therapies in patients with cardiovascular disease. *The American journal of cardiology*, *98*(5), 673-680.
15. Lau, B. H. (2006). Suppression of LDL oxidation by garlic compounds is a possible mechanism of cardiovascular health benefit. *The Journal of nutrition*, *136*(3), 765S-768S.
16. Jeyaraj, S., Shivaji, G., Jeyaraj, S. D., & Vengatesan, A. (2006). Effect of combined supplementation of fish oil with garlic pearls on the serum lipid profile in hypercholesterolemic subjects. *Alternative Medicine Review*, *11*(1), 65-66.
17. Ohaeri, O. C. (2001). Effect of garlic oil on the levels of various enzymes in the serum and tissue of streptozotocin diabetic rats. *Bioscience reports*, *21*(1), 19-24.
18. Eidi, A., Eidi, M., & Esmaeili, E. (2006). Antidiabetic effect of garlic (Allium sativum L.) in normal and streptozotocin-induced diabetic rats. *Phytomedicine*, *13*(9-10), 624-629.
19. Lau, B. H., Lam, F., & Wang-Cheng, R. (1987). Effect of an odor-modified garlic preparation on blood lipids. *Nutrition Research*, *7*(2), 139-149.
20. Salman, H., Bergman, M., Bessler, H., Punsky, I., & Djaldetti, M. (1999). Effect of a garlic derivative (alliin) on peripheral blood cell immune responses. *International journal of immunopharmacology*, *21*(9), 589-597.

ISSN 2394 - 7780

21. Morbidoni, L., Arterburn, J. M., Young, V., Mullins, D., Mulrow, C., & Lawrence, V. (2001). Garlic: Its history and adverse effects. *Journal of Herbal Pharmacotherapy*, *1*(1), 63-83.

22. Singh, D. K., & Singh, V. K. (2008). Pharmacological Effects of Allium Sativum L.(Garlic. *Annual Review of Biomedical Sciences*, *10*, 6-26.

23. Lanzotti, V. (2006). The analysis of onion and garlic. *Journal of chromatography A*, *1112*(1-2), 3-22.

24. Adetumbi, M. A., & Lau, B. H. (1986). Inhibition of in vitro germination and spherulation of Coccidioides immitis by Allium sativum. *Current Microbiology*, *13*(2), 73-76.

25. Nasri, H., Nematbakhsh, M., Ghobadi, S., Ansari, R., Shahinfard, N., & Rafieian-Kopaei, M. (2013). Preventive and curative effects of ginger extract against histopathologic changes of gentamicin-induced tubular toxicity in rats. *International journal of preventive medicine*, *4*(3), 316.

26. Chaiyakunapruk, N., Kitikannakorn, N., Nathisuwan, S., Leeprakobboon, K., & Leelasettagool, C. (2006). The efficacy of ginger for the prevention of postoperative nausea and vomiting: a meta-analysis. *American journal of obstetrics and gynecology*, *194*(1), 95-99.

27. Verma, S. K., Singh, J., Khamesra, R., & Bordia, A. (1993). Effect of ginger on platelet aggregation in man. *The Indian journal of medical research*, *98*, 240-242.

28. Ha, S. K., Moon, E., Ju, M. S., Kim, D. H., Ryu, J. H., Oh, M. S., & Kim, S. Y. (2012). 6-Shogaol, a ginger product, modulates neuroinflammation: a new approach to neuroprotection. *Neuropharmacology*, *63*(2), 211-223.

29. Hahn, G. (1996). History, folk medicine, and legendary uses of garlic. *Garlic: the science and therapeutic application of Allium sativum L. and related species. Williams & Wilkins, Baltimore, Md*, 1-24.

30. Mehdizadeh, M., Dabaghian, F., Nejhadi, A., Fallah-Huseini, H., Choopani, S., Shekarriz, N., ... & Asl, S. S. (2012). Zingiber officinale alters 3, 4-methylenedioxymethamphetamine-induced neurotoxicity in rat brain. *Cell Journal (Yakhteh)*, *14*(3), 177.

31. Ahmed, R. S., Suke, S. G., Seth, V., Chakraborti, A., Tripathi, A. K., & Banerjee, B. D. (2008). Protective effects of dietary ginger (Zingiber officinales Rosc.) on lindane-induced oxidative stress in rats. *Phytotherapy Research*, *22*(7), 902-906.

32. Waggas, A. M. (2009). Neuroprotective evaluation of extract of ginger (Zingiber officinale) root in monosodium glutamate-induced toxicity in different brain areas male albino rats. *Pakistan journal of biological sciences: PJBS*, *12*(3), 201-212.

33. Pecoraro, A., Patel, J., Guthrie, T., & Ndubisi, B. (1998, December). Efficacy of ginger as an adjunctive anti-emetic in acute chemotherapy-induced nausea and vomiting. In *ASHP Midyear Clinical Meeting* (Vol. 33, p. 429E).

34. Wojdyło, A., Oszmiański, J., & Czemerys, R. (2007). Antioxidant activity and phenolic compounds in 32 selected herbs. *Food chemistry*, *105*(3), 940-949.

35. Török, B., Belágyi, J., Rietz, B., & Jacob, R. (1994). Effectiveness of garlic on the radical activity in radical generating systems. *Arzneimittel-Forschung*, *44*(5), 608–611.

36. Morihara, N., Ushijima, M., Kashimoto, N., Sumioka, I., Nishihama, T., Hayama, M., & Takeda, H. (2006). Aged garlic extract ameliorates physical fatigue. *Biological and Pharmaceutical Bulletin*, *29*(5), 962-966.

37. Ozgoli, G., Goli, M., & Simbar, M. (2009). Effects of ginger capsules on pregnancy, nausea, and vomiting. *The Journal of Alternative and Complementary Medicine*, *15*(3), 243-246.

38. Choi, Y. Y., Kim, M. H., Hong, J., Kim, S. H., & Yang, W. M. (2013). Dried ginger (Zingiber officinalis) inhibits inflammation in a lipopolysaccharide-induced mouse model. *Evidence-based Complementary and Alternative Medicine*, *2013*.

39. Chen, B. H., Wu, P. Y., Chen, K. M., Fu, T. F., Wang, H. M., & Chen, C. Y. (2009). Antiallergic potential on RBL-2H3 cells of some phenolic constituents of Zingiber officinale (ginger). *Journal of natural products*, *72*(5), 950-953.

ISSN 2394 - 7780

40. Lantz, R. C., Chen, G. J., Sarihan, M., Solyom, A. M., Jolad, S. D., & Timmermann, B. N. (2007). The effect of extracts from ginger rhizome on inflammatory mediator production. *Phytomedicine*, *14*(2-3), 123-128.

41. Newall, C. A., Anderson, L. A., & Phillipson, J. D. (1996). *Herbal medicines. A guide for health-care professionals*. The pharmaceutical press.

42. Block, E. (2010). Garlic and Other Alliums. Allium Botany and Cultivation, Ancient and Modern. *Royal Society of Chemistry (http://www. springer. com/978-0-85404-190-9)*, *11*, 4-6.

43. Petchdee, S. (2012). Cardioprotective effects of garlic. *KKU Veterinary Journal*, *22*(2), 242-254.

44. Jabar, M. A., & Al-Mossawi, A. (2007). Susceptibility of some multiple resistant bacteria to garlic extract. *African Journal of Biotechnology*, *6*(6).

45. Macpherson, L. J., Geierstanger, B. H., Viswanath, V., Bandell, M., Eid, S. R., Hwang, S., & Patapoutian, A. (2005). The pungency of garlic: activation of TRPA1 and TRPV1 in response to allicin. *Current Biology*, *15*(10), 929-934.

46. Wojdyło, A., Oszmiański, J., & Czemerys, R. (2007). Antioxidant activity and phenolic compounds in 32 selected herbs. *Food chemistry*, *105*(3), 940-949.

47. Prasad, K., Laxdal, V. A., Yu, M., & Raney, B. L. (1995). Antioxidant activity of allicin, an active principle in garlic. *Molecular and Cellular Biochemistry*, *148*(2), 183-189.

48. Török, B., Belagyi, J., Rietz, B., & Jacob, R. (1994). Effectiveness of garlic on the radical activity in radical generating systems. *Arzneimittel-forschung*, *44*(5), 608-611.

49. Sabayan, B., Foroughinia, F., & Chohedry, A. (2007). A postulated role of garlic organosulfur compounds in prevention of valproic acid hepatotoxicity. *Medical hypotheses*, *68*(3), 512-514.

50. Morihara, N., Ushijima, M., Kashimoto, N., Sumioka, I., Nishihama, T., Hayama, M., & Takeda, H. (2006). Aged garlic extract ameliorates physical fatigue. *Biological and Pharmaceutical Bulletin*, *29*(5), 962-966.

51. Kasuga, S., Ushijima, M., Morihara, N., Itakura, Y., & Nakata, Y. (1999). Effect of aged garlic extract (AGE) on hyperglycemia induced by immobilization stress in mice. *Nihon yakurigaku zasshi. Folia pharmacologica Japonica*, *114*(3), 191-197.

52. Imo, C., & Za'aku, J. S. (2019). Medicinal properties of ginger and garlic: A review. *Curr Trends Biomedical Eng & Biosci*, *18*(2), 47-52.

53. Qureshi, S., Shah, A. H., Tariq, M., & Ageel, A. M. (1989). Studies on herbal aphrodisiacs used in Arab system of medicine. *The American journal of Chinese medicine*, *17*(01n02), 57-63.

54. Connell, D. W., & Sutherland, M. D. (1969). A re-examination of gingerol, shogaol, and zingerone, the pungent principles of ginger (Zingiber officinale Roscoe). *Australian Journal of Chemistry*, *22*(5), 1033-1043.

55. Dugasani, S., Pichika, M. R., Nadarajah, V. D., Balijepalli, M. K., Tandra, S., & Korlakunta, J. N. (2010). Comparative antioxidant and anti-inflammatory effects of [6]-gingerol,[8]-gingerol,[10]-gingerol and [6]-shogaol. *Journal of ethnopharmacology*, *127*(2), 515-520.

56. Gull, I., Saeed, M., Shaukat, H., Aslam, S. M., Samra, Z. Q., & Athar, A. M. (2012). Inhibitory effect of Allium sativum and Zingiber officinale extracts on clinically important drug resistant pathogenic bacteria. *Annals of clinical microbiology and antimicrobials*, *11*(1), 1-6.

57. Ajith, T. A., Aswathy, M. S., & Hema, U. (2008). Protective effect of Zingiber officinale roscoe against anticancer drug doxorubicin-induced acute nephrotoxicity. *Food and chemical toxicology*, *46*(9), 3178-3181.

58. Duarte, M. C., Tavares, G. S., Valadares, D. G., Lage, D. P., Ribeiro, T. G., Lage, L. M., ... & Coelho, E. A. (2016). Antileishmanial activity and mechanism of action from a purified fraction of Zingiber officinalis Roscoe against Leishmania amazonensis. *Experimental parasitology*, *166*, 21-28.

ISSN 2394 - 7780

59. Uz, E., Karatas, O. F., Mete, E., Bayrak, R., Bayrak, O., Atmaca, A. F., ... & Akcay, A. (2009). The effect of dietary ginger (Zingiber officinals Rosc) on renal ischemia/reperfusion injury in rat kidneys. *Renal failure*, *31*(4), 251-260.

60. Kumar, A., Goyal, R., Kumar, S., Jain, S., Jain, N., & Kumar, P. (2015). Estrogenic and anti-Alzheimer's studies of Zingiber officinalis as well as Amomum subulatum Roxb.: the success story of dry techniques. *Medicinal Chemistry Research*, *24*(3), 1089-1097.

61. Morioka, N., Sze, L. L., Morton, D. L., & Irie, R. F. (1993). A protein fraction from aged garlic extract enhances cytotoxicity and proliferation of human lymphocytes mediated by interleukin-2 and concanavalin A. *Cancer Immunology, Immunotherapy*, *37*(5), 316-322.

62. Capraz, M., Dilek, M., & Akpolat, T. (2007). Garlic, hypertension and patient education. *International journal of cardiology*, *121*(1), 130-131.

63. Dini, C., Fabbri, A., & Geraci, A. (2011). The potential role of garlic (Allium sativum) against the multi-drug resistant tuberculosis pandemic: a review. *Annali dell'Istituto superiore di sanità*, *47*, 465-473.

64. Benavides, G. A., Squadrito, G. L., Mills, R. W., Patel, H. D., Isbell, T. S., Patel, R. P., ... & Kraus, D. W. (2007). Hydrogen sulfide mediates the vasoactivity of garlic. *Proceedings of the National Academy of Sciences*, *104*(46), 17977-17982.

65. Josling, P. (2001). Preventing the common cold with a garlic supplement: a double-blind, placebo-controlled survey. *Advances in therapy*, *18*(4), 189-193.

66. Tsao, S. M., & Yin, M. C. (2001). In-vitro antimicrobial activity of four diallyl sulphides occurring naturally in garlic and Chinese leek oils. *Journal of medical microbiology*, *50*(7), 646-649.

67. Ledezma, E., & Apitz-Castro, R. (2006). Ajoene the main active compound of garlic (Allium sativum): a new antifungal agent. *Revista iberoamericana de micologia*, *23*(2), 75-80.

68. Shams-Ghahfarokhi, M., Shokoohamiri, M. R., Amirrajab, N., Moghadasi, B., Ghajari, A., Zeini, F., ... & Razzaghi-Abyaneh, M. (2006). In vitro antifungal activities of Allium cepa, Allium sativum and ketoconazole against some pathogenic yeasts and dermatophytes. *Fitoterapia*, *77*(4), 321-323.

69. Sabitha, P., Adhikari, P. M., Shenoy, S. M., Kamath, A., John, R., Prabhu, M. V., ... & Padmaja, U. (2005). Efficacy of garlic paste in oral candidiasis. *Tropical doctor*, *35*(2), 99-99.

70. Gebreyohannes, G., & Gebreyohannes, M. (2013). Medicinal values of garlic: A review. *International Journal of Medicine and Medical Sciences*, *5*(9), 401-408.

71. Raj, R. K. (1975). Screening of indigenous plants for anthelmintic action against human Ascaris lumbricoides: Part--II. *Indian Journal of Physiology and Pharmacology*, *19*(1), UNKNOWN-UNKNOWN.

72. Mirelman, D., Monheit, D., & Varon, S. (1987). Inhibition of growth of Entamoeba histolytica by allicin, the active principle of garlic extract (Allium sativum). *Journal of Infectious Diseases*, *156*(1), 243-244.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022

ISSN 2394 - 7780

ANALYTICAL ANALYSIS OF E-COMMERCE

Dr. Mrunal A Mule
Director, Shri Ram College of Commerce, Bhandup ,Mumbai

ABSTRACT
The E-Commerce is dynamic industry because of its rapid changing technology. E-Commerce performs vital role in the business phenomena in trading products and services. It provides the extraordinary features in the business growth of the country economy. E-Commerce firms are spending huge amount of money on Data Analytics to extract the actionable insights from larger datasets. Data driven business insights are crucial for E-Commerce sector to measure the changing market trends and consumer behavior. The business sector is grown up the greater heights with involvement of Data Analytics in E-Commerce. E-Commerce Analytics designed to analyze and predict the future trends of the market to attain the competitive advantage. However, E-Commerce may contain some critical challenges apart from the opportunities.

This paper highlights the role of Data Analytics perceived as a value creator for E-Commerce industry to attain competitive advantage.

Keywords: E-Commerce, Data Analytics, Descriptive Analytics, Predictive Analytics, Diagnostic Analytics, Prescriptive Analytics.

1. INTRODUCTION

The invention of information technology motivated enormous growth in the business and reshaped into globalised. The new business models are developed and expanded with the utility of information systems. E-Commerce eliminated technical, geographic, business and cost barriers with global flow of information between buyers and sellers. E-Commerce is a tremendous change in business sector over the traditional Commerce.

Initially Netscape.com started E-Commerce web portal for the purpose of publishing organizational advertisement in 1995. There is instrumental growth in E-Commerce is much more than other inventions such as telephone, radio and television. The major setback of "Dot.com" companies in 2001, most of business organization learned a lot of experience. Only few companies like Amazon, Google; e-bay not only survived and stand with better growth. In 2006, E-commerce achieved the remarkable significance with retail market in various developed countries of US, Asia and Europe.

In recent, the trading community offered the services such as buying and selling products through E-Commerce. As per E-Commerce times report, the Amazon achieved 28% of sales increase in 2003, due to more than 20% Americans access the online shopping from their homes with their broadband services. From year 2010 onwards, E-Commerce reached into people hands with their smart phones. The Google search engine provides services at their fingertips and browsing E-Commerce websites at home. Social media has also changed the scenario of E-Commerce with improved business communication in trading the products and services.

E-Commerce grows at the rate of 20% with usage of smart phones. The cost of setting physical store is more expansive than online services. Many startup E-Commerce companies achieved competitive advantage with development of mobile technology, faster internet access and availability of cheaper devices.

E-Commerce Analytics designed to analyze huge amount of data in order to retrieve the actionable insights. Business Analyst performs vital role in E-Commerce for getting more opportunities by overcoming the challenges. The role of analyst in E-Commerce domain is to analyze and report the changes to the E-Commerce managers. Business Analytics analyze the change of business needs, predict the impact of change on business environment, track web analytics, advertising campaign results, search engine results and branding across a website.

This paper focused the role of Business Analytics in E-Commerce with innovative direction. The rest of paper is organized as follows. The Section 2 explains the review of literature. Section 3 explains the taxonomy and overview of E-Commerce spectrum. The Section 4 states the various types of Business Analytics and its roles in E-Commerce. The Opportunities and Challenges of E-Commerce Analytics discussed in Section 5. Finally, concluded with discussion in section 6.

ISSN 2394 - 7780

2. REVIEW OF LITERATURE

Over the years many researchers and theorists identified the vital role of information technology in Commerce. In recent, it is enhanced with additional features using Data Analytics attain the competitive advantage. A numbers of theorists and researchers have worked on various issues in E-Commerce domain.

- Dr. Subhash Masanappa Suryawamshi. [4] focused on recent trends of E-Commerce industry in India with its challenges, opportunities..
- Goyal.DP [6] distinguished E-Commerce and E-Business. He highlighted the business opportunities and challenges of E-Commerce in taxonomy.
- Abdul Gaffer[1] Khan discussed various benefits of E-Commerce and its competitive advantage. The author highlights some challenges in perspective of stakeholders.
- Vivekananth.P. et al [10], compared the various Data Analytics methods used in text analytics, social media analytics, audio analytics and predictive analytics. They focused on contrast issues with comparative analysis.
- Sabarmathi.G et al[7], proposed the research plan for patient health care system. She suggested innovative methodology to integrate the Data Analytics for effective health care modeling.
- Siddhardha.K et al [8], presented paper on Big Data Analytics and its role in industry and individual applications. The authors highlighted the various challenges, limitations and tools involved in big data analytics in detailed manner.

Their developed taxonomy can be benefited to extend

the knowledge in certain domain for discussion and

to achieve quality service

3. THE TAXONOMY AND OVERVIEW OF E-COMMERCE SPECTRUM

The "E-Commerce" application has become a popular business term which is one of the brain child of information technology in trading products and services electronically. E-Commerce is the subset of E-Business. The E-Business includes E-Commerce with front and back office applications.

Internet has been the major driven force for the wide expansion of computer applications in the business environment[9]. Many business organizations irrespective of size benefited with E-Commerce by making the transactions electronically. The stakeholders gain features such as universal standards, customization, global reach and social networking with rapid growth of E-Commerce

As part of trading products through E-Commerce, it encompasses other activities such as developing, marketing, delivering, paying and servicing the products. The E-Commerce broadly includes the following functions.

- Provide the product description though catalog.
- Defining the customer requirement through the search option and comparison.
- Perform the purchase transition though electronic payment systems.
- Delivery of the products with various logistic services such as couriers, road, and airways etc.
- Provide the customer service after sales.

Apart from the above, it reduces the transaction costs, improves the customer service and establishes coordination between stakeholders such as manufacturers, suppliers and customers.

A. Classification of e-Commerce

E-Commerce classified into different types based on various perspectives such as Business to Business(B2B), Business to Consumer(B2C), Consumer to Consumer(C2C) and Business to Government(B2G).

B. Area of Applicability of E-Commerce

E-Commerce used in various business areas such as retail, wholesale, finance, manufacturing and marketing etc.

Retail and Wholesale business: Most number of E-Commerce applications involved in retail and wholesale in online mode. E-Commerce provides the services such as selling, cataloging and shipping products at the

ISSN 2394 - 7780

consumer doorstep. The cybermall provides virtual space for multiple buyers and sellers through web browser. Various companies perform wholesale trading of products through E-Commerce applications.

Finance: The financial institutions provides the effective financial services using E-Commerce such as depositing, withdrawal, transfer the money to other accounts, order for checkbooks, demand drafts, pay the bills through e-Banking etc. Stack trading is another part of E-Commerce application which provides news, analytical Charts, company profiles and analysis of trading.

Manufacturing: E-Commerce platform provides the supply chain operations of the company that can perform an electronic exchange of trading of market information with back office operations of inventory control. These applications can speed up the flow of raw material and finished products among business community with reduction of inventory cost.

Marketing : E-Commerce used in marketing for customer behavior, preferences, buying patterns, needs through the web. The information used for price fixation, product enhancement, negotiations and promotions in marketing.

Bidding and Auctions: Direct selling of products among the customers in C2C through electronic auctions. Bidding allows buyers to place a bid for a

Product/Service. Ex: Quote the price for seat booking in airline & premier tatkal of train

C. Infrastructure of E-Commerce

Infrastructure of the E-Commerce classified into two types such as Hardware and Software.

Hardware: E-Commerce hardware consists the web server configuration with sufficient storage and processing capability for smooth execution of E-Commerce transactions. Sometimes the companies acquired these services from the third parties on lease base. There must be adequate hardware backup to avoid the transaction failures and hazards.

Software : The E-Commerce software classified into following parts.

.**Web-server Software**: Server enabled operating system, which provides services such as security, retrieval of web pages, sending of web pages, tracking, web site development and webpage development.

E-Commerce Software : It is host software of E-Commerce. It contains various functionalities of Commerce. Ex: Catalog Management, Product Configuration, Transport shipping Cart, Transaction processing and Web traffic Data Analysis.

D. E-Commerce Payment Systems & Security

There is main threat for E-Commerce with electronic payment systems over internet. The computer criminals capture financial data through online, and then consumers become suspicious on their money transactions. Today, E-Commerce provides electronic payment systems with more security mechanisms such as user identification, password, encryption and digital certification. Apart from that, Internet provides Secure Socket Layer(SSL) protocol to safeguard the payment transactions. It works above the TCP layer of OSI model and other protocols like Telnet, HTTP. But, it clearly understood that there is no absolute security on the internet.

Some of the Electronic payment is as follows.

Electronic Cash: Electronic cash is similar to the hard cash that can be used for online payments. The financial institutions provide net banking facility to the customers for online payments.

Electronic Wallets: Electronic Wallet is computerized stored value that holds the credit card information. It is most convenient approach to purchase products at online.

Cards: Cards are more flexible for online buyers. The credit card, such as visa, master card has predefined spending limit. Debit card is another form of payment on the internet. Debit card works as cash or personal cheque, which have magnetic strip to withdraw the amount by swapping process.

The E-Commerce websites give the various options for payment transactions.

E. The various Phases of E-Commerce Trade Life Cycle Model

E-Commerce Trade Life Cycle consists various phases of the following

ISSN 2394 - 7780

Searching for the Item: Customer search for the required product at supplier's home page. They can search the product with description in product catalog option.

Product Selection and Negotiation: After searching required product, the customer fulfills the quotation form with entering product code and no. of items required.

Product Purchasing: The customer submits online purchase order to the supplier. In this phase customer can choose the mode of payment. The various security measures can be incorporated on the internet for safeguard the money transactions.

Product Delivery: The logical products such as software and multimedia products can be downloaded through internet after online payment. However, the physical products cannot be delivered through traditional methods like road, air and courier. Product delivery either by company or it may be outsourced with third party.

After the Sales Service : This phase belongs to service and maintenance of the product relevant with product usage, repair service under warranty can be obtained from the websites.

4. THE VARIOUS TYPES OF BUSINESS ANALYTICS AND ITS ROLE IN E-COMMERCE

Technology is an integral part of human life, there is no exception for business. It makes reality in providing effective results in business sector. Data Analytics can retrieve many insights from E-Commerce for effective decision making.

The different frameworks gather the customer data and implement innovative business strategies, which enhance the business profits and its understanding. There are various types of analytics to analyze and predict the business data is as follows.

A. Types of Business Analytics

Descriptive Analytics: The Descriptive Analytics analyze general characteristics of previous customer purchase history and mine the insights such as purchase behavior, interests, capacity and involvement[10]. It is useful to take the strategic business decisions. Premier business organizations use descriptive analytical tools for effective decision making.

Diagnostic Analytics: Diagnostic Analytics can analyze the past data for specific purpose and determine why certain things are happened in the form of exception report. Ex: Finding the reasons for sales down fall and expenditure increased in the particular month.

Predictive Analysis: Predictive Analytics finds the inferences on current data of business in order to make the predictions [2]. It ensures insights and predicts the future course of action based on present data of the business. Prediction based on the large datasets has been complex task with traditional systems. Business Intelligence programs can process and compute the data streams at large extent with social media content, experiences, daily business activities and feedback reports of the stakeholders.

The analytics identifies customer purchase behavior and implement the various strategic methods such as giving loyalties, rewards and privileges. The Machine Learning algorithms used in predictive analysis to make effective decisions in the business.

Prescriptive Analytics: Prescriptive Analytics allows to analyze business insights , then provides suggestions, advices and alternatives to make the business as more effective[5]. This analytics suggests suitable decisions based on collected data from different sources, which make greater impact on business system. It also provides the insights to the respective stakeholders of business system for better adaptive techniques based insights.

Since, we cannot confidence on machine completely, and human invention, is also taken into consideration for possibilities. The extensive research is needed in the area of prescriptive analysis towards the problem.

B. The Role of Business Analytics in E-Commerce

E-Commerce is a dynamic industry because of rapid changing technology and analytics makes the E-Commerce as more smarter than earlier. Business analytics plays vital role in E-Commerce for effective market strategy and overcoming the risks. E-Commerce industry mainly targeted to make user experience on their website and analytics focuses on finding the insights. Ex: Amazon, E-bay using Predicative algorithms in the real time business environment in the form of recommender system.

ISSN 2394 - 7780

The business analytics performs vital roles in the E-Commerce industry.

Supply Chain Management
The customers prefer online shopping for purchase of items within better price in convenient manner. This is possible with only robustness of the supply chain management. It manages the product data from warehouse to customer. Data Analytics effectively manages E-Commerce in significant portion of inventory data and optimize transportation of delivery in minimum cost. The relation between supply and demand is tricky, the analytics plays vital role in forecasting the futures sales.

Merchant Analytics: E-Commerce performs extensive analysis for merchants to get new business models and fix right price for their goods. Analytics for E-Commerce can determine the future trends based on many factors such as frequency of transactions, season, demographical and category of products and so on. This type of analytics is can outlook the future sales.

Marketing Fraud Detection: In business environment frauds not always from the merchant side, sometimes customers also make false claims in frauds. The analytics plays vital role in the fraud detection based on customer behavior. E-Commerce integrated with predictive algorithms can warn when fraud transaction is detected. E-Commerce business can send a notification to the customer for the express of approval before processing the transaction.

User Experience Analytics: The software teams works on creating user friendly architecture of the website for searching the products across website, ordering the searched products etc. They design layout of the website for customer flexibility. Various customers refer the E-Commerce website in different perspectives. E-Commerce Analytics assess the user behavior for design user friendly website based on customer privilege

Recommender Systems: E-Commerce recommender system suggests products to their customers. It recommends products based on top sellers on a site, demographics of the customer and analysis of the past customer behavior as prediction for future. The recommender engine provides contribution of analytics to E-Commerce. Someone clicks on product, then other products are recommended for purchase in addition to their original purchase. It increases the average order value by recommending other products with original.

Product specific analytics : E-Commerce Analytics find out the satisfaction rate of customers for a product among other products and predict for the future sales. It helps to maintain the stock inventory of the products for sales in forthcoming period.

Customer Sentiment Analysis: The role of Sentiment Analysis in E-Commerce over the long period. Machine learning algorithms help to automate and time saves in giving accurate outcomes. Social media is best platform for data analyst to perform customer sentiment analysis. It provides the negative or positive opinion towards the item brand. This feedback is a precaution to improve the business.

Predict the optimum price of the product : In the E-Commerce, the price of the product fixed based on the demand of the product, market availability and competitors price of the same product. The Predictive Analytics can analyze the product trends, price and determine the optimum price of the product to improve the business profits.

Online marketing analytics: E-Commerce companies spending more money in online marketing campaigns as part of marking strategy for attracting the customers. The online marketing teams works on bidding for sales ads on internet websites. This analytics can measure the ad clicks, spending time of visitors on the site, channel data and promotion effectiveness. The online marketing analytics measure these metrics to predicts return on investment and forthcoming marketing strategy

The E-Commerce stakeholders such as senior managers get insights about business objectives and product managers get insights about product sales, optimum profit through E-Commerce dashboards across the organization.

5. BUSINESS OPPORTUNITIES AND CHALLENGES OF E-COMMERCE

The E-Commerce can motivate new business models with innovative features[3]. Information technology has provided significant opportunities for business improvement. Apart from opportunities there will be certain challenges and threats to the E-Commerce.

Data Security and Privacy : Security is foremost important for the every technology. There is no exemption for E-Commerce Analytics from third party applications.

ISSN 2394 - 7780

Elimination of Data inconsistency: The data gathered from various sources of the domain and stored at single site. There may be a possibility of data inconsistency. There is need of robust tools to eliminate data inconsistency and redundancy.

Reorganization of Business process: In order to implement E-Commerce applications, business firms required to redesign the business processes and functional scope. The Business firms well defined with policies and procedures in transparent manner for sharing the data with other business firms.

Legal Problems for e-Commerce: Biggest challenge for E-Commerce is the handling of legal issues relevant with email contract, the role of electronic signatures, copyright laws etc. The internet is wide area network which connect the heterogeneous countries with different legal systems which arises legal implications.

Managerial Opportunities: The E-Commerce provides many managerial opportunities such as to reduction of transaction costs, the customers and suppliers can exchange business communication without intermediaries and proper communication and coordination between stakeholders.

6. CONCLUSIONS

The E-Commerce reduced the gap in between manufacturer and consumer with the innovation of E-Commerce applications. The major threat of E-Commerce, that intruders capture crucial data of payment transaction due to lack of security. The intruders escape from crimes with weakness of cyber laws. The role of constitution is to formulate robust legal framework for protection of E-Commerce intellectual property, privacy, consumer protection and rights etc. On other hand the governments should frame the universal legal system and enforce law and order against cyber criminals across the globe. There is a need of in depth research in the area of E-Commerce security and privacy

In perspective of Analytics, we cannot confidence on machine completely, and human invention, is also taken into consideration for possibilities. The extensive research is needed in the area of prescriptive analysis towards the problem

REFERENCES

[1] Abdul Gaffar Khan, " Electronic Commerce : Study on Benefits and Challenges in an Emerging Economy", Global Journal of Management and Business Research : Economics and Commerce, Vol.16(1). 1, 2016.

[2] Bindu. M.G.," A Survey on Big Data Analytics : Challenges and Opportunities", International Journal of Computer Science and Information Technologies" , Vol. 9(4), 2018.

[3] Dr. Naveen Kumar, "E-Commerce in India : An Analysis of Present Status, Challenges and Opportunities", International Journal of Management Studies, Vol.5, Issue.2, April,2018.

[4] Dr. Subhash Masanappa Suryawanshi, "E-Commerce in India – Challenges and Opportunities E-Commerce", International Research Journal of Multidisciplinary Studies, Vol. 3(3), March,2017.

[5] Elen Geanina Alaru et al, " Perspectives on Big Data and Big Data Analytics", vol. 3(4), 2012.

[6] Goyal.D.P "Management Information Systems – Managerial Perspectives", Macmillan Publishers- 3rd Edition, 2010.

[7] Sabarmathi.G et al," Big Data Analytics Research Opportunities and Challenges : A Review", International Journal of Advanced Research in Computer Science & Software Engineering, Vol. 6(10), Oct,2016.

[8] Siddardha.K et al, " Big Data Analytics : Challenges, Tools and Limitations", International journal of Engineering and Technical Research, Vol. 6(3), Nov, 2016.

[9] Shahriari et al, " E-Commerce and it Impacts on Global Trend and Market", International Journal of Research - Granthaalayah, Vol.3(4), April,2015

[10] Vivekananth. P. et al, " An Analysis of Big Data Analytics Techniques", International Journal of Engineering and Management Research", Vol. 5(5), Oct, 2015.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

ETHICAL HACKING & SECURITY AGAINST CYBER CRIME

Prof. Kirandevi Pal

ABSTRACT
This paper considers the fast blooming Cyber world and its components over the internet. The fast blooming Internet has benefited the modern society in form of electronic commerce, electronic mail, online banking or system, advertising, vast stores of reference material etc. however, there is also a bad side, internet become a common and easy tool for the criminal activity using the weak link and flaw of internet. This paper emphasizes the role of ethical hacker to clear from the culprits and cybercrime and show on proactive approach to minimize the threat of hacking and Cyber-crime.

Keywords: Hacking, Security, Cyber Crime, Ethical, Threat, Vulnerability.

INTRODUCTION

"Security is a state of well-being of information and infrastructure in which the probability of successful yet unobserved theft, mitigating and interruption of information and services are kept to low tolerable." [1]

•Network security:
Preventing network and data, computer program, other computer system assets from unwanted impostors, and unauthorized user.

•Information Security:
It is the practice of preventing unauthorized access, modification, inspection use, disclosure, disruption, recording or destruction of information.

There are following security services issues as given below [3-5].

•Confidentiality

•Authentication

•Integrity

•No repudiation

•Access control

•Availability

•Authorization.

1. Hacking

An attempt to exploit a computer system or a private network inside a computer. Simply put, it is the unauthorized access to or control over computer network security systems for some illicit purpose..

Hacking divided into two terms: [6-8]

- Ethical Hacking
- Unethical Hacking

1.1 Ethical Hacking:

The practice of breaking into computers without mischievous intent, simply to find security threats and report them to the people responsible. Ethical hackers choose to use their powers for good rather than evil. Ethical hackers also known as white hat hacker.

1.2 Unethical Hacking

Unethical Hacking is "cracking". Cracking activities is breaking the computer security without authorization or uses technology, or tools for credit card fraud, identity theft, piracy, or other types of illegal activity. So Since illegal hacking involves unauthorized access to business-critical data, it is considered as a criminal offense and is punishable under law..

What is Cyber Crime?

Cybercrime is criminal activity that either targets or uses a computer, a computer network or a networked device.. According to Kevin G. Coleman at al. Cyber-crime is defined as "The premeditated use of disruptive

ISSN 2394 - 7780

activities, or the threat thereof, against computers and/or networks, with the intention to cause harm or further social, ideological, religious, political or similar objectives or to intimidate any person in furtherance of such objectives."

2. Importance of Ethical Hacking and How Minimize The Security Threats

Ethical Hacker is network and computer security professional who apply their knowledge and skills in defensive purpose. Roles of ethical are following:

- Find out the mischievous contents from the network traffic.
- Ethical hackers develop many tools and methods and quality assurance tester to eliminate all the system's vulnerabilities.
- Diagnose the security threat of the system.

This diagnostic efficiently exposes operation services and known vulnerabilities in systems such as servers and network equipment by using port scans, vulnerability scans and other tool diagnostics.

3. Major Disaster of Unethical Hacking

Unethical hacking is cyber-crime and being use as noticeable arm to make crime and cause millions harm every day .

3.1 DEMOTION

Most harsh face of this unethical hacking, are hack the account, identity, penetrating in unauthorized network or system and the data etc. not only for money but also spread terrorism.

3.2 Virus attack:

The computer virus is the most infamous type of malware .It is a self-replicating program that infects a

System without authorization.

The impact of a viruses ranges widely from slow

System performance to wiping out every file on

Computer.

4. Social Awareness and Precaution During Net Surfing

•Should not click any hyperlink if you are not sure about the link .

•Should not create needlessly many email account.

•Should not use nameless user id and password for net surfing.

•System should be password protected and should automatically lock when system is idle for long time.

•Delete all the vital material related to system, network, or id so that dumpster diving cannot be done.

•User id and password should be strong with special character form and should be change occasionally.

• Use digital signature etc. techniques to transfer the important data.

•We should avoid to uses of plagiarized software.

5. Some System and Devices for Network Security

5.1 Intrusion Detection Systems (IDS):

1. An intrusion detection system(IDS) is software application or device that monitors a networks or systems for malicious activity or privacy violations.
2. Intrusion detection is the process of monitoring

The events occurring in yours network analyzing

Them for sing of possible incidents, violations, or

Imminent threats to yours security policies.

3. These security measures are available as Intrusion Detection System(IDS) and Intrusion Prevention System(IPS) ,which become part of

Your network to detect and stop protected incidents.

ISSN 2394 - 7780

5.2 Firewall:
A firewall is a system that is set up to control traffic flow between two networks. A firewall is a network security device that monitors incoming and outgoing network traffic and decides whether to allow or block specific traffic based on a defined set of security rules..

5.3 Packet Filtering Firewall:
Packet-filtering firewalls, the most common type of firewall, examine packets and prohibit them from passing through if they don't match an established security rule set.

5.4 Port Scanning:
In this process the hacker identifies available and open ports and understands what services are running.you must be understand the ports and ports

Numbers.

Well known ports from 0 to 1023

Registered ports from 1024 to 49151.

Dynamic ports from 49152 to 65535.

5.5 IPSec:
The IP security (IPSec) is an Internet Engineering Task Force (IETF) standard suite of protocols between two communication points across the IP network that provide data authentication, integrity, and privacy. It also defines the encoded, decrypted and authenticated packets.

5.6 KMP:
"Internet Security Association and Key Management Protocol" is a protocol for establishing Security Associations (SA) and cryptographic keys in an Internet environment. Internet Security Association and Key Management Protocol defines the processes for authenticating a communicating peer, creation and management of Security Associations, key generation techniques, and threat modification e.g. denial of service and replay attacks.

6. Network Security Essentials and Tools
6.1 Network Auditing:
Network auditing software is an vital security tool. It provides IT administrators with a two-pronged approach to network security. First, it provides a correct view of the complete network and subnets, making it easier to spot any open ports, unaccounted for components or other discrepancies. Second, it allows quick action to protect against any open vulnerability.

6.2 Network Scanning Strengths:
This means to look for active machines or targets on the network. This can be done using tools or scripts that pin to all IP addresses on the networks and get a list of the live nodes and their IP addresses.

6.3 Host-based Scanners:
Host-based scanners detect signs that an impostor has already penetrated a system. These hacker traces include doubtful file names, unpredicted new files, device files found in unanticipated places. Network and host-based scanning technologies provides the best susceptibility assessment for measuring an organization's security risks.

6.4 DMZ (Demilitarized Zone):
Demilitarized Zone is a firewall configuration for securing Local area network. Demilitarized Zone is a protected zone that placed between the reliable network (Local area network) and un-reliable network (WAN or Internet). This reflect as Screened subnet or separate network.

CONCLUSION
Internet is serving the modern society in numerous ways.

It has several security breaches. These security breaches can be abused by black hats for invasive purpose. So, it is compulsory to determine the vulnerable points of the information system.

REFRENCESS

- Rathore,Neeraj, and Inderveer Chana (2014). "Job migration with fault tolerance based QoS scheduling using hash table functionality in social Grid computing", Journal of Intelligent and Fuzzy Systems, Vol. 27 No. 6, PP.2821-2833.

ISSN 2394 - 7780

- Rathore, N. K., and I. Chana (2011). "A cogitative analysis of load balancing technique with job migration in grid environment", IEEE proceedings paper, No.77 No.82.
- Rathore, Neeraj. and Inderveer Chana (2013). "A sender initiate based hierarchical load balancing technique for grid using variable threshold value", Signal Processing, Computing and Control (ISPCC), IEEE International Conference on IEEE.
- Neeraj Kumar Rathore and Inderveer Chana (2008), "Comparative Analysis of Checkpointing", PIMR Third National IT Conference, IT Enabled Practices and Emerging Management Paradigm book and category is Communication Technologies and Security Issues, pp.32- 35, Topic No/Name-46, Prestige Management and "Variable threshold-based hierarchical load balancing Research, Indore, (MP) India, 2008. technique in Grid", Engineering with computers, Vol. 31 No.3, PP.597-615.
- Rathore, Neeraj, and Inderveer Chana (2014). "Load balancing and job migration techniques in grid: a survey of recent trends", Wireless Personal Communications

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

TO STUDY OF FINANCE TO AGRICULTURAL SECTOR IN INDIA

Prof. Neeraj D. Tiwari
Shri Ram College of Commerce, Department of Commerce

ABSTRACT
The institutes which are provide finance to agriculture sector plays a important role in agricultural and rural development of India. A large number of Institutional agencies are involved in distribution of credit to farmers whose financial condition is weak. It facilitate farmers to obtain input on time and getting best agricultural production. The article is based

On the secondary data taken from various sources and analysed by using statistical data.

INTRODUCTION
In the post-independence period, various attempts were made by the Government for enriching the institutional agricultural credit structure of the country leading to continuous growth in the base and sources of agricultural credit.Both the co-operative sector, commercial banks and rural banks are trying simultaneously for meeting credit requirements of the farmers. Even then, there are number of problems faced by agricultural credit structure of the country which are standing on the path of development of the agricultural sector.

Definition
According to William G. Murray, “agricultural finance is the economic study of borrowing of funds by farmers; of the organization and operation of farm lending agencies; and of society's interest in credit for agriculture”.

OBJECTIVES OF THE STUDY
The following are the objectives of the study
1) To study the concept of Agricultural Finance
2) To derive a clear advantages and disadvantages of agricultural Finance to farmers
3) To know government contribution towards agriculture sector

History: Finance in agriculture is very important factor because various inputs are required for production activities and without finance its not possible. If farmer has money then only he can purchase input material such as seeds, fertilizers, tractor and other machinery, drip irrigation and rain pipes etc. and this will make possible to produce agricultural goods.

Moneylenders were the one and only source of providing finance to agriculture till 1935.They were charge high rate of interest and used serious practices at the time of giving loan and recovering them. Due to this farmers were in burdened with debt.

With the passing of Reserve Bank of India Act 1934,

District Central Co-op. Banks Act and Land Development Banks Act, farmers get attracted towards agricultural credit and there were improvements in agricultural credit. Large-scale credit became available with reasonable rates of interest at easy terms, both in terms of granting loans and recovery of them. co-operative banks were the main institutional agencies providing finance to agriculture before the 14 major commercial banks were nationalised. After nationalization in 1969, it was made mandatory for these banks to provide finance to agriculture. A large number of formal institutional agencies like Co-operatives, Regional Rural Banks (RRBs), Scheduled Commercial Banks (SCBs), Non– Banking Financial Institutions (NBFIs), and Self-help Groups (SHGs), etc. are involved in meeting the short- and long-term needs of the farmers. Finance has played important role In bringing "Green Revolution"(take place in India in 1960) related to enhance crop yield by using fertilizers and pesticides, "White Revolution"(take place in 1970) related to milk production and "Yellow Revolution"(take place in 1987) related to oil seeds production. In the first half of 2000s, there has been a increase in the share of commercial banks in total agricultural credit.

Types of Agricultural Credit:
1) Short Term Credit: short term credit is provided for a period less than 15 months to meet their short term needs.eg; purchase of seeds and fertilizers.
2) Medium Term Credit: Medium Term Credit is provided for a period between 15 months to 5 years.eg; Purchasing agricultural machines, equipments.

ISSN 2394 - 7780

3) Long Term Credit: Long Term Credit is Provided for a period more than 5 years.eg; permanent improvement on land like sinking of wells, recovery of land.

Sources of agricultural credit in India:

I) Institutional sources

II) Non-Institutional sources

I. Non-Institutional Sources:

(i) Moneylenders:

Before 1935 moneylenders were plays important role in providing credit to farmers.

Moneylenders are of two different types:

(a) Professional moneylenders:

(b) Agriculturist moneylenders.

(ii) Traders and Commission agents:

Traders and commission agents are also advancing loan to the agriculturist for productive purposes before the maturity of crops and then force the farmers to sell their crops at very low prices and charge heavy commission. This type of loans is mostly advanced for cash crops.

(iii) Relatives:

Cultivators are also normally borrowing fund from their own relatives in times of their crisis both in terms of cash or kind. These loans are a kind of informal loans and carry no interest and are normally returned after harvest.

(iv) Landlords:

In India, small as well as marginal farmers and tenants are also taking loan from the landlords for meeting their financial requirements. This source has been following all the ill-practices followed by money-lenders, traders etc.

Sometimes landless workers are even forced to work as a bonded labour.

Thus, the non-institutional sources of farm credit have been facing serious loopholes like exorbitant rate of interest, loan for unproductive purposes, non-repayment of loan etc.

II. Institutional Sources:

The main motive of institutional credit is to assist the farmers in raising their agricultural productivity and maximising their income. Institutional credit is also not exploitative in character. The following are some of the important institutional sources of agricultural credit in India.

(i) Co-operative Credit Societies:

The cheapest and the best source of rural credit in India is definitely the co-operative finance. In India the active primary agricultural credit societies (PACS) cover nearly 86 per cent of the Indian villages and account for nearly 36 per cent of the total rural population of the country. The share of co-operatives in the total agricultural credit increased to nearly 40 per cent in 1996 as compared with only 3 per cent in 1951-52.

In 1993-94 nearly 88,000 primary agricultural credit societies (PACS) of India provided Rs 6461 crore as short term and medium term loans to the farmers. In 2006-2007, the same loan has increased to Rs 42,480 crore, which was financed by co-operative banks.

But these co-operatives have a long way to go. In some states like Bihar, West Bengal, Orissa and Rajasthan the co-operative movement did not spread much of its net world. Even in some places the working of the co-operatives had been wrecked hopelessly by unscrupulous and dishonest members leading to large scale sufferings of huge number of needy farmers.

(iii) Commercial Banks:

In the initial period, the commercial banks of our country have played a marginal role in advancing rural credit. In 1950-51, only 1 per cent of the agricultural credit was advanced by the commercial banks. But after the nationalisation of commercial banks in 1969, the commercial banks started to extend financial support both directly and indirectly and also for both short and medium periods.

With the help of "village adoption scheme" and service area approach the commercial banks started to meet the credit and other requirements of the farmers. They also sponsored various regional rural banks for extending

ISSN 2394 - 7780

credit to small and marginal farmers and rural artisans just to save them from the clutches of village moneylenders.

Till 1969, direct advances by the commercial banks were restricted to only Rs 44 crore. But as on March 2007 the amount of loan has increased to Rs 1,40,382 crore. During 2006-2007 commercial banks along with Regional Rural Banks extended nearly 79.1 per cent of the total institutional farm credit in our country.

Again in 1999-2000, disbursements of agricultural advances by public sector banks under Special Agricultural Credit Plan (SACP) were Rs 19,755 crore.

Commercial banks are finding difficulty in advancing loans to the farmers particularly in respect of lending techniques, security, recovery etc. and are expected to overcome these gradually. But the commercial banks are not very much interested to advance loan to small and marginal farmers and as on March 1997 their farm credit was restricted to only 13.5 per cent of total bank credit.

The share of commercial banks in total institutional credit to agriculture is almost 69.0 per cent in 2006-2007.

(iv) Regional Rural Banks

As per the recommendations of working Group on Rural Banks the Regional Rural Banks (RRBs) were established in 1975 for supplementing the commercial banks and co-operatives in supplying rural credit. Since 1975 these Regional Rural Banks are advancing direct loans to small and marginal farmers, agricultural labourers and rural artisans etc. for productive purposes.

Till June 1996, in total 196 RRBs have been lending annually nearly Rs 1500 crore to the rural people and more than 90 per cent of these loans were also advanced to the weaker section.

At the end of 1988 these RRBs jointly advanced loan to the extent of Rs, 2,804 crore among 11 million persons lying below the poverty line. In 2006-2007, the RRBs have disbursed agricultural credit amounting to Rs 20,435 crore which is just 10.05 per cent of total institutional credit to agriculture.

(v) Government

Another important source of agricultural credit is the Government of our country. These loans are known as taccavi loans and are lend by the Government during emergency or distress like famine, flood etc. The rate of interest charged against such loan is as low as 6 per cent.

The share of the Government in the total agricultural credit has increased from 3.1 per cent in 1951-52 to 15.5 per cent in 1961-62 but then the share declined to only 5.0 per cent in 1996. During 1990-91, the state Governments had advanced nearly Rs 350 crore as short-term loan to agriculture. But the taccavi loan failed to become very much popular due to official red tapism and corruption.

Drawbacks

(i) Insufficiency

In spite of expansion of rural credit structure, the volume of rural credit in the country is still insufficient as compared to its growing requirement arising out of increase in prices of agricultural inputs.

(ii) Inadequate Amount of Sanction:

The amount of loan sanctioned to the farmers by the agencies is also very much inadequate for meeting their different aspects of agricultural operations. Considering the amount of loan sanctioned as inadequate and insignificant, the farmers often divert such loan for unproductive purposes and thereby dilute the very purpose of such loan.

(iii) Lesser Attention of Poor Farmers:

Rural credit agencies and its schemes have failed to meet the needs of the small and marginal farmers. Thus, lesser attention has been given on the credit needs of the needy farmers whereas the comparatively well-to-do farmers are getting more attention from the credit agencies for their better credit worthiness.

(iv) Growing Overdues

The problem of over-dues in agricultural credit continues to be an area of concern. The recovery of agricultural advances to various institutions is also not at all satisfactory. In 1997-98, the recovery of agricultural advances of commercial banks, co-operative banks and regional rural banks were 63 per cent, 66 per cent and 57 per cent respectively.

Such growing over-dues have also been resulted from poor repaying capacity of farmers. As a result of that, the credit agencies are becoming wary of granting loan to farmers.

ISSN 2394 - 7780

Thus, in order to remove limitations and problems of agricultural credit in India the following measures may be suggested

(i) Co-operative credit societies should be organised to make it efficient and purposeful for delivering the best in terms of rural credit. Moreover, these societies may be transformed into a multi-purpose society with sufficient funding capacity.

(ii) Middlemen existing between credit agencies and borrowers should be eliminated.

(iii) Reserve Bank of India should arrange sufficient fund so that long term loans can be advanced to the farmers.

(iv) Power and activities of the Mahajans and moneylenders should be checked so as to declare an end to the exploitation of farmers.

(v) The Government should introduce the credit guarantee scheme so as to provide guarantee on behalf of the farmers for getting loans.

CONCLUSION

The study has shown that the institutional credit flow to the agriculture has been increasing for the past four decades. The structure of the sources of credit has witnessed a clear shift and commercial banks have emerged as the major source of institutional credit to agriculture in the recent years.

REFERENCES

- http://www.economicsdiscussion.net/essays/essay-on-agricultural-credit-in-india/18098
- https://www.researchgate.net/publication/227365313_Institutional_Credit_to_Agriculture_Sector_in_India_Status_Performance_and_Determinants

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

ENVIRONEMENT NEED STRONG PROTECTION MEASURES

Prof. Jyothi B. Yadav
Department of Commerce, Shri Ram College of Commerce

ABSTRACT
Environment means natural surrounding which affect our growth and development. Living things and Non-living things are depends on environment. Environment changes every time. Human being is responsible for bringing changes in natural environment. Human life depends on good environment. If environment is polluted that affect on living things. Environment system is integrated system. Environment give us food, shelter, air and fulfill needs of human being. It play very important role to keep our life healthy and safe.

IMPORTANCE OF STUDY
1. It gives solution for protection of environment.
2. This study analyses the environment.
3. This study helps the environment to maintain healthy and safe.
4. This research change environment.
5. It maintains natural balance between living things and environment.

OBJECTIVE OF STUDY
1. To protect the environment.
2. To find out solution for degradation of environment.
3. To analyses the environment problem.
4. To practice Environment Conservation.

Conservation efforts to save environment.

1. Environmental conservation is the practice of us humans saving the environment from the loss of species, and the destruction of the ecosystem, primarily due to pollution and human activities. Conservation is vital in saving and helping both animals and trees as we are all dependent on one another for survival.

2. Trees convert carbon dioxide produced by factories into oxygen, which helps us breathe and respire. The loss of species, which makes them go extinct, would mean they are forever lost and cannot be seen by curious eyes, or studied by the scientific minds. Additionally, such loss or destruction of ecosystems would disrupt the food web, messing up the whole ecosystem in general.

3. There is much to do when it comes to rebuilding and protecting what's left of natural resources and the biodiversity within our ecosystems. Environmental conservation is an umbrella term that defines anything we do to protect our planet and conserve its natural resources so that every living thing can have an improved quality of life.

4. Environmental conservation and preservation are two terms that are often used interchangeably, although they are quite different. Conservation refers to the responsible management of the environment and its resources for present and future use. Preservation, on the other hand, is a much stricter approach where the environment, lands and natural resources are put away, not to be consumed by humans, but are instead maintained in their pristine form. If the land is to be used by humans, it should only be utilized for its natural beauty and inspiration.

Simple Things You Can Do to Help Protect the Earth.
1. Reduce, reuse, and recycle.
2. Volunteer for cleanups in your community.
3. Conserve water.
4. Use long-lasting light bulbs.
5. Plant a tree.
6. Choose sustainable
7. Buy less plastic and bring a reusable shopping bag.

ISSN 2394 - 7780

8. Buy less plastic and bring a reusable shopping bag.
9. Drive less.

RESEARCH DESIGN/ RESEARCH METHODOLOGY

Research design is research outline and research structure. This research is very useful to get environmental information. In this research, researcher analyses environmental issues and use the Primary and Secondary sources for getting information. Researchers discuss with friends and relatives regarding environments. Along with researcher use books and online sources to get information. Here observation is also done to get right information.

Environment needs strong protection measures

In 2020 and 2021 we face health issues problems. Many people dead because of Corona or Covid-19. Covid-19 is an manmade disaster which spoiled the life of all living things and stop development also. Along with health issues, many people face financial problems. It means when environment get polluted that time human being not only face health issue, along with health issue we also face financial problems. That's why to protect environment is very important issue in our life. Right now, we are facing the problems of environmental degradation. Environment degradation means polluting environment which badly effect on human being. To come out from environment degradation problem we need to take proper measures.

All living things required good environment on earth. Environment include natural resources and other things. These natural resources get spoiled by Human being. Earth is that planet which support the life of human being. Earth provide multi resources for survival purpose but human being is selfish person which destroy natural resources rapidly. Now we face the problems of scarce resources. Still now we did not the understand real value of environment. Environment play vital role to keep human being healthy. Environment provides food, clothing, shelter, water and natural resources. So, its our duty to keep our environment safe. All living things whether they live on land and water everyone require healthy environment.

Environment gives more benefit to human being. It provides trees and plant which give us food and absorb harmful gases. Plants purify water and air and reduce the chances of flood in rural and urban area. It maintains proper balance on earth.

To protect environment, eco-friendly packaging, eco-friendly product, green marketing should be utilized. Organic farming method should be utilized to protect environment. Organic farming means without using toxic fertilizer and chemical, farmer take crops naturally. In organic farming more worker are utilized for cultivation of land which reduce the use of technology and keep our soil fertile. To stop soil and land pollution, organic farming should be utilized. If we want to maintain fertility of land we should use eco-friendly method which stops soil erosion we can take more crops on fertile soil.

For protection of environment human being should consume less. If we reduce our consumption then our resources will not be wasted and these extra resources can be utilized for next generation. Human being should use recycle and reusable resources. So, it will reduce our wastage. For any process less chemical should be utilized. Because of more use of chemical, our environment get polluted. To reduce the pollution we should less use chemical along with that use public vehicle, transportation system and walking should be done instead of using personal bike and vehicle. Travelling on foot always good than using vehicle. It will also protect environment. Water should not be wasted inside and outside of house. Stop more use of electricity consumption. Because to create electricity we required good technology and heavy expenses. But if we save electricity automatically, we save nature also. To support sustainable life, everyone should use clean energy system. To protect environment for our future generation, we need to take proper measure. Ecofriendly, technology should be used which is not harmful for environment.

Methods for monitoring and control of environmental hazards (including food and water safety, atmospheric pollution and other toxic hazards, noise, and ionising, electromagnetic radiation and cluster investigations.

Monitoring (routine measurements aimed at detecting changes in the environment or health) can use data from a range of sources, including:

- Emissions inventories (records of the permitted or actual level of emissions from specified sources);
- Environmental data (measurements of the concentrations of pollutants in the environment);
- Bio-monitoring data (measurements of specific agents or their metabolic products in biological samples);Health data, which includes:-

ISSN 2394 - 7780

- - Routine (surveillance) data;
- - Clinical surveillance (relevant to specific exposed populations);

Relevant health data might include:

- infectious disease monitoring data;
- health care utilisation data (hospital admissions, primary care consultations);
- births, congenital anomalies and related data;
- cancer registrations;
- mortality statistics;
- epidemiological surveys.

Quality standards are set for the physical, chemical and biological characteristics of drinking water and monitored throughout the water treatment and distribution network through to the household tap [1]. Among the range of tests and specified limits are those relating to pH, microorganisms including marker agents such as faecal coliform bacteria (E coli), Cryptosporidium and Giardia lamblia, chlorination by-products, dissolved metals, salts and metalloids (lead, mercury, nitrates, arsenic, etc.), organic matter and radon.

Biological and chemical testing is also carried out in the food industry, where, as with water safety, the approach is typically based on the principles of the Hazard Analysis and Critical Control Points (HACCP), which seeks to identify potential hazard points, so that key actions, known as Critical Control Points (CCP's) can be taken to reduce or eliminate the risk of the hazards being realised. The system is used at all stages of food production and preparation processes including packaging, distribution.

Noise is a complex exposure, as its effects on health and well-being are a function of multiple parameters, including: its intensity, its duration, its intermittency, its nature and quality, and its origin[9]. Loud noise may cause deafness, but constant background noise (e.g. from heavy traffic) is often tolerated better than intermittent noise from a neighbour. The nuisance value of noise is more than just the level of sound, and the sources of noise that is most often the source of complaints is neighbours.

Table. Measures to Resolve Environmental Problems

Category	Examples of Specific Measures
1. Political Action	International cooperation, Measures to alleviate disparity in wealth, or other
2. Economic Measures	Economic policy that allows for sustainable development while taking the environment into consideration, or other
3. Society and Education	Education about environmental problems, Raising awareness on environmental problems, Transforming lifestyles, Practical activities like environmental protection, or other
4. Scientific Technology	The development of theories about environmental problems, The establishment of scientific guide line towards the resolution of environmental problems, The development of energy saving technology, or other
5. Others	(Please specify the category and the measure(s) in the space provided)

Environmental Issues

Environmental issues are the harmful effects of human activities on the environment. These include pollution, over-population, waste disposal, climate change, global warming, greenhouse effect, etc.

Various environment protection programs are being practised at the individual, organizational and government levels with the aim of establishing a balance between man and environment.

Some of the current environmental issues that require urgent attention are:

Climate Change

Climate change is a great concern in today's scenario. This problem has surfaced in the last few decades. Greenhouse gases are the major cause of climate change. Environmental changes have several destructive impacts such as the melting of glaciers, change in seasons, epidemics, etc.

Global Warming

The burning of fossil fuels, emissions from the automobiles and chlorofluorocarbons add to the greenhouse gases in the atmosphere. This has led to an increase in earth's temperature causing environmental changes. This increase in temperature across the globe is known as global warming.

ISSN 2394 - 7780

Ozone Layer Depletion
The ozone layer is a layer of concentrated ozone gas. It protects us from the sun's harmful ultraviolet rays. This very important layer is being destroyed by CFCs (chlorofluorocarbons), which are used in industries and everyday life (e.g. aerosol cans).

The chlorine in these compounds destroys the ozone layer. The hole in the ozone layer leaves humans and wildlife exposed to the harmful UV rays resulting in several skin diseases including cancer.

Solid Waste Management
Solid-waste management is defined as the discipline associated with the generation, storage, collection, transfer and transport, processing, and disposal of solid waste in a manner that it does not have a harmful effect on the environment.

Deforestation
Deforestation is the depletion of trees and forests at an alarming rate. The trees provide us with oxygen, several raw materials and also maintain the temperature of the earth. Due to the depletion of trees for commercial purposes, there has been a drastic change in the earth's climate.

Forests are an abode to a large number of wild animals and plants. Destruction of forests has led to the elimination of a large number of plants and animal species affecting the biodiversity.

Overpopulation
The earth's population is increasing drastically. It is estimated to be more than seven billion. The increasing population has led to a shortage of resources. If this continues, it will be very difficult to sustain such a huge population. The other environmental issues including pollution, waste management, deforestation, climate change and global warming are all associated with over-population.

Solutions to Environmental Issues
Following are some of the most common solutions to the environmental issue:
1. Replace disposal items with reusable items.
2. The use of paper should be avoided.
3. Conserve water and electricity.
4. Support environmental friendly practices.
5. Recycle the waste to conserve natural resources.

Environmental issues are a warning of the upcoming disaster. If these issues are not controlled, there will soon be no life on earth.

ISSN 2394 - 7780

FINDING

From the present research, researcher gets proper knowledge about environment. Along with environment analyses researcher get solution also which is very useful for protecting and conserving environment. To stop environment problems, we should take strong steps against the pollution, then only human being and living things can survive properly. All living things depend on environment. So to use eco friendly product is one solution to protect environment. From the analyses researcher noticed that, in reality environment need strong protection measures.

Measure to Protect and Improve Environment

Following measures can be adopted to protect and improve environment:

1. Plant more and more trees.
2. Start recycling of domestic and agricultural waste to produce manure and biogas.
3. Separate the biodegradable wastes from non-biodegradable wastes before disposing them.
4. Avoid unnecessary use of fuels.
5. Use renewable sources of energy such as solar energy, wind energy, ocean thermal energy, water energy.
6. Use unleaded petrol in vehicles.
7. Never throw chemicals and oils in drains and toilets.
8. Avoid use of polythene bags.
9. Don't burn any article made up of plastic, rubber or polythene because their smoke contain harmful gases.

Environmental laws

many environmental laws are being enacted by state and centre governments to conserve environment and keep it pollution free. Following is the list of some important environmental laws enacted by government of India:

1. Prevention of Cruelty to Animals Act, 1960.
2. Air (Prevention and Control of Pollution) Act, 1981.
3. Water (Prevention and Control of Pollution) Act, 1974.
4. Wildlife (Protection) Act, 1972.
5. Environment (Protection) Act, 1986.
6. Forest (Conservation) Act, 1980.
7. The Factories Act, 1948.

CONCLUSION

From many centuries, human being is writing on environmental issues, but till now the environmental problems has not finished. It is increasing day by day. Global level environment is also changed rapidly. Right now we face the problems of global warming. Global level all environments is polluting fastly. To stop those problems we should analyse the environment and find out the measure for protecting environment.

REFERENCES

1. WWW. Google.com
2. WWW.gmail.com
3. WW.ipl.org.
4. Indian Vistas of Environment Chittabrata Palit
5. Environmental impact assessment paper written
6. DEFRA Air Quality Strategy website: https://www.gov.uk/government/publications/the-air-quality-strategy-for-...
7. National Environmental Public Health Tracking Program (CDC):http://www.cdc.gov/nceh/tracking/
8. Clusters have Rothman. A sobering start to the cluster-busters conference. Am J ol Epidemiology 1990;132:s6-13
9. Neutral, R. Counterpoint from a cluster-buster. Am J Epidemiology. 1990; 132: 1-8.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

STUDY AND ANALYSIS OF SECURITY CHALLENGES AND THEIR SOLUTION IN CLOUD COMPUTING

Poojadevi Sardar Gupta
Assistant Professor, Shri Ram College of Commerce & Science

ABSTRACT
Cloud computing is the on-demand accessibility of computer system resources, especially data storage and computing power, without direct active management by the user. Cloud computing provide prominent and efficient services in terms of software, hardware, server, databases etc. in highly-scalable and cost-effective manner than the traditional mode of in-housing computational infrastructure. In this paper, we discuss security threats regarding cloud computing and what protection mechanism need to be taken against that attacks.

Keywords: Cloud computing ,Security , cloud security, security threats,cloud cryptography, cloud security controls., Cloud issues, Virtual machine layer, Data issues, Security issues .

1. INTRODUCTION

Cloud is a computing technology which shared resources such as software, platform, storage, and information through internet on customer demand .It is a computing platform for sharing resources that consist of infrastructures, software, applications, and business procedures .It has three service models namely IaaS(Infrastructure as a service), PaaS(platform as a service), and SaaS(software as a service) and also three deployment model Public, Private and Hybrid.. Cloud computing has a lot of security like network security, data protection, virtualization security, application integrity, and identity management. In this paper, we discuss this security issue and solution which protect cloud data, applications, and infrastructure from threats.

2. SECURITY REQUIREMENTS IN CLOUD COMPUTING

For any computing resource, security has always important factor. Cloud computing is shared resources such as software, platform, storage, and information through internet on customer . the resources which need protection from malicious access and attack .all the security measurements that needed in traditional computing are applicable in cloud environment also. In cloud computing, a cloud service provider (CSP) provides the computational services to user on a leased basis over the internet virtualization and cloud computing can facilitate companies accomplish more by breaking the physical bonds between an IT infrastructure and its users, heightened security threats must be overcome in turn to benefit fully from this new computing paradigm. This is particularly correct for the SaaS provider.

There is many security issues associated with cloud computing. these issues fall under two broad categories: security issues face by the CSPs and security issues faced by the cloud users. Cloud computing provide facility for users to store their data on a remote server which is being provided and managed by the CSPs and proper security measures must be taken from both the CSPs and the clients to ensure that the data in the cloud is secured .To assure security in cloud, proper security assessment must be done in order to build trust among the clients. This confidence will act as the basis for security assurance as provided by the CSPs. Till date, there has not been much growth in cloud security assurance, and this is mainly due to the unclear and ambiguous roles and responsibilities among the cloud service providers and their clients. In most cases, the CSPs must ensure that their infrastructure is secure and that their client's data and applications are protected while the clients must ensure that the provider has taken the proper security procedures and are following the standard compliance guidelines to protect their data. Cloud security involve the fundamental issues as any computer security program: restricting access to authorized users, maintaining the integrity of data, and ensuring the availability of data and services. Proper security mechanisms have to be undertaken to fully realize the potential and the benefits of this modern computing paradigm.

3. PARAMETERS AFFECTING CLOUD SECURITY

There are numerous security issues for cloud computing as it encompasses many technologies including networks, databases, operating systems, virtualization, resource scheduling,transaction management, load balancing, concurrency control and memory management.Security issues for many of these systems and technologies are applicable to cloudcomputing. For example, the network that interconnects the systems in a cloud has to be secure. Furthermore, virtualization paradigm in cloud computing results in several security. concerns. For example, mapping the virtual machines to the physical machines has to be carried out securely. Data security involves encrypting the data as well as ensuring that appropriate policies are enforced for data

ISSN 2394 - 7780

sharing. In addition, resource allocation and memory management algorithms have to be secure. Finally, data mining techniques may be applicable to malware detection in clouds.

4. MAIN CLOUD SECURITY ISSUES AND THREATS

Almost every organization has adopted cloud computing to varying degrees within their business. However, with this adoption of the cloud comes the need to ensure that the organization's cloud security strategy is capable of protecting against the top threats to cloud security.

- **Misconfiguration**

Misconfigurations of cloud security settings are a leading cause of cloud data breaches. Many organizations' cloud security posture management strategies are inadequate for protecting their cloud-based infrastructure.Several factors contribute to this. Cloud infrastructure is designed to be easily usable and to enable easy data sharing, making it difficult for organizations to ensure that data is only accessible to authorized parties. Also, organizations using cloud-based infrastructure also do not have complete visibility and control over their infrastructure, meaning that they need to rely upon security controls provided by their cloud service provider (CSP) to configure and secure their cloud deployments. Since many organizations are unfamiliar with securing cloud infrastructure and often have multi-cloud deployments – each with a different array of vendor-provided security controls – it is easy for a misconfiguration or security oversight to leave an organization's cloud-based resources exposed to attackers.

- **Unauthorized Access**

Unlike an organization's on-premises infrastructure, their cloud-based deployments are outside the network perimeter and directly accessible from the public Internet. While this is an asset for the accessibility of this infrastructure to employees and customers, it also makes it easier for an attacker to gain unauthorized access to an organization's cloud-based resources. Improperly-configured security or compromised credentials can enable an attacker to gain direct access, potentially without an organization's knowledge.

- **Insecure Interfaces/APIs**

CSPs often provide a number of application programming interfaces (APIs) and interfaces for their customers. In general, these interfaces are well-documented in an attempt to make them easily-usable for a CSP's customers. However, this creates potential issues if a customer has not properly secured the interfaces for their cloud-based infrastructure. The documentation designed for the customer can also be used by a cybercriminal to identify and exploit potential methods for accessing and exfiltrating sensitive data from an organization's cloud environment.

- **Hijacking of Accounts**

Many people have extremely weak password security, including password reuse and the use of weak passwords. This problem exacerbates the impact of phishing attacks and data breaches since it enables a single stolen password to be used on multiple different accounts.Account hijacking is one of the more serious cloud security issues as organizations are increasingly reliant on cloud-based infrastructure and applications for core business functions. An attacker with an employee's credentials can access sensitive data or functionality, and compromised customer credentials give full control over their online account. Additionally, in the cloud, organizations often lack the ability to identify and respond to these threats as effectively as for on-premises infrastructure.

- **Lack of Visibility**

An organization's cloud-based resources are located outside of the corporate network and run on infrastructure that the company does not own. As a result, many traditional tools for achieving network visibility are not effective for cloud environments, and some organizations lack cloud-focused security tools. This can limit an organization's ability to monitor their cloud-based resources and protect them against attack.

- **External Sharing of Data**

The cloud is designed to make data sharing easy. Many clouds provide the option to explicitly invite a collaborator via email or to share a link that enables anyone with the URL to access the shared resource. While this easy data sharing is an asset, it can also be a major cloud security issue. The use of link-based sharing – a popular option since it is easier than explicitly inviting each intended collaborator – makes it difficult to control access to the shared resource. The shared link can be forwarded to someone else, stolen as part of a cyberattack, or guessed by a cybercriminal, providing unauthorized access to the shared resource. Additionally, link-based sharing makes it impossible to revoke access to only a single recipient of the shared link.

ISSN 2394 - 7780

- **Malicious Insiders**

Insider threats are a major security issue for any organization. A malicious insider already has authorized access to an organization's network and some of the sensitive resources that it contains. Attempts to gain this level of access are what reveals most attackers to their target, making it hard for an unprepared organization to detect a malicious insider. On the cloud, detection of a malicious insider is even more difficult. With cloud deployments, companies lack control over their underlying infrastructure, making many traditional security solutions less effective. This, along with the fact that cloud-based infrastructure is directly accessible from the public Internet and often suffers from security misconfigurations, makes it even more difficult to detect malicious insiders.

- **Cyberattacks**

Cybercrime is a business, and cybercriminals select their targets based upon the expected profitability of their attacks. Cloud-based infrastructure is directly accessible from the public Internet, is often improperly secured, and contains a great deal of sensitive and valuable data. Additionally, the cloud is used by many different companies, meaning that a successful attack can likely be repeated many times with a high probability of success. As a result, organizations' cloud deployments are a common target of cyberattacks.

- **Denial of Service Attacks**

The cloud is essential to many organizations' ability to do business. They use the cloud to store business-critical data and to run important internal and customer-facing applications.This means that a successful Denial of Service (DoS) attack against cloud infrastructure is likely to have a major impact on a number of different companies. As a result, DoS attacks where the attacker demands a ransom to stop the attack pose a significant threat to an organization's cloud-based resources.

5.SECURITY TECHNIQUES FOR DATA PROTECTION IN CLOUD

- **Authentication and Identity Techniques**

Authentication relies on data that is difficult to produce, except by that specific person. Full name, social security number, or driver's license number are all personally identifiable information (PII). Physical authentication methods like a badge, fingerprint, and facial recognition are also commonly used.Single-factor authentication is a great starting place, but it is strongly advised to implement multi-factor authentication whenever possible. Multi-factor typically involves 2-3 verification methods – commonly, your password paired with a one-time passcode (OTP) SMS. Many organizations have also applied Single Sign On (SSO) for their teams, especially in today's highly remote world. SSO allows users to login to multiple applications through one authentication source.One potential problem to be aware of is using traditional identity methods when partnering with multiple cloud service providers. Make sure they have the proper security and compliance guidelines in place to keep your protected information secure.

- **Access Control Techniques**

Access control is a method of guaranteeing that users are who they say they are and that they have the appropriate level of access to company data. At a high level, access control is a selective restriction of access to information. It consists of two main components: authentication and authorization, says Daniel Crowley, head of research for IBM's X-Force Red, which focuses on data security.Enterprises must assure that their access control technologies are supported consistently through their cloud assets and applications, and that they can be smoothly migrated into virtual environments, like private clouds.

- **Proofs of storage**

A proof of storage is a service level agreement between the CSPs and its clients and it ensures that the client data stored in the CSP's servers would never be tempered or used by the CSP without the client's permission. This guarantees that the data stored in the cloud would remain intact.

- **Server aided secure computation**

This security mechanism provides a server and users to perform some computation on their encrypted data jointly without revealing the contents of the original data. The communicating parties and the cloud remain completely unaware of the computations performed and the outcome.

- **Encryption Techniques**

Data encryption in the cloud is the process of transforming or encoding data before it is moved to cloud storage. Typically, cloud service providers offer a range of encryption services to the clients they support. A comprehensive platform should deliver robust access controls and key management capabilities that enable organizations to practically, cost effectively, and comprehensively leverage encryption to address security objectives.

ISSN 2394 - 7780

- **Secure Deletion Techniques**

Did you know hackers can still locate data that you have deleted and exploit it? Not properly deleting data on devices and in the cloud can lead to a serious vulnerability for your personal and professional information.

The first step to managing and deleting old data is to decide how long the data needs to be kept and when it should be deleted. Your organization should establish a data lifecycle for all types of data you store. Some key parameters to evaluate are:

- How long does data need to be kept for regulatory purposes?
- How long do we need the data readily available?

Here are some of our favorite secure data deletion techniques for data protection in the cloud:

- Go through and delete data annually: Depending on how much data you process, you may want to do it even more frequently.
- Designate a data disposal point person: Make sure it's someone who knows the lifecycle of data, the policies behind deletion, and how it is managed.
- Set up policies you adhere to: Document the process for secure data deletion – what should be done, when it should be done, and who is responsible for it.

- **Data Recovery Techniques**

It is important each system using cloud services performs an automatic backup at least weekly. For systems storing sensitive information, this should happen even more frequently. The overall backup procedure should include the operating system, application software, and data on the machine. Another rule of thumb is to implement multiple backups over time in accordance with regulatory compliance.

- **Monitor the Data Access**

cloud service providers have to assure about whom, when and what data is being accessed for what purpose. For example many website or server had a security complaint regarding snooping activities by many people such as listening to voice calls, reading emails and personal data etc.

- **Share demanded records and Verify the data deletion**

If the user or consumer needs to report its compliance, then the cloud service provider will share diagrams or any other information or provide audit records to the consumer or user. Also verify the proper deletion of data from shared or reused devices. Many providers do not provide for the proper degaussing of data from drives each time the drive space is abandoned. Insist on a secure deletion process and have that process written into the contract.

- **Security check events**

Ensure that the cloud service provider gives enough details about fulfillment of promises, break remediation and reporting contingency. These security events will describe responsibility, promises and actions of the cloud computing service provider.

6.CLOUD SECURITY CONTROLS

The cloud security architecture is only useful when proper security controls are in place. To control security

breaches, an organization needs to be ensured that their security softwares are up to date, and their system is

compliant with standard security guidelines. The security management of cloud addresses these issues

with various security controls, broadly classified into the following four categories.

- **Deterrent controls**

these are the security control measures that prevent any potential attack on cloud architecture. Deterrent controls warn the security management about any purposeful attack that may have been taking place so that proper preventive controls can be taken.

- **Preventive controls**

as suggested by the name, these control techniques will detect any potential attack on to the cloud system and will take proper actions to mitigate the damage and violations occurring in the system.

- **Corrective controls**

corrective controls are used to reduce the effect of an attack. Unlike the preventive controls, the corrective controls take actions as an attack is occurring.

ISSN 2394 - 7780

- **Detective controls**

These control techniques are used to detect any potential attack that may be occurring in the system. If an attack has occurred, detective controls will signal the preventive or corrective controls to address the issue.

7. CONCLUSION

Cloud computing is clearly one of today's most enticingtechnology areas due, at least in part, to its cost efficiency and flexibility. Cloud computing is a paradigm shift in which computing is moved away from personal computers and even the individual enterprise application server to a 'cloud' of computers. But along with its various efficient computing promises, cloud computing brings another dimension of security challenges that are to be addressed before its full potential can be realized.Cloud computing adoption and diffusion are threatened by unresolved security issues that affect both the cloud provider and the cloud user. Cloud nodes are inherently more vulnerable to cyber attacks than traditional solutions, given their size and underlying service-related complexity—that brings an unprecedented exposure to third parties of services and interfaces. An organization or any other individual must make sure that standard securitycompliance guidelines are being followed properly, before migrating to cloud. Protecting sensitive data and systems as well as providing visibility to the security of those systems is the key for the transition to the cloud. Both the cloud service provider and the customer should make sure that the cloud is safeenough from all the external threats, so there will be a strong and mutual understandingbetween the customer and the cloud service provider.

8. REFERENCES

[1] http://searchvirtualdatacentre.techtarget.co.uk/news/1510117/Community-cloud-Benefitsand-drawbacks.

[2] Michael glas and paul Andres, "An Oracle white paper in enterprise architecture achieving the cloud computing vision", CA-U.S.A, Oct 2010.

[3] Harjit Singh Lamba and Gurdev Singh, "Cloud Computing-Future Framework for emanagement of NGO's", IJoAT, ISSN 0976-4860, Vol 2, No 3, Department Of Computer Science, Eternal University, Baru Sahib, HP, India, July 2011.

[4] Dr. Gurdev Singh, Shanu Sood, Amit Sharma, "CM- Measurement Facets for Cloud Performance", IJCA, , Lecturer, Computer science & Engineering, Eternal University, Baru Sahib (India), Volume 23 No.3, June 2011.

[5] Joachim Schaper, 2010, "Cloud Services", 4th IEEE International Conference on DEST, Germany.

[6] Tackle your client's security issues with cloud computing in 10 steps, http://searchsecuritychannel.techtarget.com/tip/Tackle-your-clients-security-issues-withcloud-computing-in-10-steps.

[7] Problems Faced by Cloud Computing, Lord CrusAd3r, dl.packetstormsecurity.net/.../ProblemsFacedbyCloudComputing.pdf.

[8] Tackle your client's security issues with cloud computing in 10 steps, http://searchsecuritychannel.techtarget.com/tip/Tackle-your-clients-security-issues-withcloud-computing-in-10-steps.

[9] Problems Faced by Cloud Computing, Lord CrusAd3r, dl.packetstormsecurity.net/.../ProblemsFacedbyCloudComputing.pdf.

[10] Kevin Hamlen, Murat Kantarcioglu, Latifur Khan, Bhavani Thuraisingham, Security Issues for Cloud Computing, International Journal of Information Security and Privacy, 4(2), 39-51, University of Texas, USA, April-June 2010

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

INFORMATION TECHNOLOGY ROLE OF COMPUTERS IN DIGITAL FORENSICS

Mrs. Sunanda Sunil Mulgund

ABSTRACT

Digital forensics is the process of uncovering and interpreting electronic data. The goal of the process is to preserve any evidence in its most original form while performing a structured investigation by collecting, identifying, and validating the digital information to reconstruct past events. The context is most often for the usage of data in a court of law, though digital forensics can be used in other instances. *Digital forensic science is a branch of forensic science that focuses on the recovery and investigation of material found in digital devices related to cybercrime. Digital forensics is the process of identifying, preserving, analyzing, and documenting digital evidence. This is done in order to present evidence in a court of law when required. Few criminals are becoming smarter so data hiding techniques which includes encryption and steganography. The evidence of criminal activity is placed in such way where traditional search methods cannot be able to find it. Computer forensic is not just about detective work like searching for and trying to find out information it is worried about keeping sensitive data handling responsibly and confidentially, taking precautions to not nullify findings by corrupting data, taking precautions to make certain the integrity of the information, staying within the regulation and guidelines of evidence. With the help of computers we can investigate the identity theft, fraud and embezzlement, software piracy and hacking, blackmail and extortion, child pornography and exploitation etc. Computer provides different kinds of software. And with help of these software we can solve the different kinds of cases. The proof generated by computers are consider as legal proofs in the court.*

INTRODUCTION

As the world is growing towards digitalization, all these industries are utilizing the benefits of digitalization in the working process. With the help of digitalization, the working procedures are performing very fast and effectively. To use digitalization we just need a computer or a system. Some forensics software tools are there that need to be installed in the computers so one can perform the task. It gives us the benefit of fast operations. From the personal or commercial aspect of technology, computer forensics is important because we're heading into an 'internet of things' world; everything is going to be connected all the time." For instance, the Echo, Siri, and Portal digital assistants, along with web connected refrigerators and other home appliances are in more and more homes with internet connectivity and microphones. We're heading into an era where absolutely *everything* will need to be examined.

Unfortunately, those who commit crimes have not missed the information revolution. Criminals use mobile phones, laptop computers, and network servers in the course of committing their crimes. In some cases, computers provide the means of committing crime. For example, the Internet can be used to deliver a death threat via email; to launch hacker attacks against a vulnerable computer network, to disseminate computer viruses, or to transmit images of child pornography. In other cases, computers merely serve as convenient

storage devices for evidence of crime. For example, a drug dealer might keep a list of who owes him money in a file stored in his desktop computer at home, or a money laundering operation might retain false financial records in a file on a network server. Indeed, virtually every class of crime can involve some form

of digital evidence. Computers are used for committing crime. Law enforcement now uses computers to fight crime.

Computer forensics is widely known for catching criminals in various types of fraud. However, investigators are now using computer forensics to catch murderers, and access encrypted data daily that will stand as evidence in a court of law. Evidence from computer forensics investigations is usually subjected to the same guidelines and practices of other digital evidence. It has been used in a number of high-profile cases like Sheetal Amte in Maharashtra. Computer based evidence isn't just useful in solving digital-world crimes, such as **data theft, network breaches and illicit online transactions**. It's also used to solve physical-world crimes, such as burglary, assault, hit-and-run accidents and murder. Computer forensic includes various types of analysis in different fields related like..

ISSN 2394 - 7780

Forensic tools help investigators to extract crucial pieces of evidence from electronic devices to be presented in a court of law to put the criminals behind bars. Forensic tools provides us n number of solid tools which are used to help tracking criminal very easily. These tools includes

1. **Paladin :-** Paladin is undoubtedly one of the most versatile collections of forensic tools currently available. The entire suite consists of over 100 tools classified into 33 categories! Whether it is a matter of unauthorized access, data leak, modification of existing data, malicious software like spyware and malware, or even if it is something as simple as a weak password that was cracked through guesswork.
2. **CAINE (Computer Aided Investigative Environment) :-** CAINE is a suite of forensic tools that is Linux live distribution and provides an interactive GUI for forensic analysts to carry out a broad range of investigative activities. One of the major distinguishing factors about the CAINE suite is its applications for the assessment of database, memory as well as networks.
3. **3. X-Ways Forensics :-**X-Ways Forensics provides a large array of various types of tools that aid in digital forensics. From data recovery to disk cloning, finding and retrieving lost data, recovering deleted files and many more – X-Ways Forensics has grown to become an absolute must-have for all budding and professional cyber forensic analysts.
4. **Autopsy :-** The term autopsy is synonymous with the science of forensics. Medical autopsy is performed by a medical examiner to discern the cause and nature of death. Borrowing from the idea, Autopsy is a software toolkit to assess computer hard drives and smart phones and look for evidence to help identify instances of crime or malicious activities.
5. **Wireshark :-**Wireshark is a free open source forensic tool that enables users to watch and analyze traffic in a network. Since every organization maintains an internal network for day-to-day operations, Wireshark is an excellent choice for network administrators as well as cybersecurity experts to study all the activities on a network to identify deviations from established norms and zero-in on any suspicious behavior.
6. **ProDiscover Forensic :-**In the event of a crime, the perpetrators often try to destroy the evidence in order to escape justice. This is an extremely common occurrence in the case of cybercrimes. In such a scenario, it is deleted information on devices that help investigators nab the criminals and restore the damages. Few forensic tools can recover deleted information as well as ProDiscover Forensic
7. **Volatility Framework :-** is a unique forensic tool that lets investigators analyze the runtime state of a device using system information found in the volatile memory or RAM. Whenever we turn a device off, all unsaved data, which is present in the RAM gets deleted. It is only when we save something that it gets transferred from the RAM to permanent memory.
8. **Computer Online Forensic Evidence Extractor (COFEE) :-**The Computer Online Forensic Evidence Extractor or COFEE was developed by Microsoft to aid law enforcement officers in extracting information

ISSN 2394 - 7780

from Windows computers. It is an easy to use platform offering more than 150 forensic tools that investigators can use to analyze computer memory to discern actionable evidence.

9. **WindowsSCOPE :-**In the aftermath of a cyberattack, it is extremely important to evaluate the scenario and determine how the attack was carried out. WindowsSCOPE happens to be one of the best tools for incident response. In the event of an attack, this tool reverse engineers the entire operating system and all running processes, ports, open files, and so on. This allows forensic analysts to paint a clear picture of the sequence of events surrounding the attack and shed light on the causation.
10. **FTK imager :-** FTK® Imager is **a data preview and imaging tool** that lets you quickly assess electronic evidence to determine if further analysis with a forensic tool such as Forensic Toolkit (FTK®) is warranted.

METHODS

Computer forensic process includes 4 steps. With the help of these steps investigators are to find out the criminal easily.

1. Collection :- This is the first step of forensic process. In this phase data is identified labeled and recorded and gathering the data and physical evidence related to the incident being invested is done. Simultaneously integrity of the chain is also preserved.
2. Examination :- In this phase from the collected data identify and extract the pertinent information using proper forensic tools and techniques and also maintain integrity of the evidence.
3. Analysis :- In this phase results of the examination phase are analyzed. From the analysis useful answers to the questions are generated which are presented in the previous phases. Most probably the case gets solved in this phase only.
4. Reporting :- In the reporting phase the results of the analysis are done which contains – The information pertinent to the case.

-Actions that have been accomplished actions left to be performed.

-Advocated enhancements to processes and tools.

RESULTS

Law enforcers sometimes need computer forensics to investigate a crime. The computer system itself may act as a scene of a crime in cases of denial-of-service attacks and hacking. The computer system may also hold evidence of the crime. A lot of people may also store information in computer systems unwittingly or unintentionally. Evidence that computer forensics investigations produces may be in the form of emails, documents and Internet history. There may also be files relevant to crimes such as kidnapping, drug trafficking, money laundering or fraud. Examples of common situations in which computer forensics is used include: When corporate information is disclosed without permission, either by accident or by design, When an employee steals intellectual property from their employer and passes it to a competitor or uses it to set up a competing company, General criminal and civil cases. This is because criminals sometimes store information in computers.

DISCUSSION (PROS AND CONS)

The exchange of information is taking place everyday over the internet. Although this may be convenient for us, it can also pose as an opportunity for criminals. Phishing, corporate fraud, intellectual property disputes, theft, breach of contract and asset recovery are some of the situations wherein computer forensics can be used. Computer forensics' main advantage is its ability to search and analyze a mountain of data quickly and efficiently. They can search keywords in a hard drive in different languages which is beneficial since cyber crimes can easily cross borders through the internet. Valuable data that has been lost and deleted by offenders can be retrieved which becomes substantial evidence in court. Legal professionals are able to produce data in court that were previously impossible.

The main disadvantage is the cost of when retrieving data. Computer forensic experts hire per hour. Analysis and reporting of data can take as long as 15 hours but it will also depend on the nature of the case. Another one

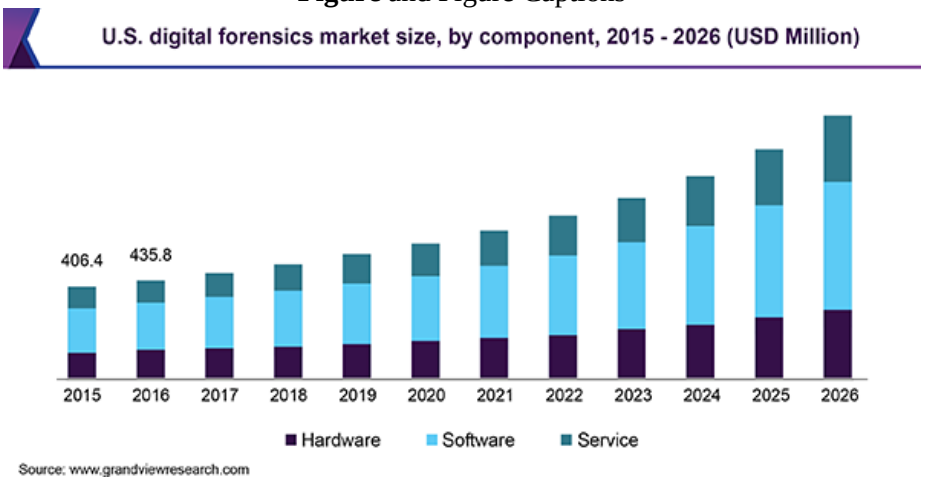
ISSN 2394 - 7780

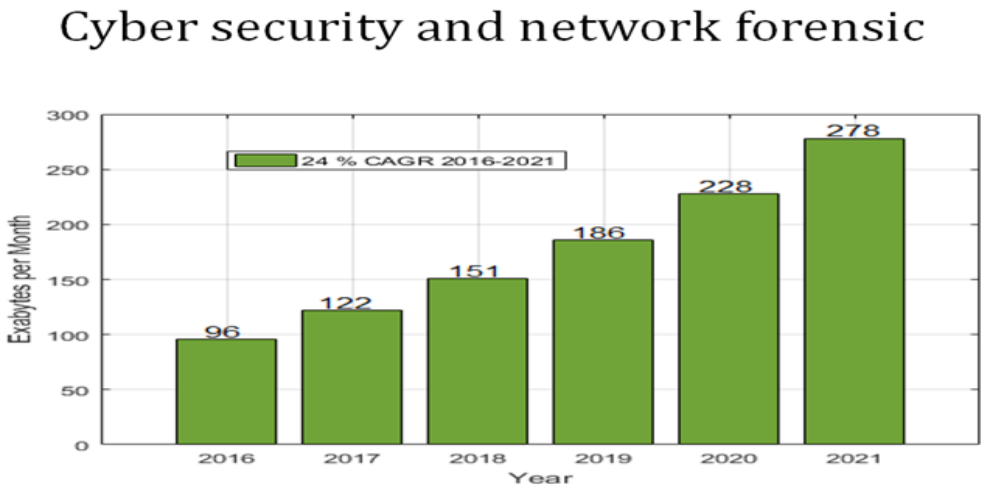
is that when retrieving data, analyst may inadvertently disclose privilege documents. Legal practitioners involved in the case must also have knowledge of computer forensics. If not they will not be able to cross examine an expert witness. This also applies to the judge, solicitors and barristers. Computer forensics is still fairly new and some may not understand it. The analyst must be able to communicate his findings in a way that everyone will understand.

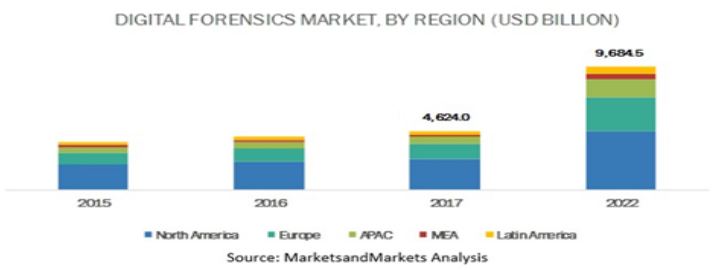
CONCLUSION

Computer forensics is quickly becoming used for many different areas of criminal investigations and there is now a methodology that is used. Computers have been widely known for being used in committing a crime but now the tables have turned and forensics has the edge using computer forensics to catch criminals who believe they do not leave an imprint when committing certain crimes.

Figure and Figure Captions







REFERENCES

- Guide to computer forensics and investigations
- Incident response and computer forensics

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

A STUDY ON EMPOWERMENT OF WOMEN THROUGH SELF HELP GROUPS IN AMBARNATH TALUK

Dr. Hemal Vora
Assistant Professor, M.Com Coordinator, Gurukul College of Commerce

ABSTRACT
The researcher has made an attempt to investigate the impact of the Self Help Group on women's empowerment, particularly with reference to AmbarnathTaluk.The present study is based on both primary data and secondary data. The primary data collected from the women Self Help Group members through the interview schedule. The secondary data were collected from various books journals and newspapers. Both descriptive analysis and inferential analysis have been attempted to throw more light on the study. A Convenient sampling technique is adopted for the study, due to the constraint of time and nature of respondents. 150 sample respondents of Women Self Help Group members were selected for the study. The production of Self Help Group movement has improved the lives of socially and economically backward women. The Self Help Group has also increased their financial independence and security. Women's empowerment is possible through the development of Self Help Group. Self Help Group has been identified as a source to address the financial needs of women. An economic activity of Self Help Group paves the way for women's empowerment in enhancing their socio economic status, not only in rural areas but also in urban areas.

Keywords:Empowerment, Women, Self Help Groups and Economic Activity

INTRODUCTION
The need of women empowerment arose due to the gender discrimination and male domination within the Indian society since ancient time. Women are being suppressed by their relations and society for several reasons. they need been targeted for several sorts of violence and discriminatory practices by the male members within the family and society in India and other countries also

Empowerment of women is needed for the economic development that covers social, economic, and social well being. The country has now been turned over by the rapid growth of Self Help Groups. The form of Self Help Groups has laid the foundation to address the above aspects of women empowerment. Self Help Groups enhance the social, economic social status of women. The fundamental principle of Self Help Groups is group dynamics. Self Help Groups is a small group of rural economically, socially backward people especially women, to bring out their talents, skills, and their capabilities which go to enhance their empowerment.

STATEMENT OF THE PROBLEM
From time out of mind women are forced to occupy a secondary place, though they're half the world's population. Moreover, the societal system made women are unable to require the place as a free and independent individual. On contrary, the constitution of India gives women a standing adequate to men. The Self Help Groups plays an important role in making them realise their importance of empowerment. Self Help Groups makes women to bring out their potentials and capabilities and make them confident to face the challenges more effectively. The Self Help Groups has brought a paradigm shift in the dynamics of women's status. It has also made women have financial independence to attain social uplightment. The very goal of Self Help Groups is to alleviate poverty by creating more revenue by creating effective work. The administration of India currently offers ample scope for Self Help Groups, especially female Self Help Groups, Providing micro credit facilities to pave the way for small investment projects. This attempt increases the standard of life, self-reliance, freedom, independence, by of women in society. Status in all respects, trust, degree of involvement, equal opportunity and the like, women in India. It is to be clearly known, from this, Self Help Groups play an important role in women. In this context, the researcher has made an attempt to investigate the impact of the Self Help Group on women's empowerment, particularly with reference to AmbarnathTaluk.

OBJECTIVES OF THE STUDY
- ✓ To analyse the reasons for joining Self Help Group members
- ✓ To identify the level of empowerment of women through Self Help Groups in AmbarnathTaluk

METHODOLOGY
The present study is based on both primary data and secondary data. The primary data collected from the women Self Help Group members through the interview schedule. The secondary data were collected from various books journals and newspapers. Both descriptive analysis and inferential analysis have been attempted to throw more light on the study.

ISSN 2394 - 7780

SAMPLING

A Convenient sampling technique is adopted for the study, due to the constraint of time and nature of respondents. 150 sample respondents of Women Self Help Group members were selected for the study

HYPOTHESES

1) There is no significant association between age group of women and level of empowerment through Self Help Groups in AmbarnathTaluk
2) There is no significant association between educational qualification of women and level of empowerment through Self Help Groups in AmbarnathTaluk
3) There is no significant association between marital status of women and level of empowerment through Self Help Groups in AmbarnathTaluk

ANALYSIS AND INTERPRETATION

Table 1 Reasons for joining Self Help Group members

Sl. No	Reasons	Mean	S.D	C.V.	't' value	Rank
1.	To avail credit	4.85	0.35	22.55	26.18*	I
2.	To promote savings	4.03	0.68	45.24	5.31*	VI
3.	To start business	4.01	0.80	42.54	7.48*	V
4.	To meet household expenses	4.08	1.03	40.95	6.81*	IV
5.	To strengthen the leadership quality	4.21	0.98	35.39	5.23*	III
6.	Compulsion from other members	4.24	1.02	29.21	13.42*	II

Source: Computed data

*** Significant at 0.05 level**

Table highlights that out of the six reasons for joining Self Help Group members, the reason 'To avail credit', Mean Score (4.85) in the highest and the co-efficient of variance (22.55) is the least, followed by the reason 'Compulsion from other members' (29.21), 'To strengthen the leadership quality' (35.39), 'To meet household expenses' (40.95), 'To start business' (42.54) and the reason 'To promote savings' have the mean score (4.03) is the least and the co-efficient variance (45.24) is the highest.

Level Of Empowerment Of Women Through Self Help Group

In order to study the level of empowerment of women through Self Help Group, the sample is grouped into three categories, namely low level, medium level and high level. The level of empowerment (total) is examined by the score value calculated for 10 statements by adopting the scaling technique. The score values greater than or equal to Mean+S.D and score values less than or equal to Mean-S.D are classified respectively as high level and low level of empowerment, while the score values in between (Mean+S.D) and (Mean – S.D) have been classified as medium level of sources of inspiration. The scores are given below.

Table 2 Empowerment Scores

Category	Low Level (Mean – Standard Deviation)	High Level (Mean + Standard Deviation)
Empowerment (Total)	39.40-4.90 = 34.5	39.40+4.90 = 44.30

To analyse the empowerment of women through Self Help Groups, it is categorized into low, medium and high level scores. The empowerment scores which falls below 34.5 is said to be in the low level and above that score is said to be high level. Based on the scores, the levels of empowerment of women through Self Help Groups can be measured.

Association Between Level Of Empowerment of Women Through Self Help Groups and Age Group of Women

Chi-square test is used to find the significance of age group of women on the level of empowerment through Self Help Group. The null hypothesis framed was "The level of empowerment of girls through Self Help Group is independent of their age group". The result of chi-square test for association between level of empowerment of women through Self Help Groups and age group of women is given in Table 3.

Table 3 Association between level of empowerment through Self Help Group and age group of women

Age group	Level of Empowerment			
	Low	Medium	High	Total
Upto 25 years	4	6	9	19
26-35 years	7	11	10	28
36-45 years	10	20	19	49

ISSN 2394 - 7780

Above 46 years	5	28	21	54
Total	**26**	**65**	**59**	**150**
Chi-square value	**12.942**			

Table Value with df = (4-1) × (3-1) = 6 is 12.60 at 0.05 level of significance
The above table shows that the calculated value of Chi-square is greater than the Table value at 5% level of significance. Hence, the null hypothesis, "The level of empowerment of girls through Self Help Group is independent of their age group" is rejected. It is concluded that there is a significant association between the levels of empowerment of women through Self Help Groups and their age group.

Association Between Level Of Empowerment of Women Through Self Help Groups And Educational Qualification Of Women

Chi-square test is used to find the significance of educational qualification of women on the level of empowerment through Self Help Group. The null hypothesis framed was "The level of empowerment of women through Self Help Group is independent of their educational qualification". The result of chi-square test for association between level of empowerment of women through Self Help Group and Educational Qualification of women is given in Table 4.

Association between level of empowerment through Self Help Group and educational qualification of women

Table 4

Educational Qualification	**Level of Empowerment**			
	Low	**Medium**	**High**	**Total**
Primary School	5	4	3	12
Middle School	12	17	11	40
SSLC	7	21	17	45
HSC	2	23	28	53
Total	**26**	**65**	**59**	**150**
Chi-square value	**15.429**			

Table Value with df = (4-1) × (3-1) = 6 is 12.60 at 0.05 level of significance

The above table shows that the calculated value of Chi-square is greater than the Table value at 5% level of significance. Hence, the null hypothesis, "The level of empowerment of women through Self Help Group is independent of their educational qualification" is rejected. It is concluded that there is a significant association between the levels of empowerment of women through Self Help Groups and their educational qualification.

ASSOCIATION BETWEEN LEVEL OF EMPOWERMENT OF WOMEN THROUGH SELF HELP GROUPS AND MARITAL STATUS OF WOMEN

Chi-square test is used to find the significance of marital status of women on the level of empowerment through Self Help Group. The null hypothesis framed was "The level of empowerment of women through Self Help Group is independent of their marital status". The result of chi-square test for association between level of empowerment through Self Help Group and Marital Status of womenis given in Table 5.

Association between level of empowerment through Self Help Group and marital status of women

Table 5

Marital Status	**Level of Empowerment**			
	Low	**Medium**	**High**	**Total**
Married	20	52	33	105
Unmarried	3	11	11	25
Widowed	2	2	8	12
Separated	1	1	6	8
Total	**26**	**65**	**59**	**150**
Chi-square value	**17.235**			

Table Value with df = (4-1) × (3-1) = 6 is 12.60 at 0.05 level of significance
The above table shows that the calculated value of Chi-square is greater than the Table value at 5% level of significance. Hence, the null hypothesis, "The level of empowerment of women through Self Help Group is independent of their marital status" is rejected. It is concluded that there is a significant association between the levels of empowerment of women through Self Help Groups and their marital status.

ISSN 2394 - 7780

SUGGESTIONS

1. The education of women should be considered on priority, which is the grassroots problem. Hence, education for women has to be paid special care.
2. Awareness programmes got to be organized for creating awareness among women especially belonging to weaker sections about their rights.
3. Women should be allowed to figure and will be provided enough safety and support to figure . they ought to be given proper wages and work on par with men in order that their status are often elevated within the society.
4. Strict implementation of Programmes and Acts should be there to curb the mal-practices prevalent within the society

CONCLUSION

The production of Self Help Group movement has improved the lives of socially and economically backward women. The Self Help Group has also increased their financial independence and security. Women's empowerment is possible through the development of Self Help Group. Self Help Group has been identified as a source to address the financial needs of women. An economic activity of Self Help Group paves the way for women's empowerment in enhancing their socio economic status, not only in rural areas but also in urban areas.

REFERENCES

1) Cheston, S and Kuhn, L. (2002).Empowering Women through Microfinance. Draft, Opportunity International
2) Pillai, J.K (1995). Women and empowerment.Gyan PublishersHouse, New Delhi.
3) Hoshemi, S.M. (1996). Rural credit programmes and women'sempowerment in Bangladesh. World Development, Vol.42, No.34, pp.635-653.
4) Venkatesh, J. & K. Kala. (2010). Empowering rural women all the way through self-help groups. International Journal of Management, Vol.1, No.(2), pp.156-63.
5) Sureshkumar, D. (2010). Self-help groups and micro credit-an analytical study with special reference to Coimbatore city. Osmania Journal of International Business Studies, Vol.5, No.(1and2), pp.135-144.
6) Sharad, M. (2016). Contribution of self-help groups in the socio economic development of the women. International Journal of research in social sciences, pp.333-344.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

ONLINE V/S OFFLINE OF YOUTH BUYING BEHAVIOUR

Shalu Agrawal[1] and Dr. Anurag Shakya[2]
[1]Research Scholar, Department of Management Mangalayatan University, Aligarh (U.P.) India
[2]Head of the Department (HOD), Department of Management & Commerce, Mangalayatan University Aligarh (U.P.) India

ABSTRACT
Today India has been recognized as one of the most promising and fastest growing economy of the world. *And market of India is also growing very fast. It is shifting from traditional market to digital market especially for the young generation. So, becsicaly this study tries to know that, how young generation measure channels for their purchasing. Specifically, it evolutions a conceptual model that addresses young consumer value perception for using the online shopping versus the offline shopping. The main objective of this study is to identifying the factors that motivate young generation to decide whether to do online shopping or go for the offline shopping. This study is mainly based on both primary and secondary data.*

Keywords:- Online shopping, Offline shopping and Youth generation behaviour.

INTRODUCTION
Consumer buying behavior is of growing importance to all marketers especially for the young generation. It is especially important in deciding how much–and where–to spend money bringing customers into the sales funnel and then leading them to buy. Consumer Buying Behavior refers to the actions taken (both on and offline) by consumers before buying a product or service. This process may include consulting search engines, engaging with social media posts, or a variety of other actions. It is valuable for businesses to understand this process because it helps businesses better tailor their marketing initiatives to the marketing efforts that have successfully influenced consumers to buy in the past. Since last five years as population are more aware of the technology the online shopping increased immensely. Online shopping has been a growing miracle in all four corners of the world, in particular amongst countries possessing highly developed infrastructure available for marketing activities through the internet. . Online Shopping behavior is a fine of individual's overall perception and evaluation for product or service during online shopping which could result in bad or good way. Online buying behaviour is the decision processes and acts of people/prospective customers involved in buying and using products through online. Offline consumer buying behavior refers to the buying behavior of the ultimate consumer who prefers to visit traditional stores or contact salesman/use magazines/newspapers/telephonic media for buying any product/service. Shopping offline, you can check if the outfit or the product you are buying fits your taste or not. You can inspect the product closely before buying it. You don't have to wait days or weeks to get the item delivered to you. You select something and you carry it home with you. An offline experience is a physical representation of your company, so even the smallest of details must be in line with your brand's image.

OBJECTIVES
- To identifying the factors that motivate young generation to decide whether to do online shopping or go for the offline shopping.
- To examine the factor influencing young generation' attitudes towards online shopping.

LITERATURE REVIEW
Park Thaichon (2017), "Consumer socialization process: The role of age in children's online shopping behavior" The researcher found that children's online shopping behavior is influenced by age, parental guidance, social networks, and peers. And develop an understanding of children perception of online shopping and its adoption within the retail sector. This study provides empirical evidence relating to children's perceptions and behavior in the online environment as consumers, which remain under-researched in the marketing literature. Moreover, the role of children's age was incorporated in the study, allowing more insights to be obtained.

Sukhwinder Kaur (2018) focused that the high touch products that the consumer feels when they need to touch, smell or try the product. It requires the offline shopping at the purchasing stage because it cannot be done in the online shopping. This research paper focused to analyze the significant difference between the online and offline consumer groups in terms of demographic, technology use, availability and attitude of the consumer.

Yi. Jin Lim, et.al, (2016), determine the relationship between subjective norm, perceived usefulness and online shopping behavior while mediated by purchase intention. University students aged between 18 and 34 that

ISSN 2394 - 7780

currently pursuing their studies in University Malaysia Perlis were selected as the subject of analysis. 662 out of 800 sets of questionnaires distributed were valid for coding, analyzing and testing the hypothesis. Collected data were then analyzed using SPSS version 18.0 and AMOS version 16.0. Structural Equation Modeling to examine the model fits and hypothesis testing.

Girish Mallapragada, Sandeep R. Chandukala, Qing Liu, (2016), influence online shopping and managing consumer relationships is not a trivial task for firms, considering the many pertinent factors that influence behavior, including the product being shopped (i.e., the "what") and the context of the website itself (i.e., the "where"). This study investigates the impact of these characteristics on an online transaction's basket value, after incorporating the role of other aspects of the browsing process including page views and visit duration. The authors estimate a multivariate mixed-effects Type II Tobit model with a system of equations to explain variation in shopping basket value, using data involving 773,262 browsing sessions resulting in 9,664 transactions across 43 product categories from 385 unique websites

Puja gupta (2015), " Comparative Study of Online and Offline Shopping: A Case Study of Rourkela in Odisha." The study contributes to the current marketing literature by comparing the offline and online channel side-by-side. This study also contributes hypothetically and practically to a better understanding of consumer behaviour, particularly the online buying decision process. The research stream identified explores the importance of the consumer's situation as an important driver of online retail sales.

Hashim Shahzad (2015) focus lays on these five online factors: financial risk, product performance risk, delivery risk, trust and security, and website design. The main objective of this research is to fill the gap of previous literature that did not much investigated the external online factors that influence consumers' online shopping behavior in Sweden's context. The empirical data was collected through a questionnaire survey and it was distributed among 100 respondents by hand and online. The findings of this research revealed that website design is the most influential and significant factor.

Arpita Khare, Shveta Singh and Ansuman Khare, (2010), The purpose of this research is to examine the relationship between innovativeness/novelty-seeking behavior of Indian youth and their online shopping behavior. Three hundred students studying in universities in the northern region of India between the ages of 18 and 24 years participated in the survey. The research findings show a positive relationship between innovativeness/novelty-seeking behavior and online shopping behavior.

Narges Delafrooz et.al (2010) focused the ever-increasing use of the internet in Malaysia provides a developing prospect for E-marketers. Such marketers' awareness of the factors affecting Malaysian buyers' attitude can further develop their marketing strategies in converting potential customers into active ones, while maintaining their existent online customers. This paper sets out to examine the factors influencing students' attitudes towards online shopping in Malaysia through a five-level Likert scale self-administered questionnaire, which was developed based on prior literature. A total of 370 students were randomly selected. The results indicated that utilitarian orientation, convenience, price, and a wider selection influenced consumers' attitudes towards online shopping.

RESEARCH METHODOLOGY

It computes the description of the sampling plan, research instruments used for the collection of data pretesting of questionnaire, the use of statistical tools and techniques for the analysis of the collected data.

- **Scope:** Scope was limited to the geographical boundary Mathura City.
- **Need of Study:** It is very difficult task to know the consumer behavior about online shopping and offline shopping. So, I conduct a survey to compare online and offline shopping modes.
- **Research Design:-** The purpose of research design is to ensure that the data collected is accurate and relevant. Any research work requires clarity of objective to be achieved effectively research. The descriptive design used for this survey.
- **Sampling Techniques**:- Researcher used Random and Convenient Sampling techniques for sample selection.
- **Sample Size**:- The sampling will be selected 80 youth consumers in Mathura city.
- **Data Collection:-** This study mainly based on primary and secondary data both. Data collected from the online and offline customers. The study covers opinion of the customer about online and offline shopping

ISSN 2394 - 7780

behaviour and problems faced by the them related to online and offline shopping espacially young generation.

Frequency distribution profile of respondents showed that 60% of the respondents were male while 40% of the remaining respondents were female. The majority of the respondents (35 %) fall in the age range between 30 to 35 years of age and 56.2% respondents had post graduation. Respondents having a monthly income ranging from 20,000 to 30,000 were (47.5 %) sample respectively (Table 1).

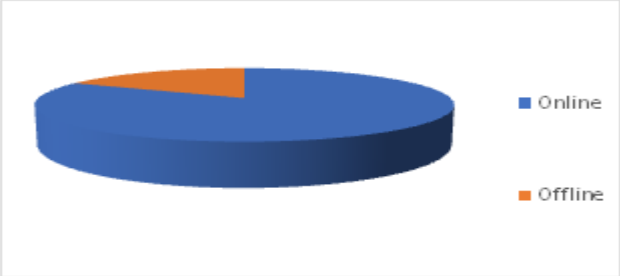
(Table 1) Demographic characteristics of respondents

Variables and category	frequency	Percentage
Gender:-		
Male	32	40
Female	48	60
Age(years):-		
20 to 30	33	41.25
30 to 40	47	58.75
Education:-		
Under 12th	4	5.0
Graducation	21	26.3
Post- graducation	45	56.2
Above post-graducation	10	12.5
Monthly Income		
Less than 10,000	8	10
10,000 – 20,000	23	28.8
20,000 – 30,000	38	47.5
30,000 above	11	13.7

- **Data Analysis and Interpretation:-**

Q. 1 What do you prefer for shopping?

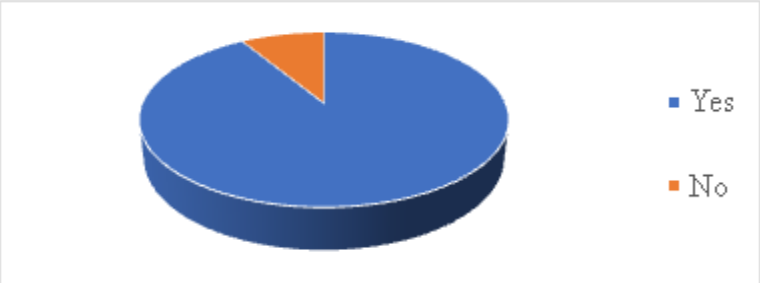
Option	Respondents	Percentage
Online Shopping	66	82.5%
Offline Shopping	14	17.5%
Total	80	100%



Q. 2 Do you trust on Online shopping?

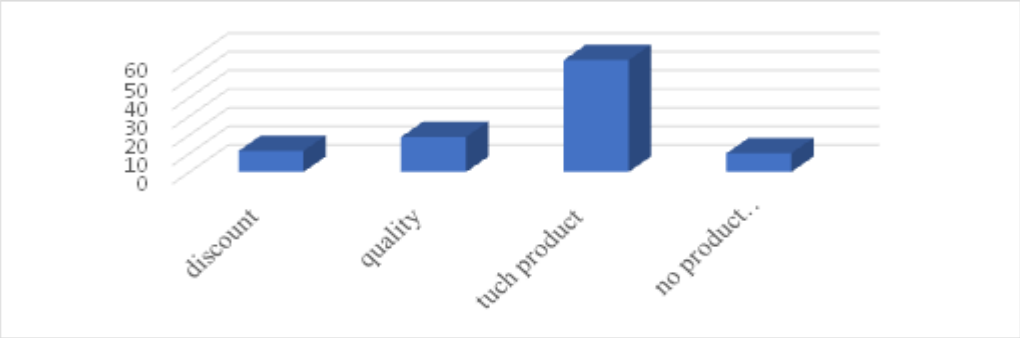
Option	Respondents	Persentage
Yes	73	91.25%
No	07	8.75%
Total	80	100%

ISSN 2394 - 7780



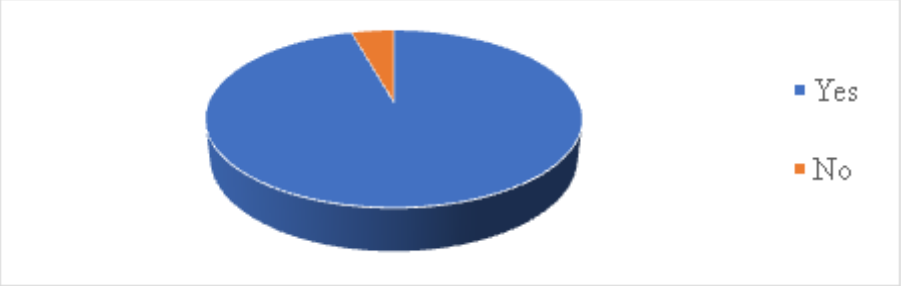
Q.3 Why do you choose offline shopping?

Option	Respondents	Persentage
For better discount	9	11.25%
For better quality	15	18.75%
Prefer to tuch the product	48	60%
No product disappointment	8	10%
Total	80	100%



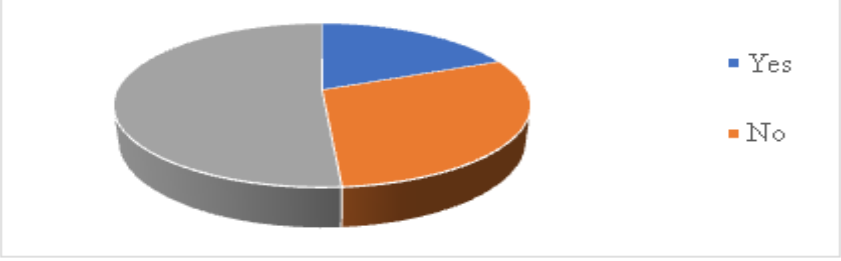
Q.4 Does online shopping is as secure as traditional shopping?

Option	Respondents	Persentage
Yes	56	70%
No	24	30%
Total	80	100%



Q.5 Is website provide the sufficient information?

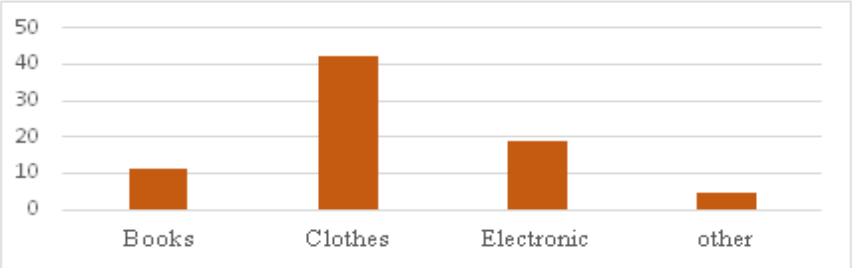
Option	Respondents	Persentage
Yes	15	18.75%
No	24	30%
Sometime	41	51.25%
Total	80	100%



ISSN 2394 - 7780

Q.6 Things you mostly prefer from online shopping?

Option	Respondents	Persentage
Books	19	23.75%
Clothes	42	52.5%
Electronic item	11	13.75%
Other	8	10%
Total	80	100%



Q.7 What are the most important criterion when you buy in online shopping?

Option	Respondents	Persentage
Delivery	16	20%
Price	12	15%
Quality	18	22.5%
Return policy	12	15%
Payment security	22	27.5%
Total	80	100%

Q. 8 How frequently do you buy online?

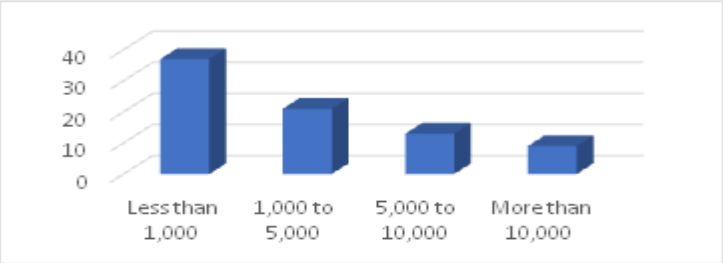
Option	Respondents	Persentage
Frequently or at least once a month	40	50%
Once in six month	24	30%
Once a Year	16	20%
Never	0	0%
Total	80	100%

Q.9 What is an approximate amount you would spend on a single online purchase?

Option	Respondents	Persentage
Less than 1,000	37	46.25
1,000 to 5,000	21	26.25

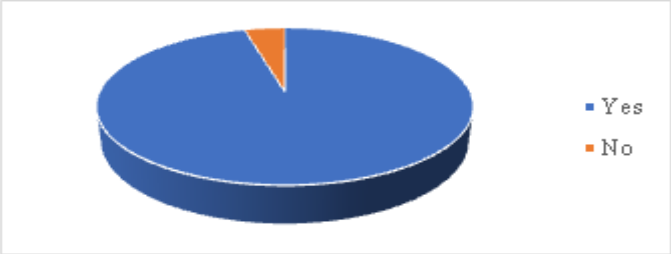
ISSN 2394 - 7780

5,000 to 10,000	13	16.25
More than 10,000	9	11.25
Total	80	100%



Q. 10 Do you like bargaining?

Option	Respondents	Persentage
Yes	6	7.5%
No	74	92.5%
Total	80	100%



FINDING OF THE STUDY

The primary objective of this study was to compare online and offline shopping modes of youth generation. The findings and analysis of the study are:

- The survey showed, 47% consumers are 30 to 40 years old and 33% consumers are 20 to 30 years and in which 60% consumers of online and offline shopping are female and 40% consumers are male.
- The survey showed that 82.5% youth generation prefer the online shopping and 92% consumers trust on the online shopping while other not trusted on online shopping. The maximum consumer are satisfied with online shopping.
- Analysis showed that 51.25% consumers think that sometimes website is not provide full information about the product, 30% consumers think website is never provide fully information and 18.75% consumers think website provide full information about the product.
- Analysis showed 27.5% consumers think that payment security, 22.5% consumers think that quality, 20% consumers think that delivery and 15% - 15% consumers think that price and return policy is the most important criterion when they buy in online shopping.
- The survey showed that 70% youth consumers think online shopping is as secure as traditional shopping while other think negative.
- Analysis showed Youth consumers mostely 52.5% perfer clothes from online shopping, 23.75% prefer books, 19.75% prefer electronic items while 10% prefer other items from online shopping.
- The surveyed showed 60% youth consumers think that they can touch the product in offline shopping, 18.5% consumers think that there are better quality and 10% consumers think that there is no disappointment about the product in offline shopping.
- Out of data surveyed 92.5% consumers do not like bargaining while 7.5% consumers like bargaining.

CONCLUTION

Online shopping is a new experience and has greatly impacted the lives of youth consumers in its short time of existence. Online shopping has made young consumers more effective and efficient in their shopping behavior and has motivated businesses to a new level, forcing many to make the necessary adjustments and changes to reach the new market of knowledgeable consumers. The young generation are more often purchasing from

ISSN 2394 - 7780

online sites because of the revolution in the technology among the youth population and they are able to use this technology for their well-being more than other age group category.

The result of this study reveals that the male are less doing the online shopping than female. The female are more into online shopping because they enjoy doing shopping whether it is traditional shopping or e-shopping. There are increasing demand of online shopping because the variety of options for the consumers to choose and that to at a reasonable price and sometime even less price than the market. Electronic items were less demanded from the e-shopping but clothes are much more demanded by the consumers. The study revealed that innovativeness in new technology and relative benefit had positive effects on users' intention to transfer usage. Moreover, the findings of the study also indicated that internet experience moderates the relationship between relative benefit and consumers' intention to transfer usage from offline to online services

The overall results shows that the youth have perceived online shopping in a positive manner. In fact, they trust the online shopping more than offline shopping and they think online shopping is more convenient and efficient rather than offline shopping. This clearly explains the project growth of online shopping in the country. The results can also be used by various organizations to identify their target customer segments. Online websites should pay more attention to the female segments as results prove that females shop more in online shopping as compared to men.

REFRENCES

- Kaur, S. and Kaur, V. (2018), Comparative Study on Online vs. Offline Shopping. International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org.
- Arya, N. (2018), Comparative Review of Online and Offline consumer behavior. International Journal Of Business Management Available at www.ijbm.co.in ISSN NO. 2349-3402 VOL. 2(2),2015
- Lim, Y. J. et.al, (2016), Factors Influencing Online Shopping Behavior: The Mediating Role of Purchase Intention. Peer-reviewed under responsibility of Universiti Tenaga Nasional doi: 10.1016/S2212-5671(16)00050-2.
- Mallapragada G., Chandukala, S. R., Qing Liu, (2016), Exploring the Effects of "What" (Product) and "Where" (Website) Characteristics on Online Shopping Behavior. Volume: 80 issue: 2, page(s): 21-38, March 1, 2016
- Gupta, P (2015), Comparative Study of Online and Offline Shopping: A Case Study of Rourkela in Odisha.
- Shahzad, H. (2015), Online Shopping Behavior. Uppsala Universitet campus gotland.
- Khare, A., Singh, S. and Khare, A. (2010), Innovativeness/Novelty-Seeking Behavior as Determinants of Online Shopping Behavior Among Indian Youth. Journal of Internet Commerce Volume 9, 2010 - Issue 3-4
- Kumar, Mr. V., Dange, Dr. U. (2014). A study on perceived risk in online shopping of youth in Pune: A factor analysis. Acme Intellects International Journal of Research in Management, Social Sciences & Technology. Vol. 8(8), pp. 1-9.
- Nagra, Dr. G., Gopal, Dr. R., (2013). A Study of Factors Affecting on Online Shopping Behavior of Consumers. International Journal of Scientific and Research Publications. Vol. 3(6), pp. 1-4.
- Delafrooz, N., Paim, L. and khatibi, A. (2010), Students' Online Shopping Behavior: An Empirical Study. [Journal of American Science 2010;6(1):137-147].
- Haque, A., Sadeghzadeh, J., & Khatibi, A. (2006). Identifing Potentiality Online Sales In Malaysia: A Study On Customer Relationships Online Shopping. Journal of Applied Business Research, 22(4), 119-130.
- www.Stannsannquest.com.
- http://www.ebay.com/gds/advantages-of-online-shopping-and-its-disadvantage//g.html.
- http://www.shoppingcartelite.com/articles/top-objectives-of-selling brand and-services online.
- https://xcluesiv.com/blog Kothari.C.R.(2005),'Research methodology, Methods and Techniques' New Age ,International publisher.
- https://www.planetmarketig.com/blog/importance-offline-online-marketing.

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

SYNTHESIS, MOLECULAR DOCKING AND IN-VITRO CYTOTOXICITY STUDIES OF 3,5-DIMETYL ARYLAZO PYRAZOLE DERIVATIVES

K. Ishwarbhat
Department of Pharmaceutical Chemistry, NGSM Institute of Pharmaceutical Sciences (NGSMIPS), Nitte (Deemed to be University), Mangalore-575018, (Karnataka) India

INTRODUCTION

Cancer is the name given to a large group of related diseases, which can affect almost any part of the body. It occurs when damaged cells, failed to undergo self-destruction and instead they grow, proliferate and spread abnormally. Disruption of the normal regulation of cell cycle progression and proliferation are the major events leading to cancer. The excess cells so formed may continue to divide indefinitely and form growths called tumour which tend to metastasize in some cases. The tumour micro-environment and the stress signals, such as those caused by damaged DNA, are the regulating factors, that determine whether cancer cells proliferate or die.

MAIN BODY OF THE PAPER

A series of novel 3,5-dimethyl arylazo pyrazole derivatives **(3a-h)** were synthesized by the condensation of oxobutyrate derivatives **(2a-h)** with p-toluenesulfonyl hydrazide **(1)** in glacial acetic acid medium. Oxobutyrates were prepared from different substituted anilines by diazotization and followed by condensation with acetylacetone in alcoholic medium. All the synthesized compounds were screened for their In-vitro cytotoxicity against MCF-7 and MDA-MB-231 human cell lines.

CONCLUSION

Some of the tested compounds 3a, 3b, 3e showed significant cytotoxicity activity on both the human cell lines. All the new compounds were characterized by ^{1}H-NMR, IR, Mass spectral data. In order to understand the interactions with active binding site of receptor, Molecular docking studies were also performed.

Key words: Pyrazole, oxobutyrates, Cancer, Cytotoxicity, MTT assay

REFERENCES

1. Dimitris Matiadis, Marina Sagnou. Pyrazoline hybrids as promising anticancer agents:an up-to-date overview Int. J. Mol. Sci. 2020, 21, 5507 PMID: 32752126
2. Sung H, Ferlay J, Siegel R L, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBACON estimates the incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin, 2021; 71(3):209-249 . PMID: 21296855
3. Housman G, Byler S, Heerboth S, Lapinska K, Longacre M, Nicole Snyder N, Sarkar S. Drug Resistance in Cancer: An Overview. Cancer. 2014;6:1769-92. PMID: 25198391

International Journal of Advance and Innovative Research
Volume 9, Issue 2 (X) April - June 2022
ISSN 2394 - 7780

ANTHELMINTIC ACTIVITY OF BROMO CONTAINING BENZOTHIAZOLE COMPOUNDS

Poonam Daga, Madhu Toshniwal, Mahendra Singh Bundel and Arun Pareek
Analytical and Pharmaceutical Research Laboratory, Department of Chemistry, S.P.C.Govt. College Ajmer (305001),Rajasthan, INDIA

ABSTRACT
A chemical's biological activity may be assessed directly in vitro, for example, by measuring the degree of inhibition or stimulation of an enzyme system. Biological activity can take numerous forms and be quantified in many ways depending on the level of research. There are two steps involved in the formation of our final product which is evaluated for biological activity. In first, the intermediate is formed from the reaction between the 4,6-dibromo-1,3-benzothiazol-2-amine and chloro acetyl chloride. In second step, product is formed from reaction between aliphatic or aromatic amine derivative and the intermediate. A. lumbricoides, Unicaru strencencephala, and other worm species are used in in-vitro procedures for anthelmintic activity. Anti-helmintic action may be tested by exposing worms to anti-helmintic solutions. Some of the derivatives were found to be biologically active.

Keywords: Benzothiazol , Biological, Anthelmintic .

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.

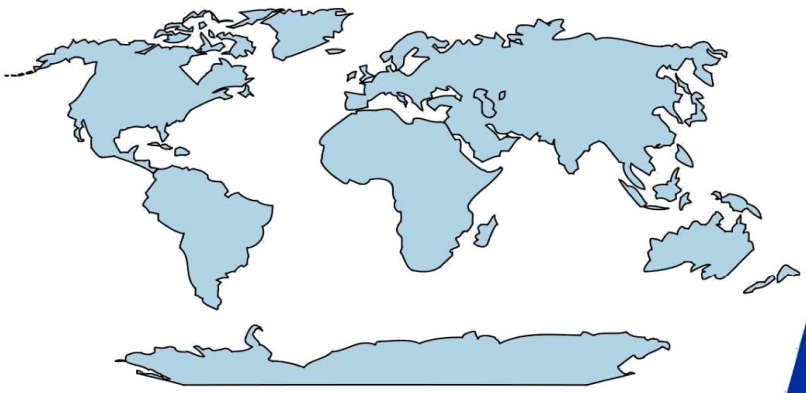
8. Decision of the Editorial Board regarding selection/rejection of the articles will be final.

www.iaraedu.com

Journal

ISSN 2322 - 0899

INTERNATIONAL JOURNAL OF RESEARCH IN MANAGEMENT & SOCIAL SCIENCE



Volume 8, Issue 2
April - June 2020

www.iaraedu.com

Journal

ISSN 2394 - 9554

International Journal of Research in Science and Technology

Volume 6, Issue 2: April - June 2019

Indian Academicians and Researchers Association
www.iaraedu.com

INDIAN ACADEMICIANS AND RESEARCHERS ASSOCIATION

Membership No: M / M – 1365

Certificate of Membership

This is to certify that

XXXXXXXX

is admitted as a

Fellow Member

of

Indian Academicians and Researchers Association

in recognition of commitment to Educational Research

and the objectives of the Association

Date: 27.01.2020

Director

President

INDIAN ACADEMICIANS AND RESEARCHERS ASSOCIATION

Membership No: M / M – 1365

Certificate of Membership

This is to certify that

XXXXXXXXXX

is admitted as a

Life Member

of

Indian Academicians and Researchers Association

in recognition of commitment to Educational Research

and the objectives of the Association

Date: 27.01.2020

Director

President

INDIAN ACADEMICIANS AND RESEARCHERS ASSOCIATION

Membership No: M / M – 1365

Certificate of Membership

This is to certify that

XXXXXXXX

is admitted as a

Member

of

Indian Academicians and Researchers Association

in recognition of commitment to Educational Research

and the objectives of the Association

INDIAN ACADEMICIANS AND RESEARCHERS ASSOCIATION

Date: 27.01.2020

Director

President

IARA Organized its 1st International Dissertation & Doctoral Thesis Award in September'2019

1st International
Dissertation & Doctoral Thesis Award
(2019)

Organized By

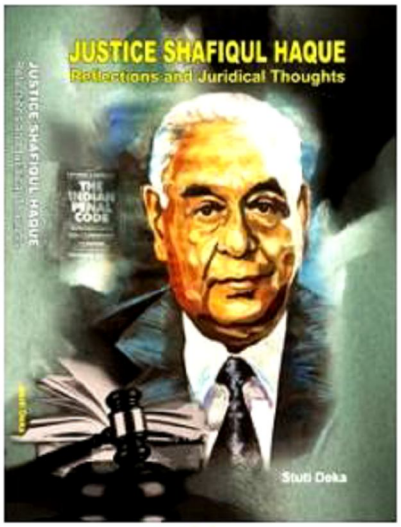
Indian Academicians and Researchers Association (IARA)

EMPYREAL PUBLISHING HOUSE

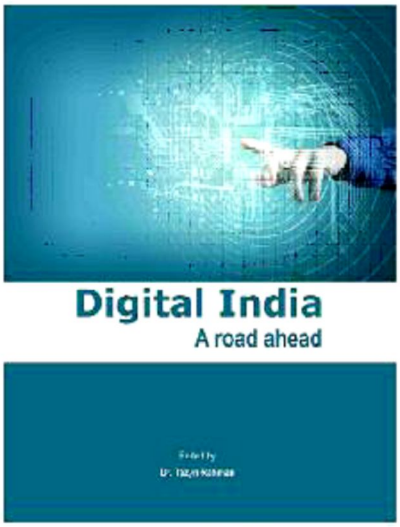
www.editedbook.in

Publish Your Book, Your Thesis into Book or Become an Editor of an Edited Book with ISBN

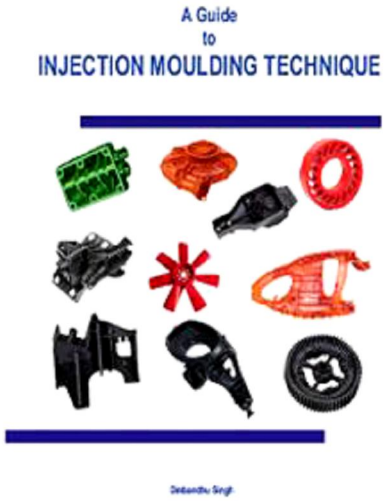
BOOKS PUBLISHED



Dr. Stuti Deka
ISBN : 978-81-930928-1-1

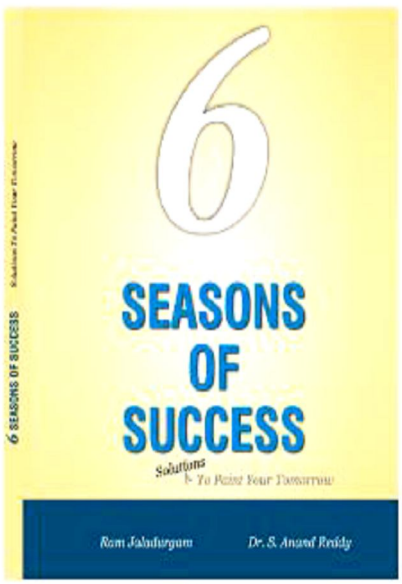


Dr. Tazyn Rahman
ISBN : 978-81-930928-0-4

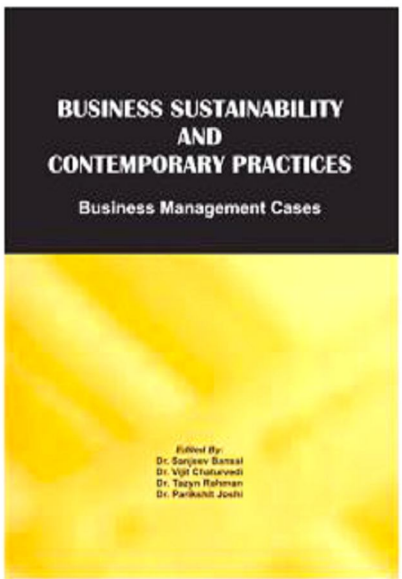


Mr. Dinbandhu Singh
ISBN : 978-81-930928-3-5

Dr. Ismail Thamarasseri
ISBN : 978-81-930928-2-8

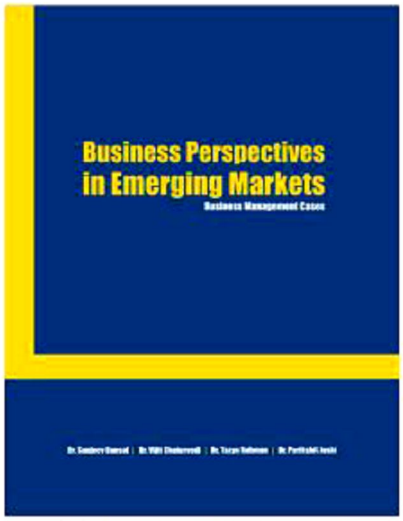


Ram Jaladurgam
Dr. S. Anand Reddy
ISBN : 978-81-930928-5-9



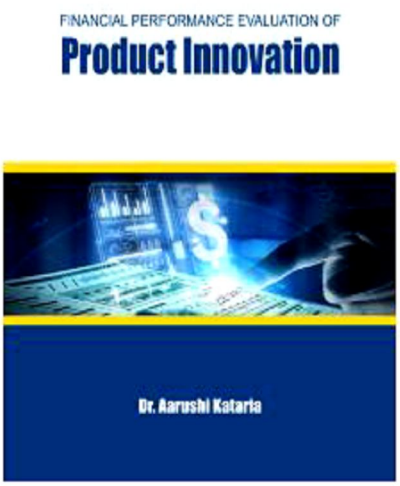
Dr. Sanjeev Bansal, Dr. Vijit Chaturvedi
Dr. Tazyn Rahman, Dr. Parikshit Joshi
ISBN : 978-81-930928-6-6

Ashish Kumar Sinha, Dr. Soubhik Chakraborty
Dr. Amritanjali
ISBN : 978-81-930928-8-0

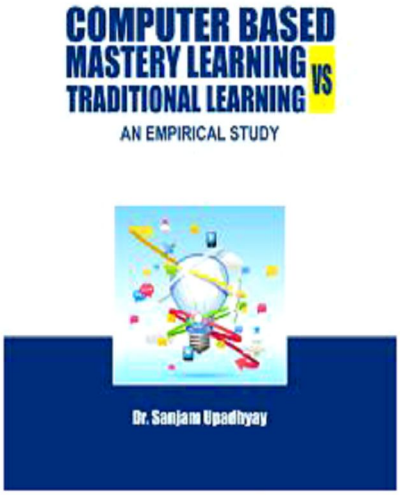


Dr Sanjeev Bansal, Dr. Vijit Chaturvedi
Dr. Tazyn Rahman, Dr. Parikshit Joshi
ISBN : 978-81-936264-0-5

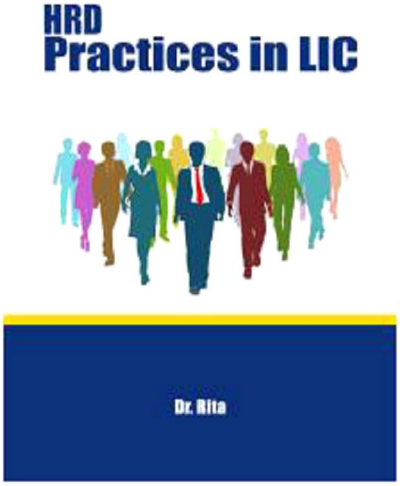
Dr. Jyotsna Golhar
Dr. Sujit Metre
ISBN : 978-81-936264-6-7



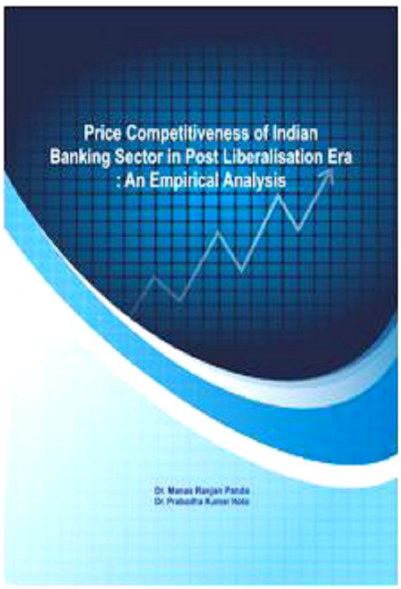
Dr. Aarushi Kataria
ISBN : 978-81-936264-3-6



Dr. Sanjam Upadhyay
ISBN : 978-81-936264-5-0



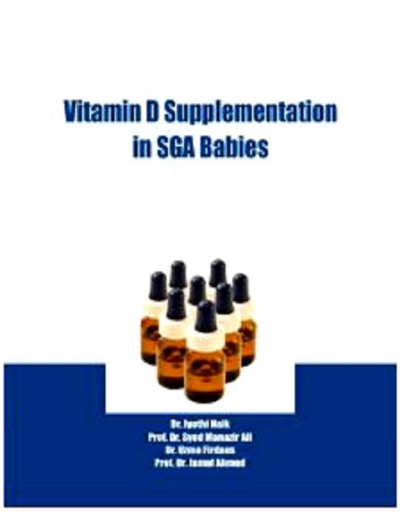
Dr. Rita
ISBN : 978-81-930928-7-3



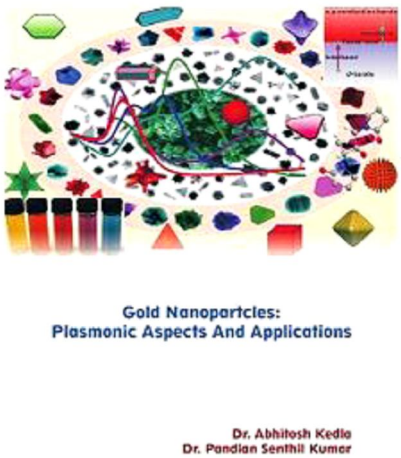
Dr. Manas Ranjan Panda, Dr. Prabodha Kr. Hota
ISBN : 978-81-930928-4-2

Poornima University
ISBN : 978-8193-6264-74

Institute of Public Enterprise
ISBN : 978-8193-6264-4-3



Dr. Jyothi Naik, Prof. Dr. Syed Manazir Ali
Dr. Uzma Firdaus, Prof. Dr. Jamal Ahmed
ISBN : 978-81-936264-9-8



Dr. Abhitosh Kedia
Dr. Pandian Senthil Kumar
ISBN : 978-81-939070-0-9

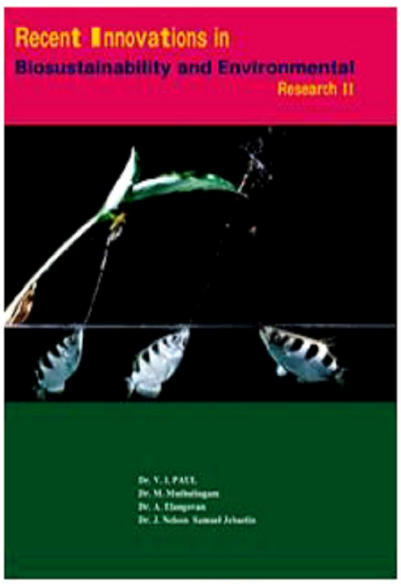
Dr. Vinod
S. Chandwani
ISBN : 978-81-939070-2-3

Prof. Dr. Dhananjay
Awasarikar
ISBN : 978-81-939070-1-6

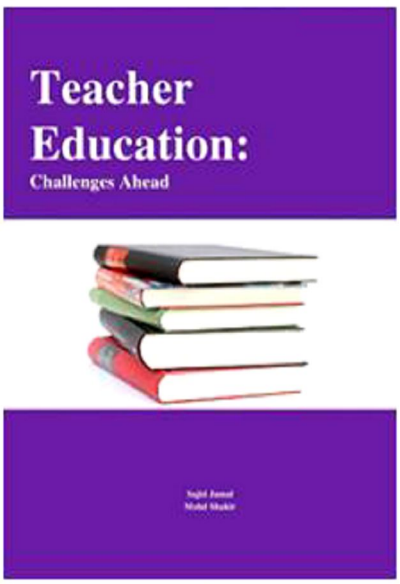
Dr. C. Samudhra Rajakumar, Dr. M. Ramesh
Dr. C. Kathiravan, Dr. Rincy V. Mathew
ISBN : 978-81-939070-4-7

Dr. C. Samudhra Rajakumar, Dr. M. Ramesh
Dr. C. Kathiravan, Dr. Rincy V. Mathew
ISBN : 978-81-939070-6-1

Dr. C. Samudhra Rajakumar, Dr. M. Ramesh
Dr. C. Kathiravan, Dr. Rincy V. Mathew
ISBN : 978-81-939070-7-8

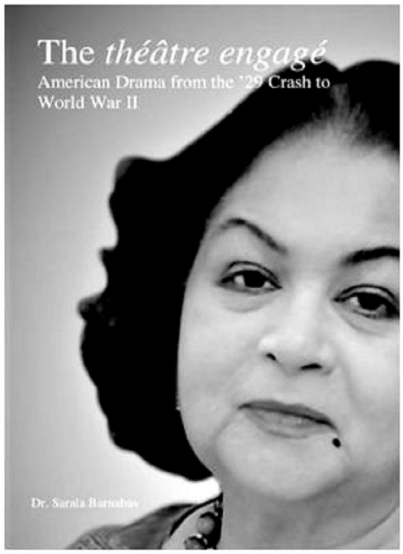


Dr. V. I. Paul, Dr. M. Muthulingam
Dr. A. Elangovan, Dr. J. Nelson Samuel Jebastin
ISBN : 978-81-939070-9-2



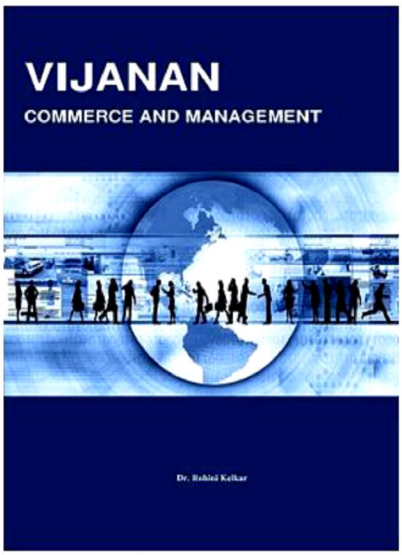
Sajid Jamal
Mohd Shakir
ISBN : 978-81-939070-8-5

Dr. R. Emmaniel
ISBN : 978-81-939070-3-0

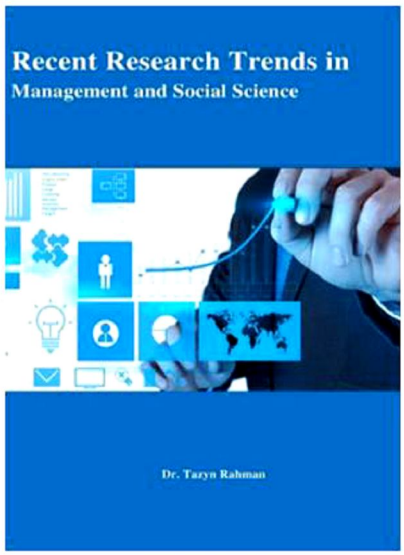


Dr. Sarala Barnabas
ISBN : 978-81-941253-3-4

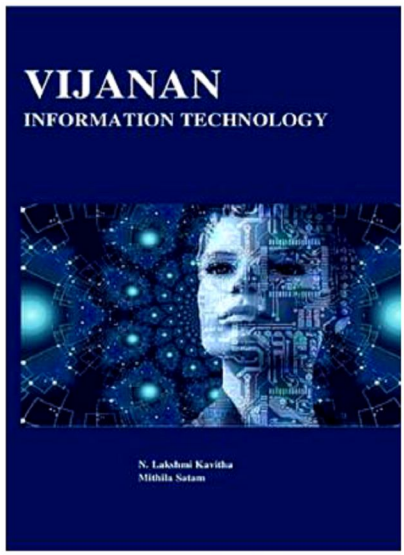
Dr. M. Banumathi
Dr. C. Samudhra Rajakumar
ISBN : 978-81-939070-5-4



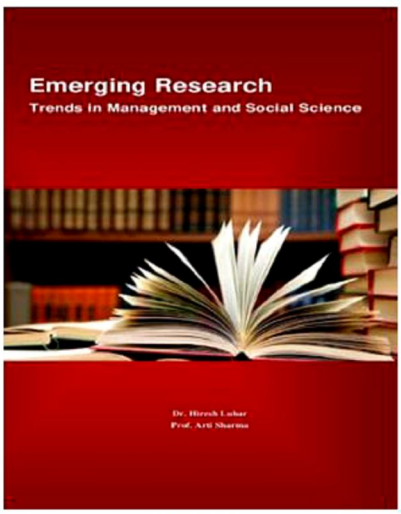
Dr. (Mrs.) Rohini Kelkar
ISBN : 978-81-941253-0-3



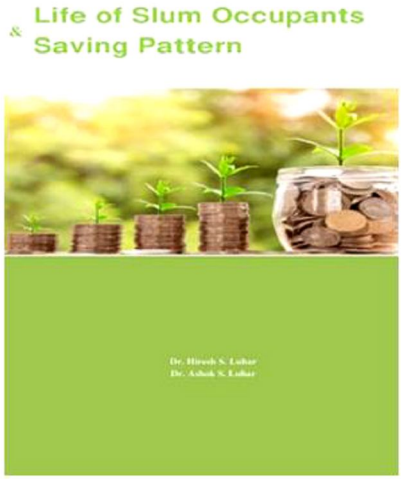
Dr. Tazyn Rahman
ISBN : 978-81-941253-2-7



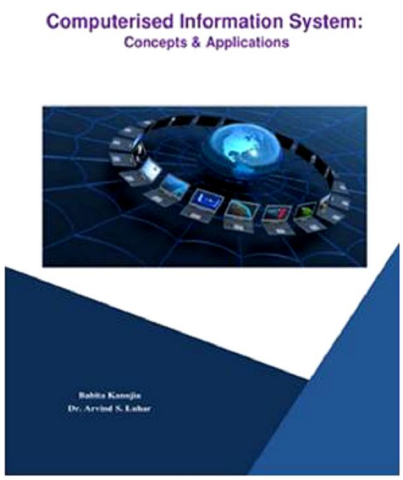
Dr. N. Lakshmi Kavitha
Mithila Satam
ISBN : 978-81-941253-1-0



Dr. Hiresh Luhar
Prof. Arti Sharma
ISBN : 978-81-941253-4-1



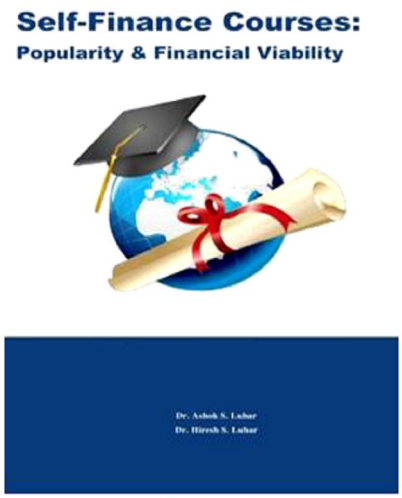
Dr. Hiresh S. Luhar
Dr. Ashok S. Luhar
ISBN : 978-81-941253-5-8



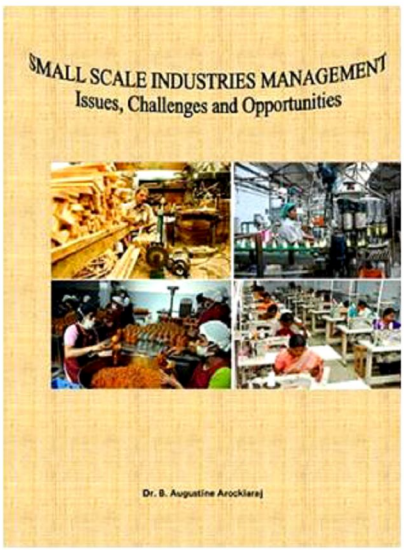
Dr. Babita Kanojia
Dr. Arvind S. Luhar
ISBN : 978-81-941253-7-2

Dr. Sw Rajamonaharane
SK Nathan
ISBN : 978-81-942475-0-0

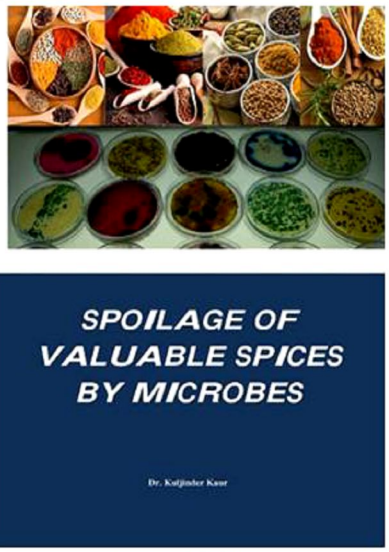
Aditi Sharma
ISBN : 978-81-941253-8-9



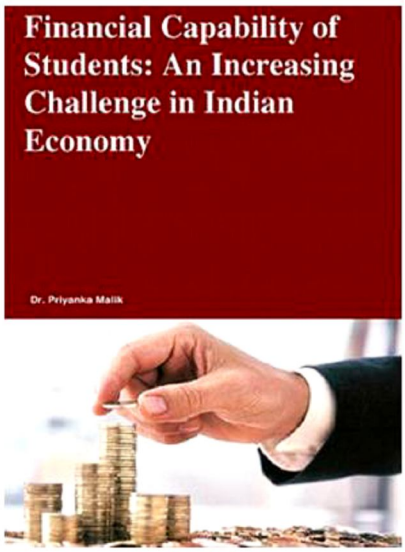
Dr. Ashok S. Luhar
Dr. Hiresh S. Luhar
ISBN : 978-81-941253-6-5



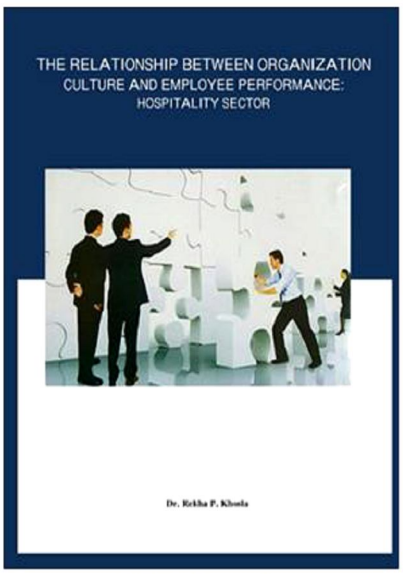
Dr. B. Augustine Arockiaraj
ISBN : 978-81-941253-9-6



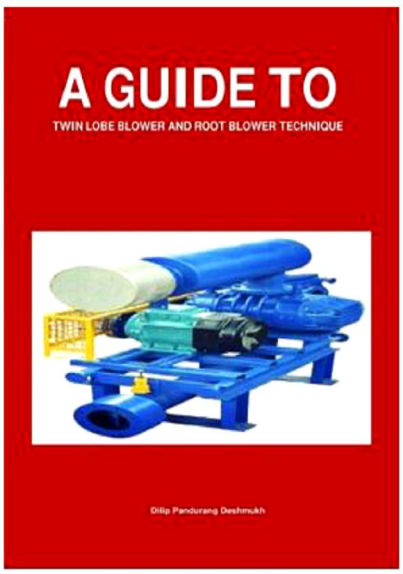
Dr. Kuljinder Kaur
ISBN : 978-81-942475-4-8



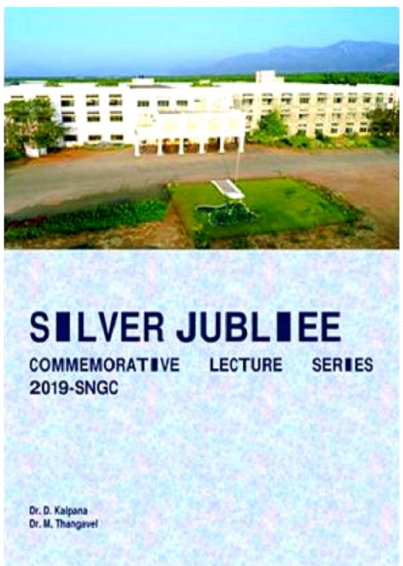
Dr. Priyanka Malik
ISBN : 978-81-942475-1-7



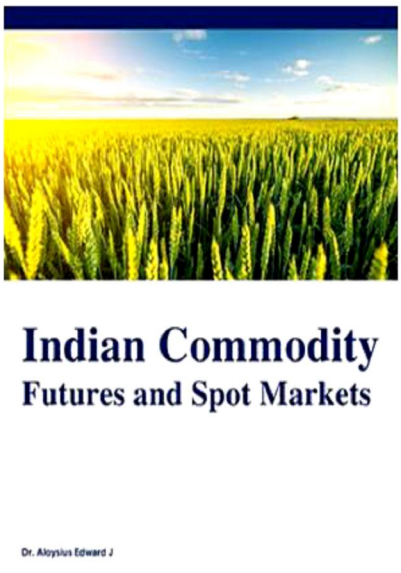
Dr. Rekha P. Khosla
ISBN : 978-81-942475-2-4



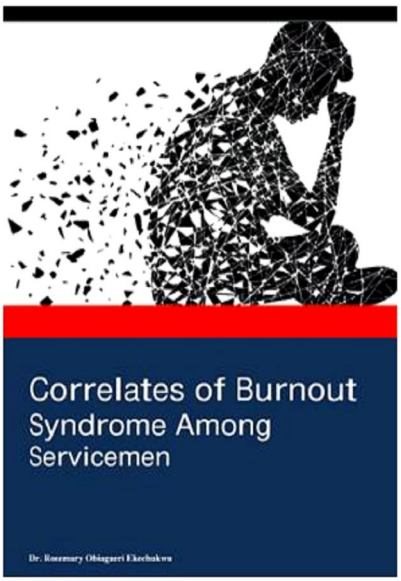
Dilip Pandurang Deshmukh
ISBN : 978-81-942475-3-1



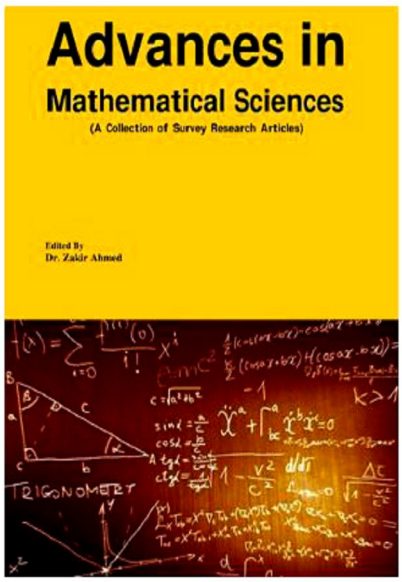
Dr. D. Kalpana, Dr. M. Thangavel
ISBN : 978-81-942475-5-5



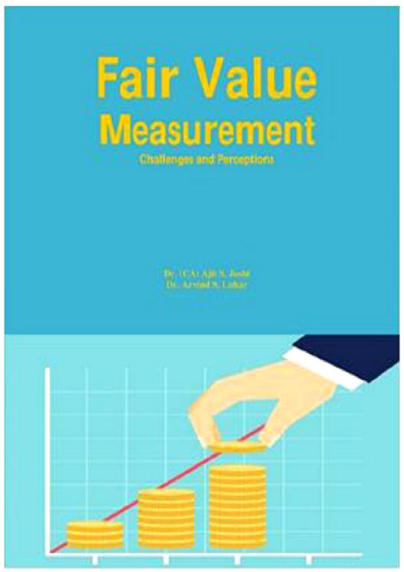
Dr. Aloysius Edward J.
ISBN : 978-81-942475-7-9



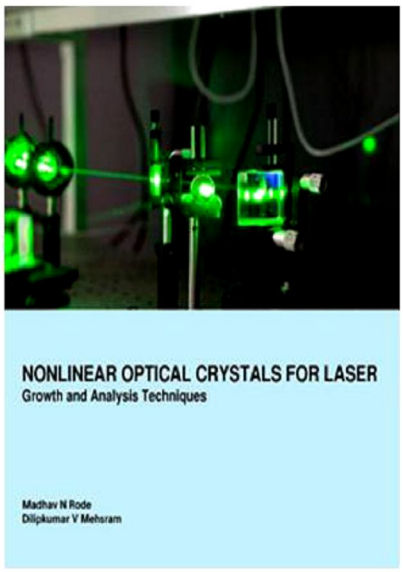
Dr. R. O. Ekechukwu
ISBN : 978-81-942475-8-6



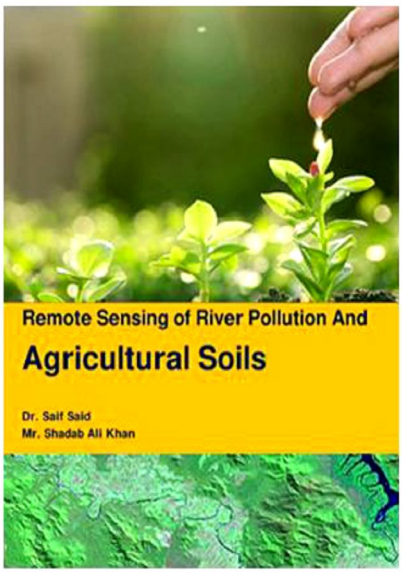
Dr. Zakir Ahmed
ISBN : 978-81-942475-9-3



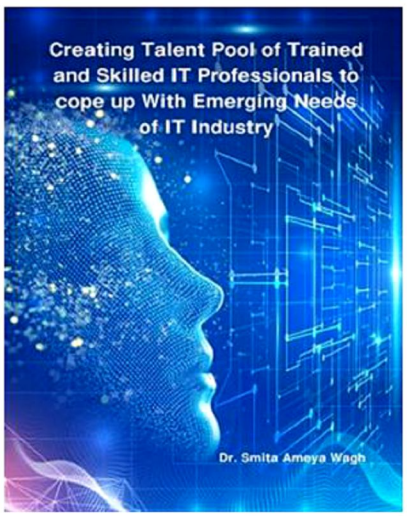
Dr. (CA) Ajit S. Joshi
Dr. Arvind S. Luhar
ISBN : 978-81-942475-6-2



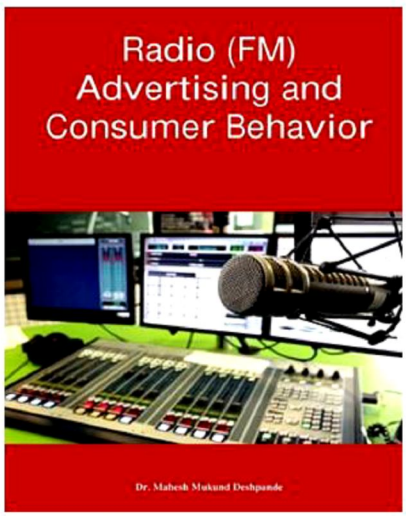
Madhav N Rode
Dilip Kumar V Mehsram
ISBN : 978-81-943209-6-8



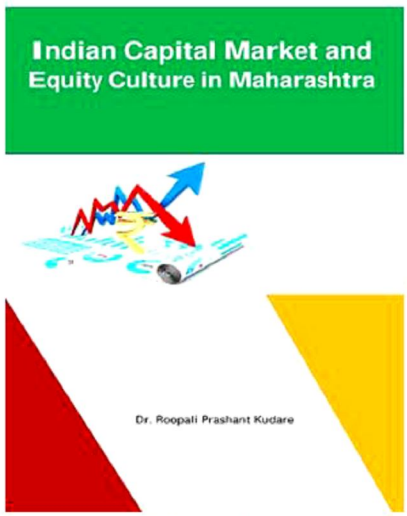
Dr. Saif Said
Shadab Ali Khan
ISBN : 978-81-943209-1-3



Dr. Smita Ameya Wagh
ISBN : 978-81-943209-9-9

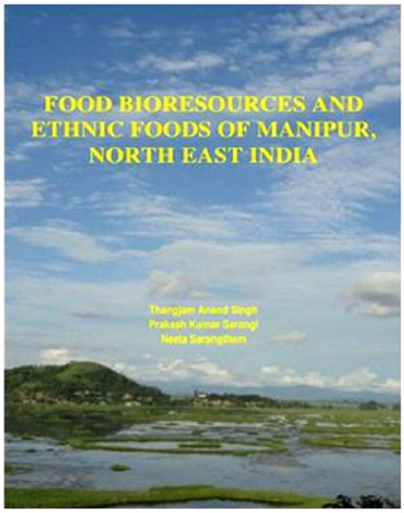


Dr. Mahesh Mukund Deshpande
ISBN : 978-81-943209-7-5

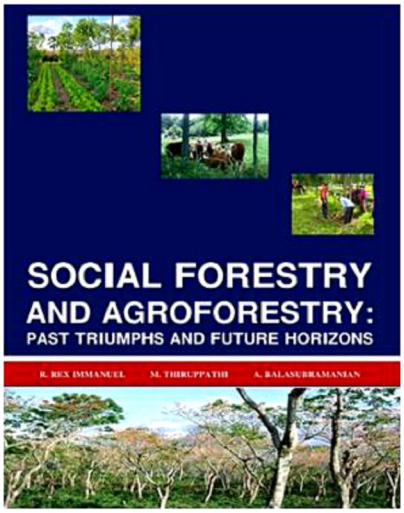


Dr. Roopali Prashant Kudare
ISBN : 978-81-943209-3-7

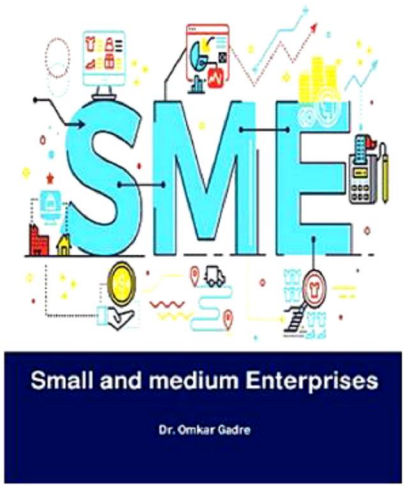
M. Thiruppathi
R. Rex Immanuel
K. Arivukkarasu
ISBN : 978-81-930928-9-7



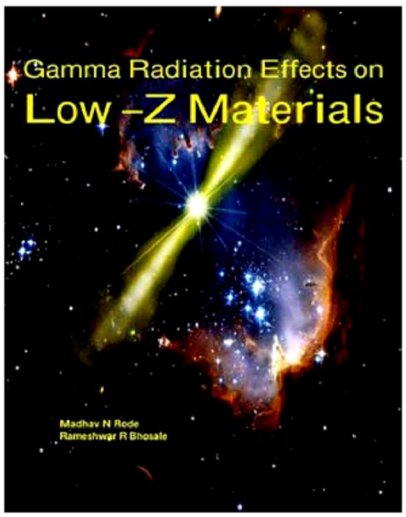
Dr. Th. Anand Singh
Dr. Prakash K. Sarangi
Dr. Neeta Sarangthem
ISBN : 978-81-944069-0-7



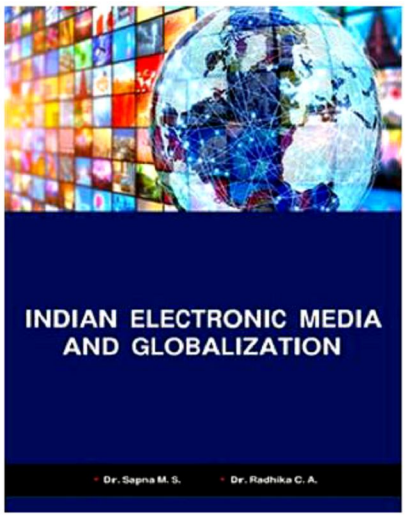
R. Rex Immanuel
M. Thiruppathi
A. Balasubramanian
ISBN : 978-81-943209-4-4



Dr. Omkar V. Gadre
ISBN : 978-81-943209-8-2

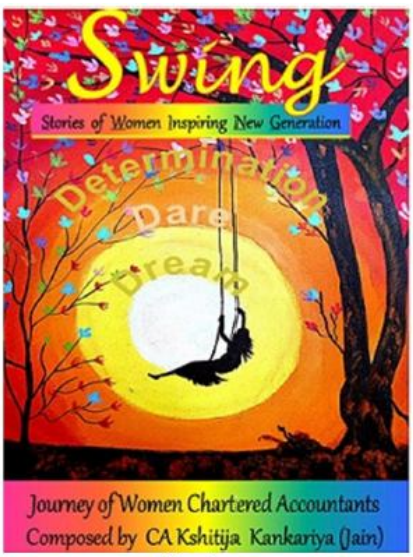


Madhav N Rode
Rameshwar R. Bhosale
ISBN : 978-81-943209-5-1

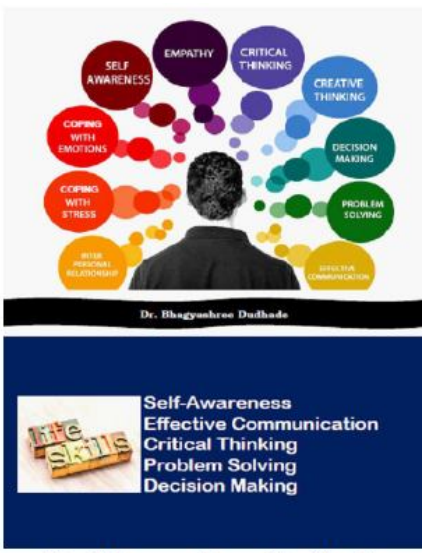


Dr. Sapna M S
Dr. Radhika C A
ISBN : 978-81-943209-0-6

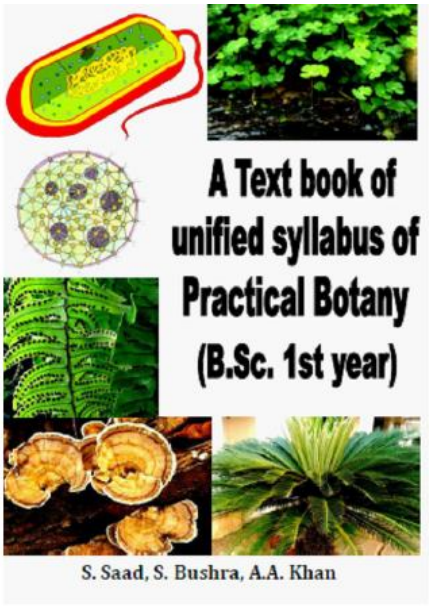
Hindusthan College
ISBN : 978-81-944813-8-6



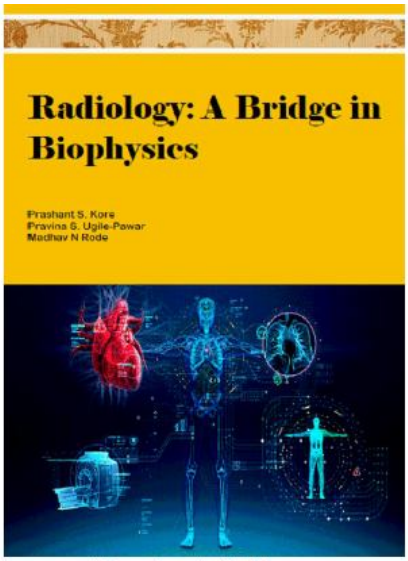
Swing
ISSN: 978-81-944813-9-3



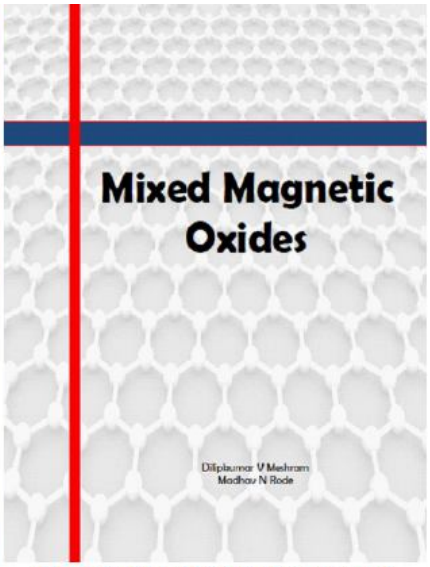
Dr. Bhagyashree Dudhade
ISBN : 978-81-944069-5-2



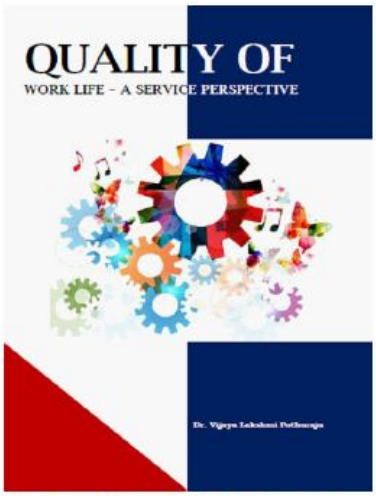
S. Saad, S. Bushra, A. A. Khan
ISBN: 978-81-944069-9-0



Prashant S. Kore
Pravina S. Ugile-Pawar
Madhav N Rode
ISSN: 978-81-944069-7-6



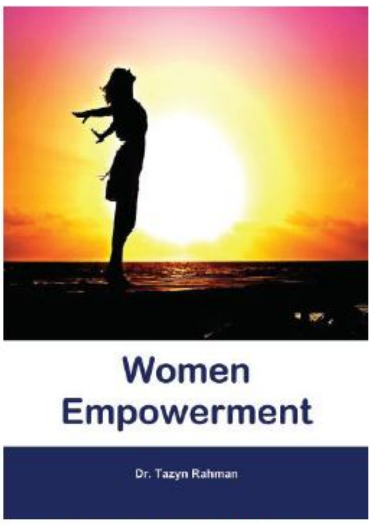
Dilipkumar V Meshram and
Madhav N Rode
ISSN: 978-81-944069-6-9



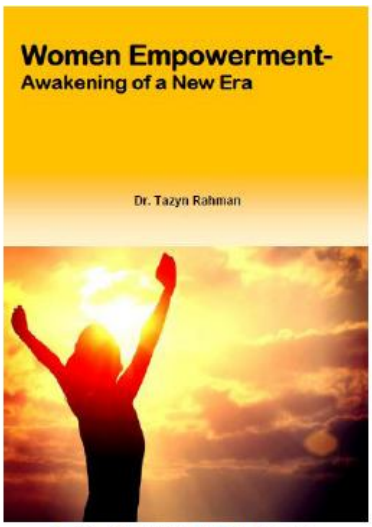
Dr. Vijaya Lakshmi Pothuraju
ISBN : 978-81-943209-2-0

Pratibha College
ISBN : 978-81-944813-2-4

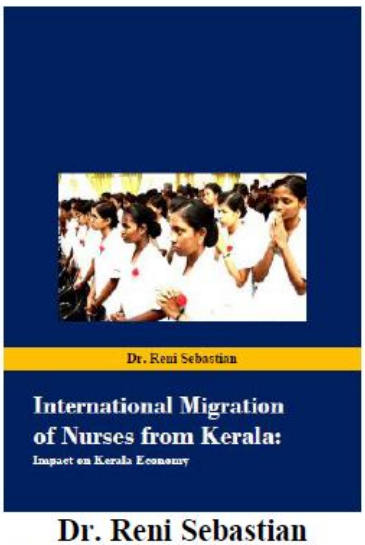
Pratibha College
ISBN : 978-81-944813-3-1



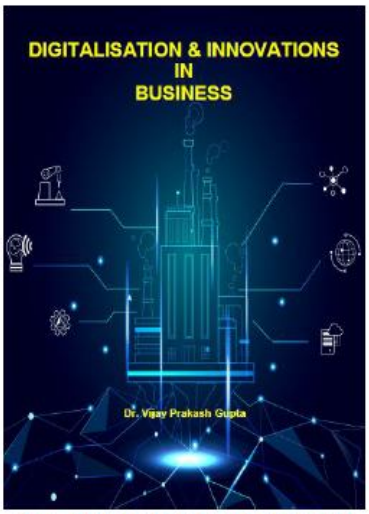
Dr. Tazyn Rahman
ISBN : 978-81-936264-1-2



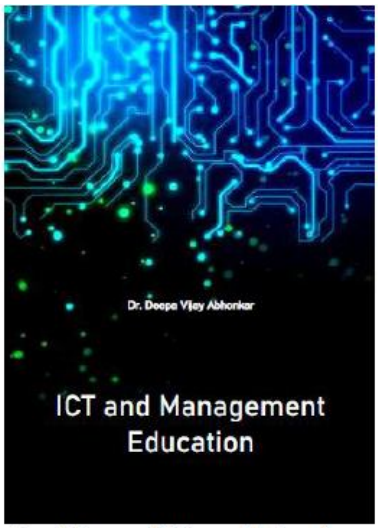
Dr. Tazyn Rahman
ISBN : 978-81-944813-5-5



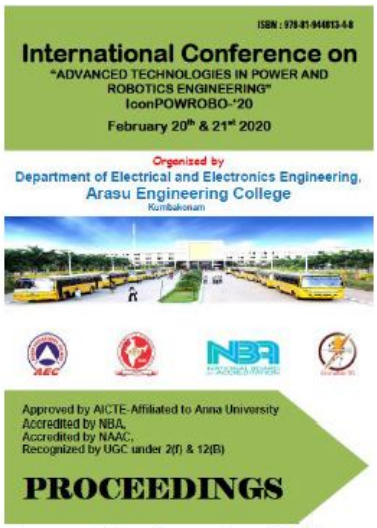
Dr. Reni Sebastian
ISBN : 978-81-944069-2-1



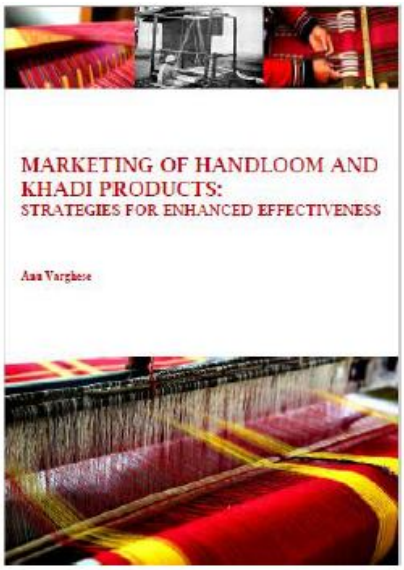
Dr. Vijay Prakash Gupta
ISBN : 978-81-944813-1-7



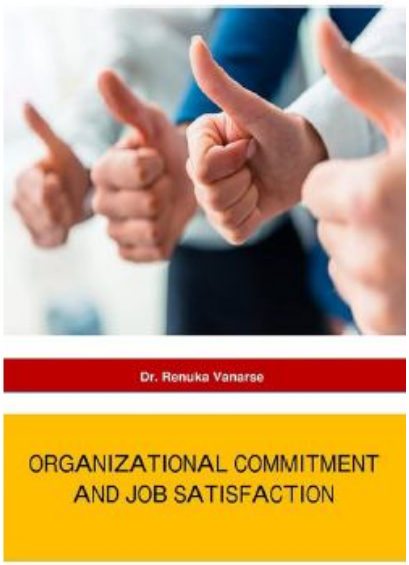
Dr. Deepa Vijay Abhonkar
ISBN : 978-81-944813-6-2



Arasu Engineering College
ISSN: 978-81-944813-4-8



Dr. Anu Varghese
ISBN : 978-81-944069-4-5



Dr. Renuka Vanarse
ISBN : 978-81-944069-1-4

Indian Academicians and Researchers Association
www.iaraedu.com