

## GREEN SYNTHESIS OF SILVER NANOPARTICLES USING AZADIRACHTA INDICA LEAVES EXTRACT AND CHARACTERIZATION BY UV

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### ABSTRACT

The synthesis of Silver nanoparticles using a plant – mediated approach is presented in this paper. Present Work focus on synthesis of Silver nanoparticle by Azadirachta Indica through green Method. Green Synthesis Method is non toxic and ecofriendly. In this work the precursor material was Silver Nitrate ( $AgNO_3$ ) and Azadirachta Indica. The Particles obtained were characterized by UV Visible Spectroscopy for to analyse the absorption pattern.

**Keywords:** Silver nanoparticles, Azadirachta Indica leaves extract, UV-Vis Spectroscopy, Antibacterial activity.

### Introduction

Green synthesis techniques make use of moderately pollutant free chemicals to synthesis nanoparticles and embrace the use of mild solvents such as water, natural extracts Among the various noble metals, silver is preferred as a nanoparticle because of its antibacterial catalytic properties and their nontoxicity towards human in comparison to other metals.

### Plant description

Family name : Meliaceae  
Botanical name : Azadirachta Indica  
Common name : Neem  
Plant part taken : Leaves

We can used different careful way for the putting together of Silver Nanoparticle. Which can be either biological ,physical, chemical methods . Earlier methods used for the putting together of silver nano-particles were deadly , full of poison and dangerous chemicals were used for chemical synthesis. Thus the use of nature friendly processes, for the synthesis of silver nano-particles is experienced as “Green synthesis”. Green synthesis is supported over common synthesis because it is eco-friendly, good price, one-step careful way that can be easily scaled up for greatly sized scale synthesis and does not have need of high force over a given square unit, temperature, power for a given time and deadly, full of poison chemicals.

Many researchers have reported the use of materials such as plant leaf extract, root, stem,

bark, leaf, fruit, bud and latex , fungi ,bacteria and enzymes for the synthesis of silver nanoparticle. [1] A lot work has been done on green synthesis of silver Nano-particles using microorganisms including bacteria, fungi and plants because of their antioxidant properties capable of reducing metal compounds in their respective nanoparticle. For the stabilization of silver nanoparticles taken plant extracts to produce best capping material .

The present work try to use the leaf extract of Azadirachta Indica (commonly known as neem) a member of the Meliaceae family used for the green synthesis of silver nanoparticles. Neem is a medical plant and is used for the process bacterial, fungal, viral and many types of skin diseases since old times. The aqueous neem extract is used in the synthesis of different nanoparticles such as gold, zinc oxide, silver and so on. Terpenoids and flavanones are the two important phytochemicals present in neem which play a vital part in making fix the nanoparticle and also act as capping and reducing agent . Aqueous neem leaf extract reduces silver salt to silver nitrate. This capped nanoparticle with neem extract give signs of antibacterial activity.

Azadirachta Indica plant is commonly ready in India and each part of this tree has been used as a family house way of putting things right against different to do with man diease from days long past and for treatment against viral, bacterial and fungal infections. Silver nanoparticles can be produced at low strong amount of leaf extract without using any

addition of damaging chemical / physical ways of doing. The effect of strong amount of metal ions and getting together of leaf extract amount were also valued to make the most out of way to putting together silver nanoparticle. The careful way applied here is simple, price effective, easy to act and able to keep going. The biomedical application of silver nanoparticle can be effective by the use of biologically synthesized nanoparticles which minimize the factors such as toxicity, cost and are found to be exceptionally stable. The selecting cancer units using silver nanoparticles has made certain to be working well.[3-4]

### Experimental Method and Materials Apparatus

Beaker, Burning stand, conical flask, pipette, ring stand, funnel, Burette, ring stand, bushel burner.

### Material

silver Nitrate ( $\text{AgNO}_3$ ), Plant Extract

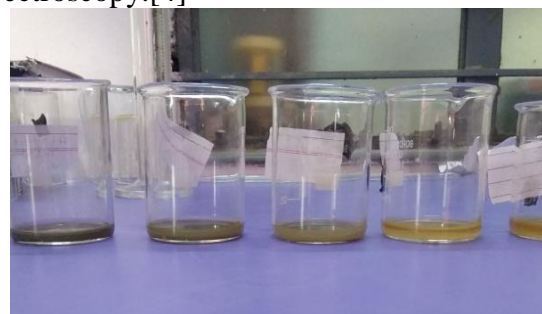
### Preparation Of Leaf Extract

Azadirachta Indica leaf extract was used to prepare silver nanoparticles on the basis of cost effectiveness, ease of availability and its medicinal property. Fresh leaves were collected from college campus. They were surface cleaned with running tap water to remove debris and other contaminated organic contents, followed by double distilled water and air dried at room temperature.[4] 20g of finely chopped Neem leaves were added to 100ml double-distilled water and boiled 30min. The extract was cooled down and filtered with Whatman filter paper and store for further use. This solution was used for green synthesis of silver nanoparticle (AgNP) or reducing the silver ions.[1]



### Green Synthesis Of Silver Nanoparticles

Silver nitrate GR used as such 100ml, 1mM solution of silver nitrate was prepared in an Erlenmeyer flask. Then 1,2,3,4 and 5ml of plant extract was added separate to 5mL of silver nitrates solution keeping its concentration at  $\text{AgNO}_3$  (1mM-5mM) keeping extract concentration constant(1mL).[4] This setup was incubated in dark chamber to minimize photo-activation of silver nitrate at room temperature. The colour change from colorless to brown in colour confirms the reduction of silver ions.[1] Its formation was also confirmed by using UV-Visible spectroscopy.[4]

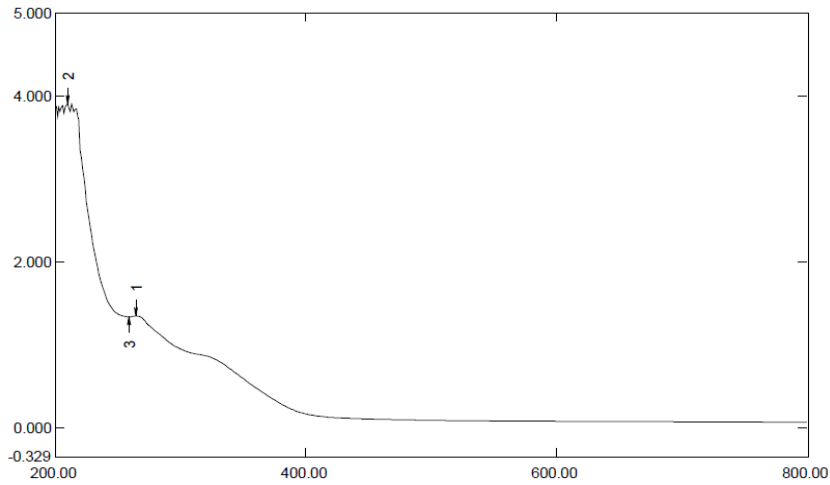


**Result and Discussion:**

**a) UV –Vis Spectroscopy:**

**Sample S1 –**

As it can be seen from the graph for S1.(1ml plant extract + 5 ml silver nanoparticle) at 259 nm wavelength absorbance was recorded at 1.3 , at 264 nm the wavelength absorbance was recorded at 1.3 .

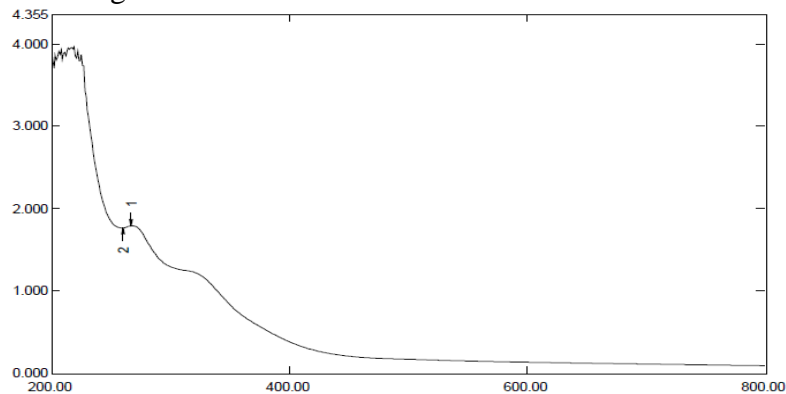


UV Visible Spectra Analysis Sample 1

No.	P/V	Wavelength	Abs.	Description
1	⬆	264.00	1.355	
2	⬆	210.00	3.916	
3	⬇	259.00	1.344	

**Sample S2 –**

As it can be seen from the graph for S2( 2ml plant extract + 5 ml silver nanoparticle) at 260 nm and 267 nm the wavelength absorbance was recorded at 1.7 .

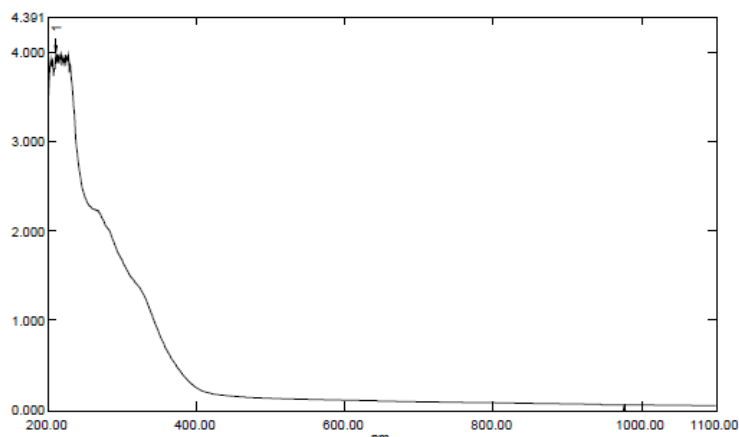


UV Visible Spectra Analysis Sample 2

No.	P/V	Wavelength	Abs.	Description
1	⬆	267.00	1.790	
2	⬇	260.00	1.763	

**Sample S3 –**

As it can be seen from the graph for S3 (3ml plant extract + 5ml silver nanoparticle)at 977 nm wavelength absorbance was recorded 0.05

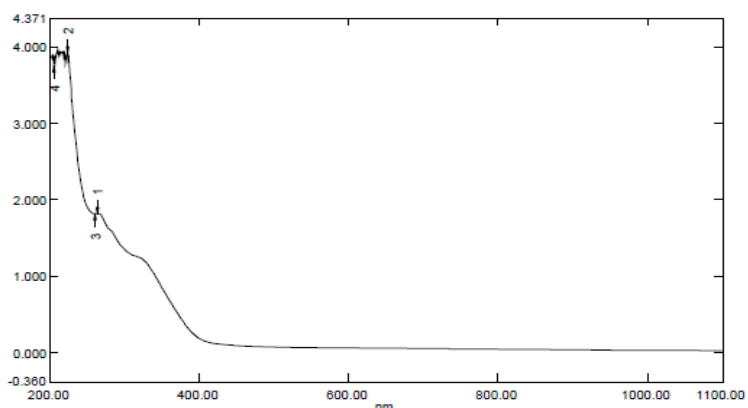


UV Visible Spectra Analysis Sample 3

No.	P/V	Wavelength	Abs.	Description
1	↑	210.00	3.995	
2	↓	977.00	0.053	

**Sample S4 –**

As it can be seen from the graph for S4 (4 ml plant extract + 5 ml silver nanoparticle) at 260 nm the wavelength absorbance was recorded at 1.8 .



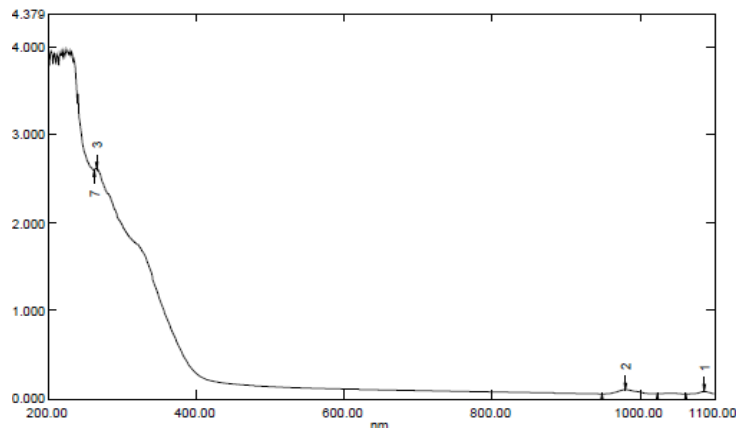
UV Visible Spectra Analysis Sample 4

No.	P/V	Wavelength	Abs.	Description
1	↑	263.00	1.827	
2	↑	223.00	3.919	
3	↓	260.00	1.819	
4	↓	205.00	3.753	

**Sample S5-**

As it can be seen from the graph for S5 ( 5 ml plant extract + 5 ml silver nanoparticle) at 261 nm the wavelength absorbance at 2.6 and at 265 nm the wavelength absorbance at 2.6 . Bio reduction of silver ions into AgNP after addition of aqueous Neem extract was confirmed with change in color. Initially, after addition of aqueous neem extract, the color change was pale yellow with the increase in incubation time the color changed from pale yellow to light brown and after 24h. Incubation it was deep brown in color slight variation in

the peak absorbance was observed which might be due to variation in particle size. The brown color was due to the excitation of the surface Plasmon resonance (SPR), very much a characteristic property of silver nanoparticle. The flavonoids and terpenoids present in neem extract act like natural reducing agents which are responsible for reducing silver salts to silver nanoparticle. A complete colour change was seen within 1h of incubation after which no color change was seen which indicates that all the silver salts are completely reduced to AgNP.



UV Visible Spectra Analysis Sample 5

No.	P/V	Wavelength	Abs.	Description
1	↑	1087.00	0.072	
2	↑	980.00	0.095	
3	↑	265.00	2.623	
4	↓	1081.00	0.047	
5	↓	1024.00	0.049	
6	↓	948.00	0.047	
7	↓	261.00	2.603	

**Conclusion**

The present work is one of the most simple and thrifty methods for the green synthesis of silver nanoparticles from Azadirachta Indica leaves. This eco-friendly method could be a competitive alternative to the conventional physical/chemical methods used for synthesis

of silver nanoparticles and thus has a potential to use in biomedical applications and will play an important role in opto-electronics and medical devices in near future. Lower ratio of plant extract is best for the synthesis of silver nano-particle.

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## SYNTHESIS AND CHARACTERIZATION OF ZNO NANOPARTICLES BY GREEN SYNTHESIS METHOD

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### ABSTRACT

*In this paper, the synthesis of zinc oxide nanoparticles using a plant-based approach is presented. This work focuses on the synthesis of ZnO nanoparticles by Calotropis gigantea leaves using the green method. This method is non-toxic and ecological. In this work, the precursor material was zinc nitrate [ZnO<sub>3</sub>] and leaves of Calotropis gigantea. The particles thus obtained were characterized by various analytical techniques. X-ray diffractometer (XRD) to calculate the average crystal size, particle size analyzer for average particle size, UV visible spectroscopy to analyze absorption patterns, Fourier transform infrared spectroscopy (FTIR) is used to analyze the functional group involved in the reaction.*

**Keywords:** green synthesis, ZnO, Calotropis Gigantea, FTIR, UV-visible spectroscopy

### Introduction

Nanotechnology is a rapidly developing field of science that has been of interest to researchers especially since the early 1990s. Nanoparticles remain the most important part of creating any nanostructure. [1-2]

Nanoparticles or ultrafine particles are usually defined as particles of matter between 1 and 100 nanometers (nm) in diameter. In the lowest range, metal particles smaller than 1 nm are usually called aggregations of atoms. Nanoparticles are usually distinguished from microparticles (1-100  $\mu\text{m}$ ), "fine particles" (size between 100 and 2500 to 10,000 nm) because their smaller size drives very different physical or chemical properties, such as colloidal properties and ultrafine optical effects or electrical properties. Since they are more subject to Brownian motion, they usually do not sediment like colloidal particles, which on the contrary are usually understood to be in the range from 1 to 100 nm. Because nanoparticles are much smaller than the wavelength of visible light (400-700 nm), they cannot be seen with ordinary optical microscopes, requiring the use of electron microscopes or a laser microscope. By the same token, dispersions of nanoparticles in transparent media can be transparent, while suspensions of larger particles usually scatter some or all of the visible light incident on them. Nanoparticles also easily pass-through common filters such as conventional ceramic candles, so separation from liquids requires special nanofiltration

techniques. The powder is widely used as an additive in many materials and products including plastics, ceramics, glass cement, rubber (e.g., automobile tires), lubricants, food (source of Zn nutrients), batteries, ferrites, flame retardants, etc. ZnO is present in the earth's crust like the mineral zincite. In materials science, ZnO is often called a II-VI semiconductor because zinc and oxygen belong to the 2nd and 6th groups of the periodic table. This semiconductor has several favorable properties: strong luminescence at room temperature, good transparency, high electron mobility, wide bandgap, etc.

Calotropis gigantea plant belonging to the Asclepiadaceae family, also called Vasuka Alarka, Shwetarka, Mandara; it is distributed throughout India, dry deserts Sharma PC et al, 2008. Calotropis gigantea is a species of Calotropis native to India, Cambodia, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand and China. Various parts of the plant are used in Indian traditional medicine to treat fever, painful muscle spasms, dysentery, rheumatism, asthma, and as an expectorant and laxative. To the best of our knowledge, a biological approach using Calotropis gigantea leaf extract as both a reducing material and a surface stabilizing agent was used for the synthesis of spherical ZnO nanoparticles for the first time. The structure, phase and morphology of the synthesized product were investigated by standard characterization methods. [3-7]



## Experimental Method and Materials

### Apparatus

Beaker, Magnetic stirrer (EQUIP-TRONICS), Furness, Heater, Conical Flask, Burner.

### Materials

Zinc Nitrate ( $ZnNO_3$ ), Distilled Water, Calotropis Gigantea leaves.

### Preparation of leaf extract

Fresh leaves were collected from Calotropis Gigantea plants. The leaves were washed several times with water to take away the dust particles and then sun-dried to remove the residual moisture. The extract used for the reduction of zinc ions ( $Zn^{2+}$ ) to zinc nanoparticles ( $ZnO$ ) was got ready by placing 50 g of washed dried fine cut leaves in a 250 ml glass beaker along with 100 mL of distilled water. The solution was then boiled for 1 hour until the color of the liquid solution changed from watery to pale yellow. The extract was cooled to room temperature and made clean using filter paper. The extract was stored in a refrigerator to be used for further procedures.



### Preparation of zinc nanoparticles

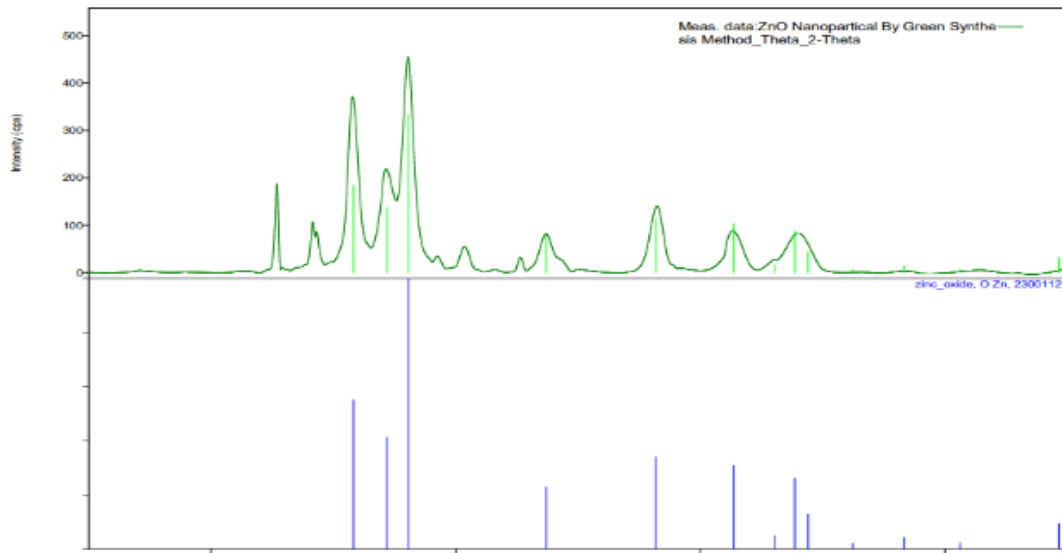
For the synthesis nanoparticle, 16 ml of Calotropis gigantea leaves extract was taken and boiled to 60-80 degrees Celsius using a stirrer-heater. 1.6 grams of Zinc Nitrate was added to the solution as the temperatures reached 60 degrees Celsius. This mixture is then boiled until reduces to a deep yellow-colored paste. This paste was then collected in a ceramic crucible and heated in an air furnace at 400 degrees Celsius for 2 hours. A light-yellow colored powder was obtained and this was carefully collected and packed for characterization purposes. The material was mashed in a mortar-pestle to get a finer nature for characterization. [3-7]



### Result and Discussion

#### A) X-Ray Diffractometer

The graph showed main peaks corresponding to  $2\theta$  values of  $31.77^\circ$ ,  $34.43^\circ$ , and  $36.26^\circ$  in the multi-plot shown in fig. The highest peak is in  $36.26^\circ$ . The location of the peaks was compared to literature values and the pressure of the zinc oxide particle was confirmed. XRD gives the crystalline nature of  $ZnO$  nanoparticles. The diffractogram shows the intensity of the diffraction angles. The spectra show the details of the crystal planes corresponding to the lattice plane (100), (002), (101), (110)

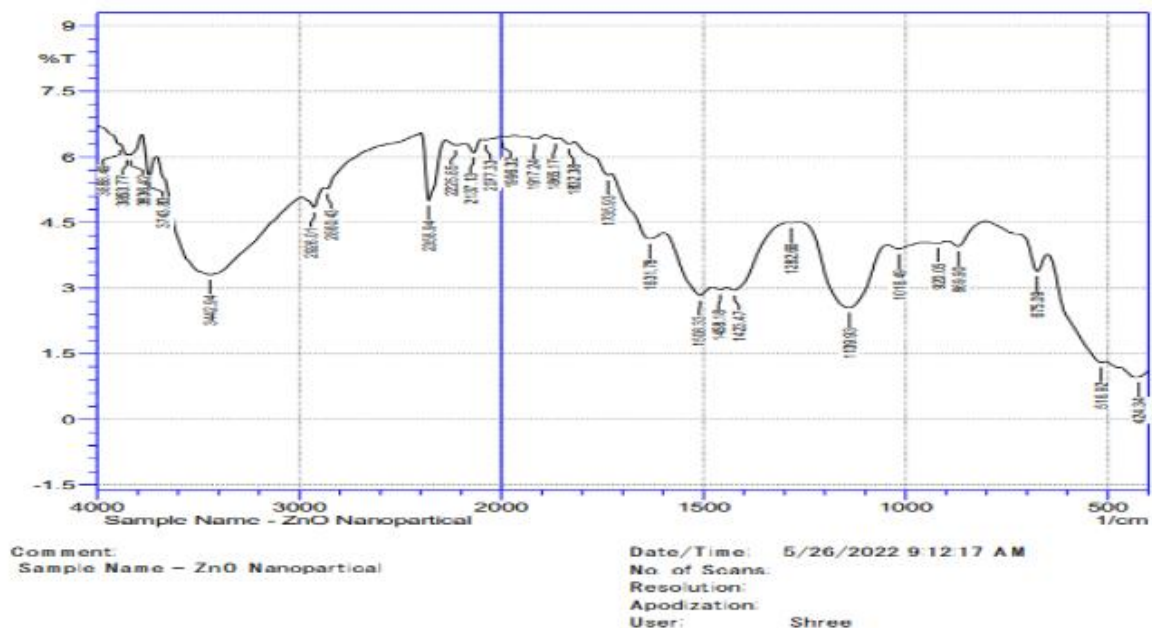


**XRD Patterns of ZnO Nanoparticles**

**B) FT-IR Analysis**

FTIR spectroscopy gives the information about composition and formation of functional groups of the synthesized ZnO nanoparticles. It also suggests that the formation of ZnO nanoparticles is due to the interaction of the phenolic compounds, alkynes, terpenoids, and

flavonoids. fig. represents FT-IR spectra of the synthesized ZnO nanoparticles in the range 400-4000 cm<sup>-1</sup>. The functional groups are responsible for reducing zinc ions to ZnO, which have been observed as bands. Each of the bands corresponds to various stretching modes.



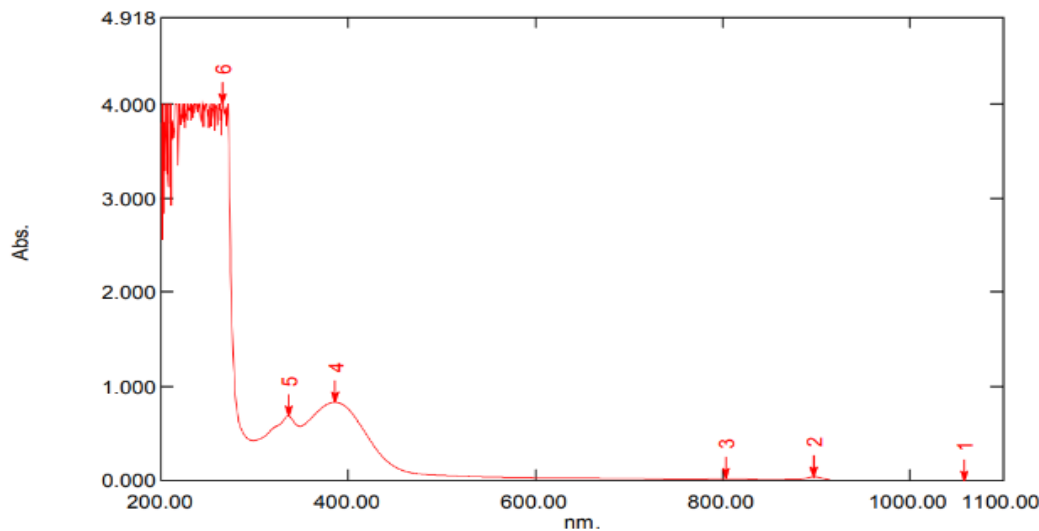
**FT-IR Analysis**

**C) UV Visible Spectroscopy Analysis**

UV-Vis Analysis of ZnO nanoparticles from Calotropis gigantean extract. From fig., the absorption spectrum of the prepared zinc oxide nanoparticle with the absorption peak nearby is

266 nanometers. It expresses that ZnO nanoparticles exhibit excitation absorption (at 266nm) due to their huge excitation Binding energy at 37°C. The existing sharp bands of Zn colloids were perceived at 266nm.





### UV visible Spectroscopy Analysis

#### Conclusion

The rapid biological synthesis of zinc nanoparticles using leaf extract of *Calotropis gigantea* provides an environmentally friendly, simple, and efficient route for the synthesis of nanoparticles. The use of plant extracts avoids the usage of dangerous and

poisonous reducing and stabilizing agents. The synthesized nanocrystallites of ZnO are in the range of 30nm. Zinc crystalline nanoparticles can exist in ions only in the presence of strong oxidizing substances. The environmental conditions will affect the stability of nanoparticles and agglomerates formed.

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**MINOR INSECT PEST ON BANANA IN ANJAGAON SURJI REGION,  
DIST-AMARAVATI - MAHARASTRA****M.R. Yeotkar**

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**ABSTRACT**

*Banana is a globally important fruit crop with 97.5 million tons of production. In India, it supports livelihood of millions of people. Banana occupies 20% area among the total area under crop in India and contributes 37% of the total fruit production and ranks second in importance next to mango with a total annual production of 16.91 million tons from 490.70 thousand hectares with national average of 33.5 T/ha. Bananas were originally found in South East Asia, mainly in India.*

**Keywords:** Aphid, Cut worm, Banana scab moth, Thrips

**Introduction**

Banana, the fruit of a plant of the genus -Musa (family- Musaceae) is basically cultivated for food, and secondary for the production of fibers, and also for producing tissue-thin tea bags. Besides this, bananas are also cultivated for some ornamental purposes in various regions of the world. They are also known as Bananier Nain, Canbur, Curro and Plantain. These creamy, rich, and sweet fruits are favourite among the people of all ages right from infants to elders. Bananas consist mainly of sugars (glucose, fructose and sucrose) and fiber. They provide instant energy as they are the rich sources of Vitamin B6.

**Origin of Banana**

Musa species grow in a wide range of environments and plantains of the tropics to cold-hardy fiber and ornamental plants. These large, perennial herbs, 2-9 m in height, is evolved in Southeast Asia, New Guinea, and the Indian subcontinent, developing in modern time secondary loci of genetic diversity in Africa, Latin America, and the Pacific.

Musa species attained a position of central importance within pacific societies, the plant is a source of food, beverages, fermentable sugars, medicines, flavourings, cooked foods, silage, fragrance, rope, cordage, garlands, shelter, clothing, smoking material and numerous ceremonial and religious use.

Banana (Musa) is the one of the major fruits in Thailand. It is a fast-growing. plant with a 3-5

m high herbaceous stem and almost every part of it is usable. It is the main plant for fruit production in Phitsanulok province where many people have their own family industry for banana products. Therefore, every year this province has a problem of banana waste, especially banana peel. The proportion of the banana which is wasted as peel is 18-20 % (Dividich et al., 1976).

**Objective**

Viral diseases-Banana bunchy top virus is also known Banana virus, cucumber mosaic virus. Fungal diseases-Panama disease, Singatoka diseases caused by fungus: *Mycosphearellamusicola*, Black Sigatoka. Insect pest-Banana stem weevil, banana pseudo stem borer, *Odoiporus longicollis*, Oliver, banana rust thrips, Fruit rust thrips, Hard scale-*Aspidiotus destructor*, Cut worm. Nematodes have been growth and yield through its damage to the roots and corm. The parasitic nematodes feed, multiply and migrate to roots.

**Material and Method**

There are different types of methods are available for collecting banana pest like pitfall trap method, handpick methods, light trap method, net swapping method, above methods are used for the collection of the banana pest.

In this survey used the hand-pick methods for the collection of banana pest, firstly selected a specific agricultural land for the collection of banana pest, this agricultural land is in Amravati district in Pandhari village. This

agricultural land visited monitoring regularly for the collection, near about 20 to 30 different types of pest collected and preserved in 70% alcohol. Later took photographs of each and every pest for their identification.

The specific field which were selected for the collection of pest is of 4 hectares. On these agricultural there are 4000 banana trees and each row contains 100 banana trees, having distance between two trees of 2.5 feet and distance between two rows is of 5 feet respectively.

## Result & Discussion

Total 40 to 50 individuals of various groups of insects were collected from the selected banana field and stored in 70% alcohol later brought to laboratory. After sorting the minor pests are identified through available literature. Five minor banana pests are selected for the study and observed and their biology were studied. (S. Mandal and H.S. Singh)

- 1) Cut worm - Spondopteralitura
- 2) Banana Scale Moth –Nacoleiaoctasema
- 3) Hard scale - Aspidiotus destructor
- 4) Thrips –chaetanaphothripssignipennis
- 5) Bag Worm -Apteronahelicoidella

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**ANALYSIS OF SOIL PROPERTIES AND NUTRIENTS OF THE SOIL SAMPLES FROM AGRICULTURE LAND OF JAWALA VILLAGE, DIST YAVATMAL****Awate P.J. and Bhokare P.R.\***

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**ABSTRACT**

The present study objectively conducted to analysis the soil properties and nutrients of the soil sample agriculture land of Jawala village. The study area was divided into five sampling stations to cover the whole farms of Jawala village Arni tehsil comprehensively in the November 2021. The physico-chemical parameters were observed Moisture, pH, EC, Carbon, Calcium carbonate, TDS, Magnesium, Calcium, Nitrogen, Copper, Potassium and Phosphorous content, were analyzed during the study. The study revealed that the pH of the soil samples ranged from 7.08 to 8.50 and was on slightly alkaline side but within the limit of 6.5-8.5 which is optimum for crops. EC values ranged from 0.4ms to 0.8ms. and indicating low salinity status of the soils. OC content ranged from 1.27% to 1.60% and all the samples were of medium rating. Available nitrogen ranged from 247 kg/ha to 297kg/ha; available phosphorous ranged from 19.0kg/ha to 25.0 kg/ha and samples were nitrogen and phosphorous deficient. Potassium ranged from 442 kg/ha to 640 kg/ha and samples were of medium rating except one sample of high rating with respect to potassium.

**Keywords:** Physico-chemical parameters, Jawala village, Soil quality.

**Introduction**

Soil analysis is well recognized as a sound scientific tool to assess the status of available micronutrients in soils and their relationship with various physico-chemical properties. Considerable research work has been done regarding the study of Nutrients and Physico-Chemical assessment of various types of soil in Maharashtra as well as in India have been attempted by several investigators. Kumar M. (2011), Nazif, et.al. (2016), Methur R. et.al. (2011) reported soil analysis and its environmental impact on Nanded city of Maharashtra State. Khadke P.A. et.al. (2013), The status of micronutrients in soils district Bhimber and their relationship with various physico-chemical properties were investigated by Wajahat Nazif, et.al. (2006).

Soil fertility and productivity are the key pillars for food production and soil quality is of equal significance in the background of soil degradation caused by many factors. Crop growth is influenced by aerial and soil environment. Suitable environment is necessary for better germination, growth and yield of crops.

The higher nutrient availability is favourable when soil has higher water holding capacity, proper aeration and less soil strength or mechanical resistance. The six elements

nitrogen, phosphorous, potassium, magnesium, calcium and sulphur which are required in large quantities are labeled as macronutrients. Most of the soils supply enough calcium, magnesium and sulphur and soil scientists called these elements as secondary nutrient elements. The other three elements nitrogen, phosphorous and potassium are called as primary nutrients and are not usually available in large amounts which is enough for best growth and therefore are added through fertilization. Considerable research work has been done regarding the study of Nutrients and Physico-Chemical assessment of various types of soil in Maharashtra as well as in India. A.A. Patil et.al. (2013), R.P. Ganorkar et.al. (2013), R.P. Ganorkar et.al. (2014), Keeping these points in view, investigation was carried out to analysis of status of soil samples of Jawala village in Arni Tahsil of Yavatmal district in Maharashtra, India.

**Material and Methods****Study Area**

Jawala is a village in Arni Tahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha region Yavatmal Division, This area is well known for cotton and soyabean. The sources of water for this area is of well and tube well.

**Sample Collection**

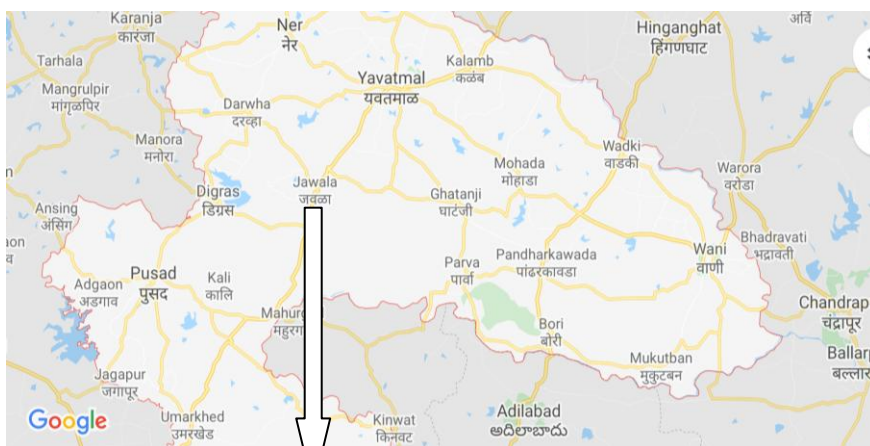
Five samples were collected from the study area (farmers field) in the month of November 2021. Soil samples were collected randomly at 0 to 15 cm and 15 to 30 cm depths with five plots, five samples from each plot respectively, in well sterilized polythene pouches. Soil sample were collected from following Farmers fields-

1. Sample-1 was collected from Mr. Prakashrao Dhakulkar’s field.
2. Sample-2 was collected from Mr. Ullas Prakash Jadhav’s field.
3. Sample-3 was collected from Mr. Chandrakant Gabhane’s field.
4. Sample-4 was collected from Mr. Sanjay Gaddamwar’s field.

5. Sample-5 was collected from Mr. Tarachand Jadhao’s field.

**Physicochemical Analysis of Soil Samples**

The soil sample were dried for about 24 hrs. and grinded more finely. Methods use for estimation of various parameters is as fallows, like Determination of Moisture was by Weighting Method, pH by Digital pH Meter, EC by Conductometer, OC, Ca, N,P,CaCo3 by Titration Method, Determination of Mg was done by EDTA Titration Method. Determination of TDS estimated by TDS meter, Determination of Pottasium (K) by Flame Photometry. Determination of Colour Of Soil, by Viewing soil.



- S-1:-Sample
- S-2:-Sample 2
- S-3:-Sample 3
- S-4:-Sample 4
- S-5:-Sample5

Figure1:-Map of Study area Jawala,Arni Tehasil

**Result and Discussion**

**Colour of Soil**

The soil sample S1 are Brown, sample S3 are Reddish Brown and S2,S4,S5, was Faint Black in colour.

**TDS**

The percentage of TDS in soil samples ranges from 115-220.It was observed in sequence S3<S4<S1<S5<S2.

**Moisture**

Value of moisture contain ranges from 1.6% - 10 %.The result shows that the moisture of sample S1 is less as compared to other samples.

**pH**

The range of pH is found in between 7.80 – 8.50. The sample S4,S5 is slightly alkaline sample as compare to S1,S2,S3 soil sample which is medium alkaline.

**Organic Carbon**

Organic carbon were recorded in the range of 1.27 – 1.60 %.The soil sample S1,S4 has high percentage of organic carbon sample S2,S5 have moderate and sample S3 has less organic carbon.

**Nitrogen**

Nitrogen content in the soil ranged from 247-297 kg/hect. The sample S5 have high nitrogen content as compared to other sample.

**Phosphorous**

Phosphorous content in the soil sample ranged between 19.0- 25.0 kg/hect. The soil sample S3,S5 has

more phosphorous content as compared to sample S1,S2 and S4.

**Potassium**

Potassium content in the soil sample ranged between 442 – 640 kg/hect. The soil sample S2 and S5

have more potassium content as compared to sample S3,S1 & S4 .

**Magnesium**

The Magnesium content in the soil sample ranged from 0.840 – 0.893 %. It is seen in sequence S1<S2<S3<S5<S4.

**Electric Conductance**

The Electric Conductance values varies from 0.4 – 0.8 ms . It is seen that soil sample S3 have less amount of

Electric Conductance as compared to sample S1,S2,S4,S5.

**Calcium**

The Calcium content in soil sample ranges from 0.08 - 0.18 %. The soil sample S4,S5 has high percentage of calcium ,sample S3 have moderate and samples S1,S2 has less calcium content.

**Alkalinity**

The Alkalinity was observed in the range between 533.5–1164 mg/lit. and it is in the range S5>S4>S2>S1>S3.

**Calcium Carbonate**

The Calcium Carbonate content in soil samples ranges from 5.25-7.25 %.It is seen that soil sample S1,S4 have less amount of Calcium Carbonate as compared to soil samples S2,S3 and S5 .

**Conclusion**

The physico chemical analysis of soil provides necessary information to set the target of nutrient application. The soil samples are slightly alkaline.and the pH is in S3<S2<S1<S5<S4 order hence the Suggestion the use of compost manure, In the soil sample S1 and S2 the magnesium is less. In the soil sample S2andS4 phosphorous is less as compare to other sample. In the soil sample S1, S4 and S5 the organic carbon is approximate high and nitrogen is approximate high.

Table 1 : Physico chemicals parameters of soil samples.

S. No.	Parameters	S1	S2	S3	S4	S5
1	Colour	Brown	Faint Black	Reddish Brown	Faint Black	Faint Black
2	TDS (mg/L)	168	220	115	162	197
3	Moisture (%)	1.6	7	10	2.6	2.6
4	pH.	7.90	7.80	8.20	8.50	8.40
5	Organic Carbon (%)	1.60	1.44	1.27	1.60	1.55
6	Nitrogen (kg/hect)	271	247	250	256	297
7	Phosphorous(kg/hect)	21.5	19.0	25	20.0	22.5
8	Potassium (kg/hect)	496	640	442	512	540
9	Magnesium (%)	0.840	0.855	0.873	0.893	0.864
10	Electro Conductance(ms)	0.5	0.8	0.4	0.6	0.7
11	Calcium (%)	0.08	0.08	0.10	0.18	0.12
12	Alkalinity(mg/L)	727.5	824.5	533.5	1018.5	1164
13	CaCO <sub>3</sub> (%)	5.25	7.25	5.60	5.25	7.25

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## IMPACT OF COVID-19 LOCKDOWN ON THE FISH MARKET OF WASHIM, MAHARASHTRA

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### ABSTRACT

Corona virus also known as Covid-19 pandemic has largely limited human activities with multiple lockdowns in several parts of the world. Fisheries and aquaculture is considered a sunrise sector in Indian economy. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is an important source of nutritious food besides being a source of foreign exchange earner. The blue economy and especially the small-scale fisheries sector in the fish catch, market and supply chain have also been affected largely due to the Covid-19 pandemic. The present study is on the Impact of Covid-19 lockdown on the fish market of Washim city of Maharashtra. As per government guidelines fish farming related activities like fish netting and harvesting, feeding stocked fishes and transportation of fish feed were permitted but due to lockdown the fish markets were closed so farmers used to sale fishes directly from their ponds and earned good profit. The study reveals that During the unlock period when markets were allowed to open only for necessary things for few hours of the day fisherman and fish farmers has witnessed record sale of fish directly from the pond at the rate of 200-240/kg. Also Rumours about poultry birds and eggs has attracted consumers to purchase fishes. In nut shell it is concluded that because of the concession and active support of Government fish farmers and fish sellers have got sale confidence of direct selling and the circumstances have given message about self-sufficiency.

**Keywords:** Fishery, Aquaculture, Covid-19 pandemic

### Introduction

The novel corona virus or popularly known as Covid-19 pandemic have brought the planet to standstill. It has largely limited human activities with multiple lockdowns in several parts of the world. It has severely shrunk the global economy in the year 2020, including India. The blue economy and especially the small-scale fisheries sector in the fish catch, market and supply chain.

The cumulative loss of global GDP in 2020-2021 due to pandemic is estimated to be around \$9 trillion. For India, despite various sustained efforts with lockdown featuring five different phases, the impact of covid-19 has shown multi-spill-over effects. According to the center for monitoring Indian Economy (CMIE), a research think tank in India, nearly 27 million youth in the age group of 20-30 years lost their jobs in April 2020. The micro, small and medium enterprises (MSMEs), as the second largest employer after agriculture, involving 110 million workforces are struggling to cope with this economic fallout. The Indian economy has already contracted by 8.9 % of GDP, as the businesses are daily

losing around \$8-16 billion. The impact of pandemic is also seen in the fisheries sector, which is important for economy as well as livelihood of Indian people.

Due to the contentment of Covid-19 pandemic in our country India, Honorable Prime Minister shri Narendraji Modi has declared janta curfew on 22 March 2020 and lockdown also declared with effect from 24 March 2020 to 14 April 2020 (21 days period) to control the spread of Covid-19. In the second phase extension of lockdown period was continued to remain prohibited from 15<sup>th</sup> April to 3<sup>rd</sup> May 2020 across the country during this period relaxation were given to agriculture and agriculture related activities were permitted with effect from 20 April 2020, which may include farming operations by farmers, sales of inputs, operations in the fisheries, plantation and animal husbandry activities.

Ichthyodiversity i.e., the diversity of fish species refers to variety of fish species, depending on context and scales, genotypes within the fish population, species of life forms within a fish community or across aqua regimes. Fishes exhibit enormous diversity of size, shape, biology and habitat. Around the



world approximately 22,000 species of fish have been recorded out of which 11% are found in India i.e., about 2500 species of which 930 lives in fresh water and 1,570 are marine. India is home to more than 10 percent of the global fish biodiversity.

India has a large spread of fresh water resources in the form of rivers, lakes, ponds, etc. The reservoirs have an area about 3 million hectares and produce 20,000 tons of fish annually. By impounding the river system, reservoirs are constructed for effective utilization of water for irrigation, power generation and flood control. Along with these primary goals these water sources can be effectively used for fish farming. Reservoirs contribute considerably to inland fish production of India which has been estimated at 93,000 tons. In spite of these facts, reservoir fish production has been treated as a byproduct, giving it less importance as a fish production system. The benefits of increased yield and income generated of fishing communities of reservoir is more equitably distributed.

Fisheries and aquaculture is considered a sunrise sector in Indian economy and it has witnessed a spectacular growth of over 1100 per cent, from 0.75 MT to 10.79 MT, during the last six decades. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is an important source of nutritious food besides being a source of foreign exchange earner.

### **Fish as a food commodity**

The nutritive and medicinal value of fish has been recognized from time immemorial. Fresh fish flesh provides an excellent source of protein for human diet. Other important constituents are fats, carbohydrates, minerals & vitamins. This protein is relatively of high digestibility, biological and growth promoting value for human consumption. Nutritional studies have proved that fish proteins rank in the same class as chicken protein and are superior to milk, beef protein and egg albumen. Fish proteins comprise all the ten essential amino acids in desirable strength for human consumption, namely, lysine, arginine,

histidine, leucine, isoleucine, valine, threonine, methionine, phenylalanine and tryptophan.

The principal biochemical contents of fish are: protein, fat and water. Protein constitutes about 20%; fat and water vary widely and one varies inversely as the other. Besides, there are minerals, vitamins and enzymes. Carbohydrates does not in the composition except as glycogen. In the liver. Water content varies from 55 to 83 per cent. The principal minerals are Ca, Mg, K, Na, P, Fe, S, Cl, Cu, Mn, I, Br. Besides, traces of Sr, Zn, Ba, Al, Pb, Mo, Co, Ni, Hg, Cd are also present. Fish provides Vitamins A, B and D-all essential vitamins for human diet.

About Washim district of Maharashtra:India is the second largest producer of fish in the world contributing to 5.6% of global fish production. India is also a major producer of fish through aquaculture & ranks second in the world after China.

Maharashtra is one of the most important states for fish production and natural resources having 87,000 sq.km. area suitable for fishing. It stands 1<sup>st</sup> in the total number of fisheries co-operatives and fish production in country. Maharashtra is having 2245 fisheries cooperative societies and 31 cooperative societies are having 2.46 lack members.

Washim district is a district of Maharashtra state in central India. The district occupies an area of 5150 sq.km. The district is bounded by Amravati, Yavatmal, Buldhana and Akola districts. Total population of Washim district is 81,771. The district is among aspirational districts and more than 90% of working population in Washim depends on agriculture and its related sectors like fisheries and animal husbandry for livelihood. It comprises of several rivers and impounded water sources with their numerous tributaries. The district is having 306 numbers of reservoirs, ponds and check dams constituting 5221 hectares of area under water with total catchment area of 4718 hectares. Traditional fisheries in numerous water bodies like village tanks, lakes, reservoirs, dams etc. of Washim is mainstay of most of fish production.

Fishery activities in Washim district are mostly performed at reservoirs, check dams and main rivers.

Main rivers: Painganga, Arunavati, Adan, Pus, Katepurna and Bewla

Reservoirs, check dam and main dams:Ekburji dam, Savargoan dam, Borala dam, Tornala dam, Supkhela dam, Khandala dam, Dhumka dam and Nagthana dam

Fishing communities:Koli, Dhiwar and Bhoi

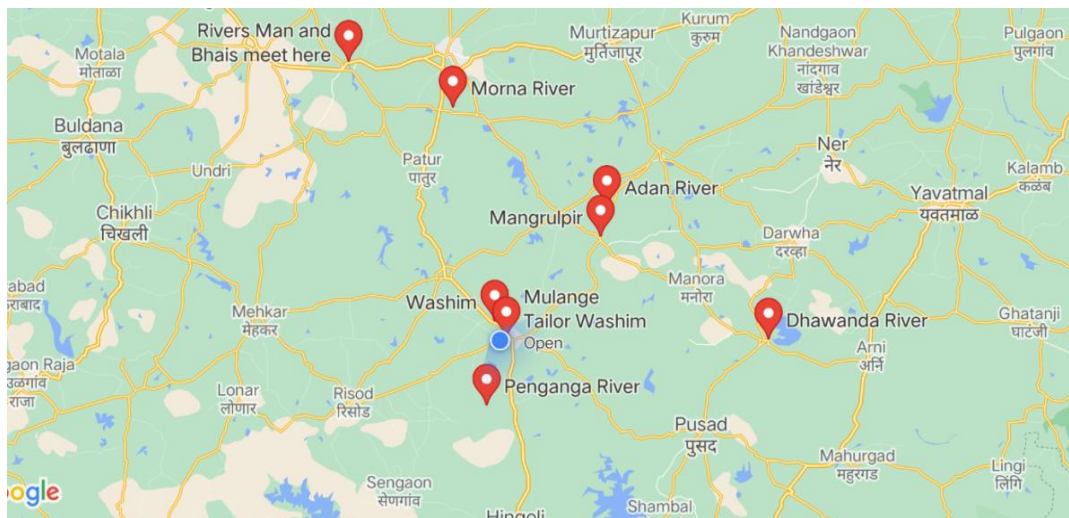
(In addition to these communities, local Muslims also do fish farming, capturing and selling)

Species of fishes found in Washim district:

There is total 22 species of fishes belonging to 06 orders, 11 families and 19 genera found in Washim district in above mentioned fresh water reservoirs. Cypriniforms such as *Labeorohita*, *Catlacatla*, *Cirrhinusmrigala*, *Cyprinus carpio*, *Labeoboggut*, *Garramullya*, *Puntius sophore**Cirrhinusreba*, *Rasbora daniconius**Salmostoma sp.* is most abundant.



Map 1: The map of Washim dist.



Map 2: The map of Rivers in Washim district



Map 3: Map of Dams in Washim district

### Review of Literature

Many studies are already been carried out by different workers on many reservoirs of Maharashtra some of which includes, The diversity of fresh water fishes from Washim district of Maharashtra and observed 22 species of fishes belonging to 06 orders, 11 families and 19 genera from the study area was studied by A.G. Thakare. The checklist of Ichthyological fauna of Washim district and total 36 species belonging to 11 families were recorded by Gulhane R.A.

Fishery status of upper Morna reservoir, Medshi (M.S.) in which six culturable species i.e., *Catla catla*, *Labeo rohita*, *Cirrhina mrigala* and *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix* and *Cyprinus corpio*, seven predatory fishes i.e., *Wallago attu*, *Mastocembalus armatus*, *Mystusseenghala*, *Ophiocephalus gachua*, *Ophiocephalus striatus*, *Ompok bimaculatus*, and *Notopterus chitala* and six weed species i.e., *Tilapia mossambica*, *Puntius sophore*, *Cirrhinus reba*, *Rasbora rasbora*, *Rasbora doniconius* and *Parambasisranga* were recorded by Tayde S.N., et.al. D.S. and Khade R.N.

Fish diversity in relation to Aquaculture in Ekburji Reservoir of Washim and observed eight predatory and four weed fishes by Sone and Malu. The diversity of ichthyofauna, taxonomy and fisheries from fresh water of Parbhani district and recorded thirty-two species of fishes belonging to twenty fine genera and nine families from two orders,

Ahirrao and Mane. The fish fauna of Bhadra reservoir, Western Ghats and recorded twenty-seven fish species belonging to five orders, Venkateshwarlu et al. The fish diversity in the Sirur dam near Mukhed, Nanded district and observed eleven species of fishes, Pawar et al. The diversity of fish fauna of Umra (Shamsudin) reservoir, Washim district and observed that twelve species belong to twelve different genera of three orders of six families from this reservoir, Rathod et al. Morna River in Washim and Akola districts of Maharashtra was studied for a period of one year (August 2012 to July 2014). A total of 30 fish species were recorded during the study belonging to 10 families and 5 orders. Among these, *Ophisternon bengalense* was first time reported from Maharashtra on West coast of India. Bandyopadhyay (1999), Ahmad et al., (2008), Bhakta and Bandyopadhyay (2008), Devi Prasad et al. (2009), Goswami and Landmankodi (2010), Sarwade et al. (2010), Jadhav et al., (2011), Thirumala et al., (2011), Muruga (2012), Gohil and Mankodi (2013), Islam et al., (2013), Bose et al., (2013), Khanna and Fouzia (2013), Mohite and Samant (2013), Chouhan et al., (2013), Sirajudheen and Khan (2014) and Londhe (2015).

### Methods and Materials

Observation, questionnaire, interviews, consultations and discussion methods were used to collect the required information and data. To ascertain the impact of Covid-19 on fish market of Washim, consultations with fishermen, fish sellers and fish dealers were

done. Feedback on social media, news published in local newspapers and google search engine were taken into consideration to conduct the study. The study area is located in Washim district. Discussion with local market fish dealer Mr. Sham Chahare who is a fish merchant and exports fishes and the Assistant Officer of Fishery Society Washim Mr. Ashutosh Jadhav provided addition

required information about the production, capture and selling of Fishes in the district and local fish market.

**Observations**

The cost of fish per kilogram and their daily approximate sale before and after the pandemic Washim district are given below:

No.	Name of Fish	Price per kilogram		Approx. sale per day	
		Before pandemic	After pandemic	Before pandemic	After pandemic
1	<i>Catlacatla</i>	280-300 Rs.	300 Rs.	130-150 kg	10-20 kg
2	<i>Labeorohita</i>	180-200 Rs.	200 Rs.	200-250 kg	10-20 kg
3	<i>Cirrhinamrigala</i>	400 Rs	No sale	120-130 kg	No sale

Table 1: The fishes that are sold in local fish market

No.	Name of Fish	Price per kilogram		Approx. export per day	
		Before pandemic	After pandemic	Before pandemic	After pandemic
1	Prawns	500-600 Rs.	500-600 Rs.	500-700 kg	100-150 kg
2	Patola	200 Rs.	200 Rs.	400-500 kg	100-150 kg
3	Katarna	100-120 Rs.	120 Rs.	500 kg	100-120 kg
4	Ballo	100-110 Rs.	120 Rs.	500-600 kg	100-120
5	shengath	150 Rs	150 Rs.	400-500 kg	100-120

Table 2: Fishes that are exported to Delhi, Calcutta and Punjab fish markets

**Results and Discussion**

Fishery activities in Washim district are mostly performed at reservoirs, checkdams and main rivers. Main rivers are Painganga, Arunavati, Adan, Pus, Katepurna and Bewla. Reservoirs, check dam and main dams are Ekburji dam, Savargoan dam, Borala dam, Tornala dam, Supkhela dam, Khandala dam, Dhumka dam and Nagthana dam. There are nearly 148 lakes in the district where activities like fish seed production and fish capture takes place.

The species which are in high demand and sold in local markets are specially: *Catlacatla* locally called Catla, *Labeorohita* locally called Rohu and *Cirrhinamrigala* locally called mrigal.

In addition to these fishes Pankaj, bam wire and Chambhari are also sold in local fish market of Washim. The species that are produced and captured in Washim district but are exported to Delhi, Calcutta and Punjab fish market are: Prawns, Patola, Katrna, Ballo and Shengath



Fig.1 *Cirrhinamrigala* Fig.2 *Catlacatla*



Fig.3 Labeo rohita Fig.4 Katarna (export quality)



Fig.5 Patola (export quality) Fig.6 The visiting card of the local fish merchant

### Conclusion

Subject to guidelines Government has permitted fish farming related activities like fish netting and harvesting, feeding stocked fishes and transportation of fish feed. Rumor about poultry birds and eggs has attracted consumers to purchase fishes. Due to lockdown the fish markets were closed so farmers used to sale fishes directly from their ponds and earned good profit. Before pandemic when market used to open whole day, fish farmers and fish sellers used to sell 500-600 kgs of fishes per day. But during the period of lockdown

markets were closed by Government so the fish sellers had to sell fishes independently. During the unlock period when markets were allowed to open only for necessary things for few hours of the day fisherman and fish farmers has witnessed record sale of fish directly from the pond at the rate of 200-240/kg. In nut shell it is concluded that because of the concession and active support of Government fish farmers and fish sellers have got sale confidence of direct selling and the circumstances have given message about self-sufficiency.

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**CHALLENGES IN CLIMATE CHANGE AND ENVIRONMENTAL ISSUES****Balraje Madhavrao Kadam**

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**ABSTRACT**

*The environmental movement has done a great job of trying to meet these environmental challenges by making great attempts with limited investment in effective measures. In these attempts the environmental movement follows a simple strategy. Attraction to organizations (both government and business) and to certain actions involving citizens. Here we provide an overview of these techniques before introducing a third method from the environmental movement that may require special attention. This one-third method, which we call identification campaigns, has great potential for enhancing the effectiveness of contemporary paintings of movement and for developing useful techniques for entirely new types of interventions.*

**Introduction**

Much of the attention of the environmental movement today is focused on attractive organizations. For example, a primary method is based on improving and refining coverage proposals, in conjunction with political lobbying to promote acceptance of these proposals through agency funding. This is an important strategy. The environmental movement has undoubtedly contributed to the success of policy campaigns pursued by authorities by improving many of the key environmental reporting proposals. For example, consider new performance standards, pollution regulations, and improvements to the current state of your area. Climate-related issues affecting our well-being may have been a major trigger for our familiarization with the need for more advanced herbal management. It is captured through human physical play in the circle of human beings and has an impact on our health design. Ecological alternatives are weather alternatives or aggravations that are often brought about by human influences and normal organic cycles. Ecological adaptation includes unique elements such as cataclysmic events, human disturbances, and organism cooperation. Persistent and devastating droughts, storms, heat waves, rising sea levels, melting ice sheets and warming oceans directly harm life, wipe out habitats and disrupt human livelihoods and networks. There is likely to be. Unstable weather activity will continue or become severe as environmental conditions deteriorate.

**Ecological health**

Ecological well-being as characterized by

WHO includes those parts of human well-being, including individual well-being, controlled by physical, composite, organic, social and psychosocial climatic factors. It also refers to surveying hypotheses and practices. To fix, control and prevent climate change that adversely affects the well-being of people now and in the future. Our current situation is affecting our health in many ways. Environment and climate affect human well-being. General health depends on good quality food, clean drinking water and appropriate measures for a good retreat. Catastrophic events such as storms, storms, and floods regularly kill many. Extreme rainfall triggers bowel and waterborne diseases (Fewtrell,2003). Global environmental change poses a real challenge to well-being. Many countries have to prepare for questionable weather conditions due to unnatural changes in weather. At this point, we may not understand what lies ahead as our environment changes. Storms are spreading in some countries, dry seasons in others, and temperatures are rising around the world. El Niño winds affect climate around the world. His EI Nino event in 1997/98 had a profound impact on the welfare and prosperity of millions of people in many countries. It caused actual droughts and floods and caused pandemics. New techniques must be developed to reduce vulnerability to environmental fluctuations and changes (McMichael et al., 2003). Financial imbalances and ecological change go hand in hand. A powerless state cannot demand the remedial principles necessary to reverse environmental change. Depletion of ozone in the stratosphere (atmosphere) is also having a significant impact

on the world's environment, thereby improving human well-being and expanding the range of destructive ultraviolet radiation that reaches the earth's surface. This leads to infections such as skin cancer (McMichael et al., 2003). Remediation processes that do not strengthen the biological protective shield regularly lead to illness, while technology that can increase well-being will always protect the climate even more. Therefore, natural well-being and human well-being are closely related. Improving well-being is fundamental to healthy nature management. In any case, it is rarely given proper importance in the design of advancing technology. Financial imbalances and ecological change go hand in hand. A powerless state cannot demand the remedial principles necessary to reverse environmental change. Depletion of ozone in the stratosphere (atmosphere) is also having a significant impact on the world's environment, thereby improving human well-being and expanding the range of destructive ultraviolet radiation that reaches the earth's surface. This leads to infections such as skin cancer (McMichael et al., 2003). Remediation processes that do not strengthen the biological protective shield regularly lead to illness, while technology that can increase well-being will always protect the climate even more. Therefore, natural well-being and human well-being are closely related. Improving well-being is fundamental to healthy nature management. In any case, it is rarely given proper importance in the design of advancing technology.

### Health care

General health is concerned about the possible risks to the general well-being of many local residents. I am focused. From many points of view, public health is generally a progressive idea, but it has long been established. Overall, some understanding of the causes of disease was essential for governments to create general welfare regulations and projects. It was quickly recognized that contaminated water and lack of proper waste disposal were implicated in the spread of vector-borne diseases. was known in Roman times to be an essential foundation for the general well-being of the human population (DFID/EC/UNDP/World Bank,

2002; World Health Report 2003).

Human conduct influences the widely varied vegetation specifically regions. Other than the qualities as an asset for creation and utilization, nature has a worth to and without anyone else. At the point when a specific types of creature becomes particular in a specific region, this isn't just tragic yet will have genuine ramifications for the number of inhabitants in other under these conditions the greenery will recover itself. Anyway when the gather surpasses the bearing limit, it will influence the recovery limit and populace size. Accordingly, certain species might become particular. Also nature has the ability to change squander in valuable materials, which it utilizes in its recovery measures. Think about the creation of fertilizer that is utilized to take care of the dirt and plants. Anyway when the synthesis and measure of waste surpasses the limit of the nature to change, the waste amasses and changes the nature into a waste belt (The World Health Report 2003). Contingent upon the half seasons of the waste segments, eco-qualities and normal creation esteems might be lost for outrageous significant time frames.

### Conclusion

Climate related issues that influence our wellbeing have been perhaps the main triggers in the expanding familiarity with the requirement for better natural administration. The progressions in our current circumstance enlisted by human exercises in essentially every circle of life have affects our wellbeing designs. Ecological change is a change or aggravation of the climate regularly brought about by human impacts and normal biological cycles. Ecological changes incorporate different components, like cataclysmic events, human obstructions, or creature cooperation. More continuous and exceptional dry spell, storms, heat waves, rising ocean levels, liquefying icy masses and warming seas can straightforwardly hurt creatures, obliterate the spots they live, and unleash devastation on individuals' livelihoods and networks. As environmental change deteriorates, risky climate occasions are turning out to be more continuous or serious.



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## STUDY OF ISOTHERMS AND KINETICS OF MALACHITE GREEN ADSORPTION BY ACTIVATED CARBON-CELLULOSE COMPOSITE BEAD

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### ABSTRACT

Decontamination of synthetic dyes from aqueous solution has paid more attention to the researchers as they are highly toxic and responsible for serious environmental pollution. In the present study, the removal of malachite green from an aqueous solution by an environmental-friendly low-cost adsorbent has been studied. Waste sugarcane bagasse and cellulose powder were taken as starting materials for the synthesis of adsorbent. The characterization of the adsorbent was performed using Fourier transformed infrared spectroscopy (FT-IR), field emission scanning electron microscope (FESEM) and energy dispersive X-ray analysis (EDAX). A batch adsorption study has been selected for the investigation of the isotherm and kinetics of the adsorption process. The Freundlich model was found to fit well with the experimental data. The maximum adsorption capacity calculated from the Langmuir model was 45.7 mg/g. From the kinetic analysis, it was found that the adsorption kinetics followed the pseudo-second-order model.

### 1. Introduction

Synthetic dyes are extensively used in textiles, paper and pulp, jute, leather, cosmetic and food processing industries. People used different types of natural dyes derived from insects, leaves, barks or roots of plants and trees before the discovery of synthetic dyes. Synthetic dyes become more popular due to their simplicity in application, cost-effectiveness, availability of a large number of colour shades and more resistance to external factors like sunlight, heat, moisture etc. Over  $7 \times 10^5$  tones of commercial dyes are produced annually all over the world (Nasuha et al., 2011). Textile industries contribute about 17–20% of industrial water pollution (Kant, 2012). According to the United Nations World water development report (2017), 80% of global waste water enters the environment without any treatment and it causes serious environmental pollution destroying the ecological balance. Industrial effluents released from dye-related industries enter the natural water sources and it prevents the penetration of sunlight into the natural water sources and consequently, the photosynthesis of aquatic plants is affected. As a result, the growth of aquatic plants and algae has been affected and it influences the food chain of aquatic systems. As the demand for clothing,

textiles and similar products is growing day by day; the industries which produce synthetic dye are continuously increasing their production. Among all industries, textile industries have the highest contribution to discharging the dye effluent into the environment. It contributes about 54% i.e. more than half of the total contribution.

Low-quality dyeing of cloths also produces a little amount of dye effluent when they require washing with the detergent solution and directly enter into the environment with domestic wastewater. India is one of the major textile-producing countries and also the major contributor to textile wastewater. Due to a poorly equipped wastewater management system, India faces great environmental problems for dye discharged industrial effluents.

Malachite green is a synthetic, cationic dye belonging to triphenyl methane. Extensive use of malachite green has been observed in the textile industry. It is also used in food, medical disinfectant, acrylic industries, cosmetics manufacturing, rubber, leather and paper printing (Elhalil et al., 2016). Malachite green is also used as an antibacterial to treat Saprolegnia, which infects fish eggs in commercial aquaculture (Srivastava et al., 2004). Long-time exposure to malachite green in high concentrations may cause chromosomal fractures, mutagenesis, carcinogenesis,

teratogenicity, respiratory problem and many side effects (Srivastava et al., 2004). So, the removal of this dye from water and wastewater is the main challenge for the researchers. A large number of papers have been published in various prestigious journals regarding the numerous removal techniques of malachite green. Coagulation–flocculation, membrane filtration (Ullah et al., 2018), oxidative method (Hashemian et al., 2013), biodegradation (Chaturvedi et al., 2015) biosorption (Chen et al., 2014) and adsorption are some common methods suggested by researchers. Among all techniques, adsorption is preferred due to its simplicity, availability of various types of adsorbents, reusability and also cost-effectiveness.

## 2. Materials and method

### 2.1 Materials

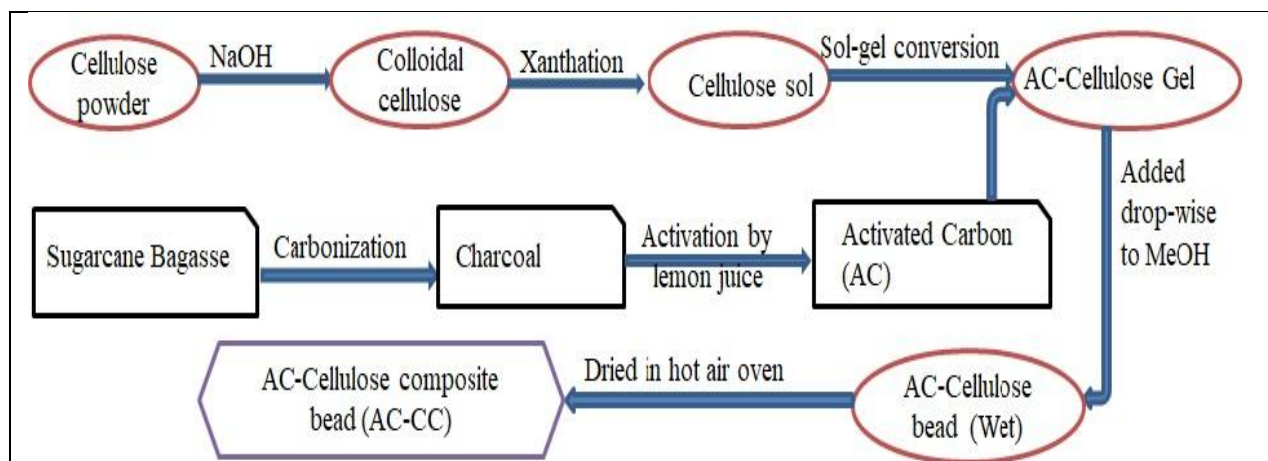
Cellulose powder, malachite green, sodium hydroxide and carbon disulfide were purchased from Merck. Lemon and waste sugarcane bagasse were collected from the local market of Nabadwip, Nadia, West Bengal. Double distilled water was used to prepare stock and experimental solutions.

### 2.2 Synthesis of adsorbent:

In the present study, a low-cost activated carbon-loaded cellulose composite bead was used for the adsorption of malachite green. The activated carbon was prepared from waste sugarcane bagasse collected from a street hawker of Nabadwip, Nadia, West Bengal.

Initially, the sugarcane bagasse was washed several times with distilled water to remove any dirt or unnecessary substances. The washed sugarcane bagasse was dried in sunlight for several days and it was cut into small pieces. Thereafter the sugarcane bagasse was dried in a hot air oven for 6h at 120<sup>0</sup>C before and carbonized to make charcoal. Activation of charcoal was carried out using lemon juice. Activated carbon was stored in an air-tight container for further use.

Cellulose sol to cellulose gel by sol-gel approach (Santra et al., 2014) was the principal step of the synthesis of adsorbent. At first, 2.0 g of cellulose powder was mixed with 40 ml of 20% NaOH solution and kept in an air-tight glass bottle for 48 h to prepare a colloidal suspension. In the next stage, 2.0 ml of carbon disulfide was added to the colloidal suspension and shaken in a horizontal mechanical shaker for 6h. 20 ml of 6% NaOH solution was added to the mixture and was shaken again for 2 h to make a clear reddish-orange sol. After allowing the cellulose sol to settle for at least 72 h, it condensed to form cellulose gel. 50 ml of the cellulose gel was taken in a beaker and 150 mg of activated carbon was mixed thoroughly with the cellulose gel using a glass rod. The mixture was taken in a 5.0 ml syringe and was added to methanol drop-wise to prepare a spherical shape bead. The beads were washed with distilled water until the pH of the washing liquid reached 7.0. At the final stage, the beads were dried in a hot air oven for 4 h at 120<sup>0</sup>C and thereafter the beads were allowed to cool for storage and further use as adsorbents.



### 2.3 Adsorption experiment

Adsorption of MG was carried out by batch adsorption method. The adsorption experiment was performed by taking 10 ml of MG solution and a fixed amount of adsorbent in a 100 ml conical flask. The flask was shaken in a rotary shaker (Remi 12R) at 125 rpm until the process reached equilibrium. The adsorption process was found to reach equilibrium in 90 min with 0.030 g AC-CC bead and a shaking speed of 125 rpm at room temperature. All the experiments were performed at the natural pH of the dye solution. Therefore, the isotherm and kinetic study were carried out at the mentioned equilibrium conditions. The concentration of the residual solution was measured by a UV-vis spectrophotometer (Shimadzu 1900i). Percent removal and the amount of dye adsorbed were measured by Eq. 1 and Eq. 2 respectively.

$$\%R = \frac{C_0 - C_e}{C_0} \cdot 100 \quad (1)$$

$$q_e = \left( \frac{C_0 - C_e}{C_0} \right) \cdot \left( \frac{V}{m} \right) \quad (2)$$

where  $C_0$ (mg/L) and  $C_e$ (mg/L) are the initial and equilibrium concentration of dye solution respectively.  $q_e$ (mg/g) is the amount of dye

adsorbed on the surface of the AC-CC bead.  $V$  (L) is the volume of the dye solution and  $m$  (g) is the mass of the adsorbent.

## 3. Results and discussion

### 3.1 Characterization of adsorbent

The spectral and morphological characterization of the synthesized adsorbent was carried out by Fourier transformed infrared spectroscopy (FT-IR), field emission scanning electron microscope (FESEM) and energy dispersive X-ray analysis (EDAX). The synthesized adsorbent in the solid state was investigated within the frequency range of 450 to 4000  $\text{cm}^{-1}$  (Perkin Elmer L120-000A IR spectrophotometer). FT-IR spectra of the adsorbent are represented in Fig.1. The peak at 3409  $\text{cm}^{-1}$  was attributed due to the stretching band of O-H group (Sarkar et al., 2020). Peaks at 2922, 1640 and 1380  $\text{cm}^{-1}$  were assigned to symmetrical C-H stretching, bending due to absorbed water molecule and C-H bending (in plane) respectively. The peaks at 1058,  $\text{cm}^{-1}$  confirmed the presence of C-C, C-OH, C-H ring and side groups. The peaks at 772 and 608  $\text{cm}^{-1}$  were assigned to O-H bending (out of plane) and C-H deformation respectively.

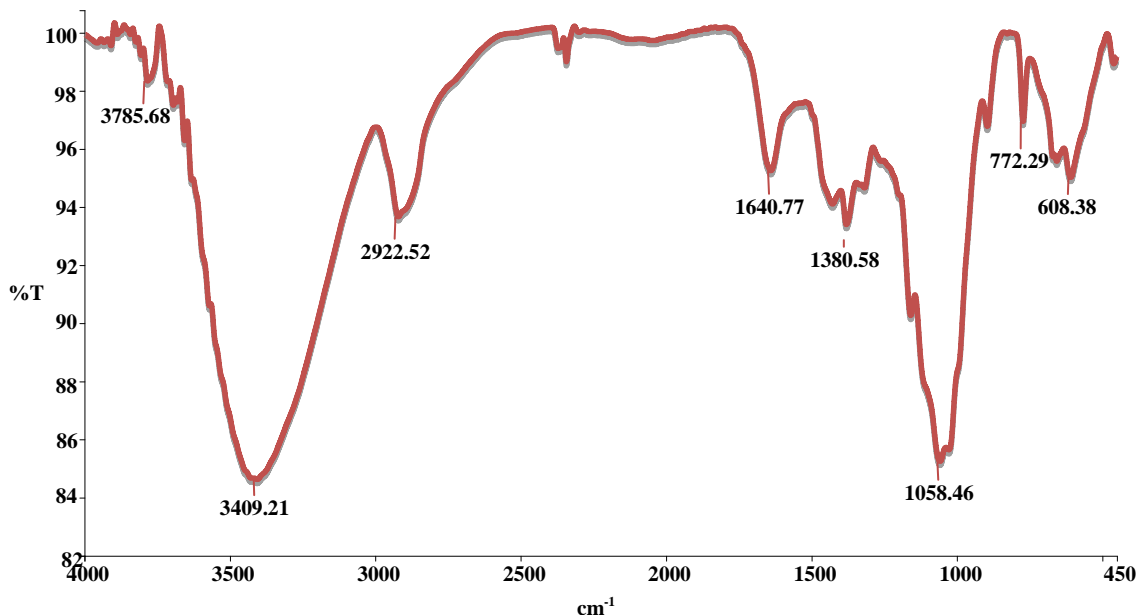
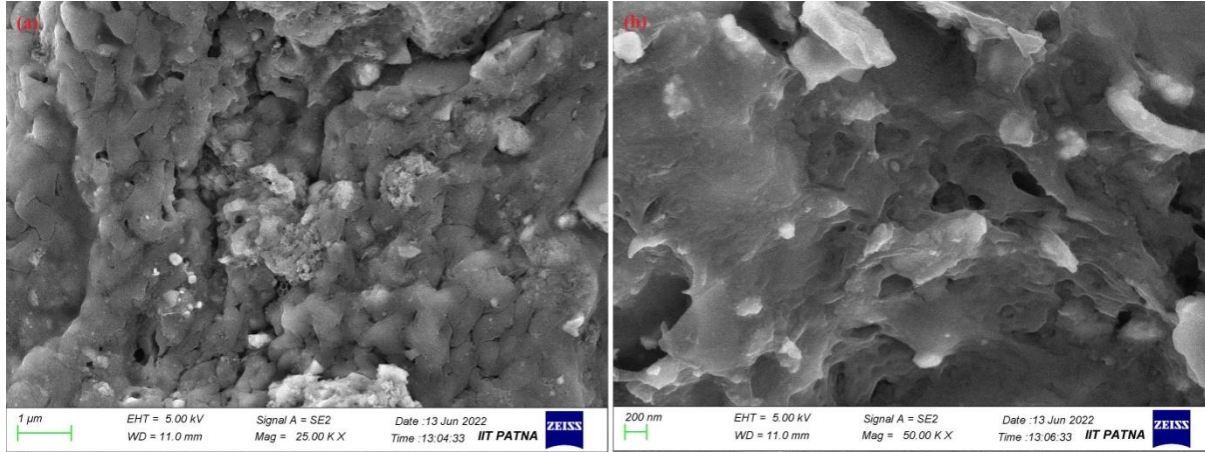


Fig.1: FT-IR of AC-CC bead

The surface morphology of the AC-CC bead was studied from FESEM images obtained from a field emission scanning electron microscope (Zeiss GeminiSem 500). The FESEM images were taken at two different magnifications of 25.00 KX (Fig.2(a)) and

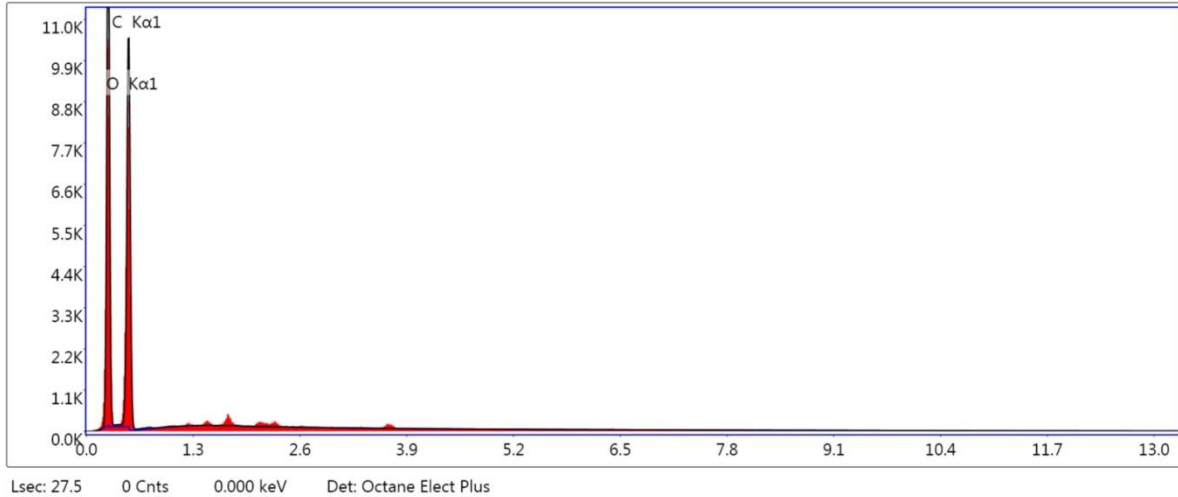
50.00 KX (Fig.2(b)) with a scale of 1  $\mu\text{m}$  and 200 nm. FESEM images revealed the roughness of the surface with particles of different sizes. The distribution of some nanoparticles of cellulose was also noticed in the image (Fig.2(b)).



**Fig.2: FESEM of AC-CC bead**

Elemental analysis of the adsorbent was carried out using the EDAX instrument attached to Zeiss GeminiSem 500 instrument. The EDAX spectrum of AC-CC bead is represented in Fig.3 along with the composition of each

element (Table 1). Fig.3 revealed that the AC-CC bead was composed of carbon and oxygen. The synthesized adsorbent was found to contain 48.75% carbon and 51.25% oxygen.



**Fig.3: EDAX of AC-CC bead**

**Table 1: Elemental composition of AC-CC bead**

Element	Weight %	Atomic %
C K	48.75	55.89
O K	51.25	44.11

### 3.2 Study of adsorption isotherm

Adsorption isotherms can be defined as “the relationship between the adsorbate in the liquid phase and the adsorbate adsorbed on the surface of the adsorbent at equilibrium at constant temperature”. The study of different adsorption isotherm models is very useful in obtaining an understanding of the adsorption

process. In the present study, some two-parameter isotherm models viz. Langmuir, Freundlich, Temkin and Dubini-Raduskevich isotherm models were investigated to analyze the characteristics of adsorption of MG. The linear form of the Langmuir isotherm equation can be represented as (Ghafar et al., 2017)

$$\frac{C_e}{q_e} = \frac{1}{K_L Q_0} + \frac{C_e}{Q_0} \quad (3)$$

where  $C_e$  ( $L^{-1}$ ) and  $q_e$  ( $mg\ g^{-1}$ ) are the concentration of MG and the amount of MG adsorbed at equilibrium.  $Q_0$  ( $mg\ g^{-1}$ ) represents

the maximum adsorption capacity and  $K_L$  is the Langmuir constant. The values of  $Q_0$  and  $K_L$  can be calculated from the slope and intercept of the plot of  $\frac{C_e}{q_e}$  against  $C_e$ . Fig.4 represents the Langmuir plot of MG adsorption on the AC-CC bead. The linear regression values of the plot were found to be 0.9251, 0.9030 and 0.9243 for MG concentrations of 25, 50 and 100  $mg\ L^{-1}$  respectively. The maximum adsorption capacity was determined to be 45.7  $mg/g$ .

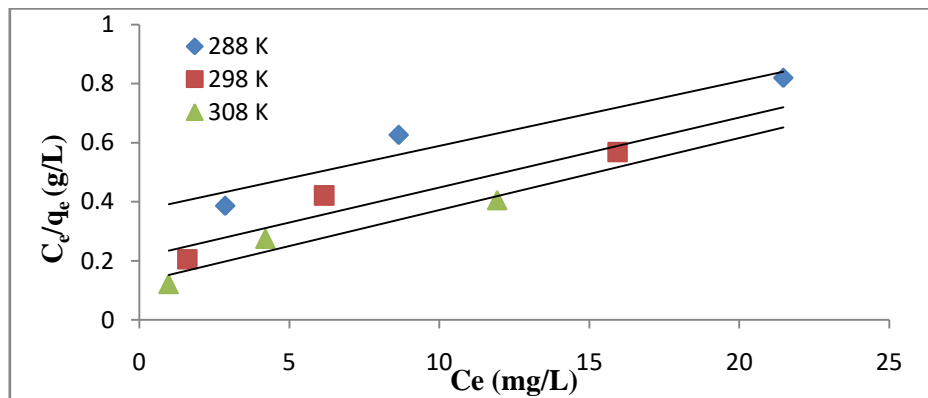


Fig.4: Plot of Langmuir isotherm model

The linear form of the Freundlich isotherm equation can be represented as (Sarkar et al., 2019)

$$\ln q_e = \ln K_F + \frac{1}{n} \ln C_e \quad (4)$$

where  $K_F$  is the Freundlich isotherm model constant and  $\frac{1}{n}$  is the adsorption intensity.

The plot of  $\ln q_e$  against  $\ln C_e$  of MG adsorption on AC-CC bead is represented in Fig.5. The values of  $\frac{1}{n}$  were determined from the slope of the plot. The values were found to lie between

0-1 which indicated that the adsorption process was favorable. The values of the Freundlich isotherm constants were found to be  $3.59 \times 10^2$ ,  $5.82 \times 10^2$  and  $7.87 \times 10^2$  ( $g/mg$ )  $(mg/L)^{-1/n}$  corresponding to MG concentrations of 25, 50 and 100  $mg\ L^{-1}$  respectively. The linear regression values were found to be 0.9913, 0.9879 and 0.9900 for MG concentrations of 25, 50 and 100  $mg/L$  implying the good fitting of the experimental data with the Freundlich model.

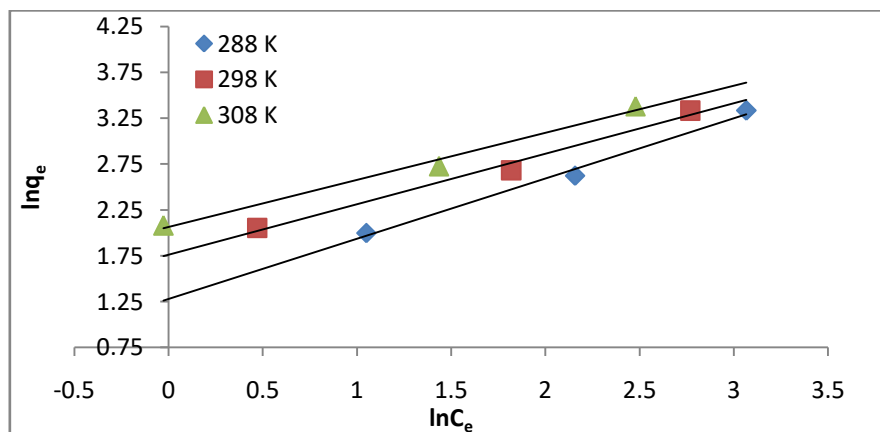


Fig.5: Plot of Freundlich isotherm model

The equation of the Temkin isotherm model can be represented as (Adeyi et al., 2019)

$$q_e = B_T \ln K_T + B_T \ln C_e \tag{5}$$

$$\text{and } B_T = \frac{RT}{b} \tag{6}$$

where  $K_T$  (L mg<sup>-1</sup>) is the equilibrium binding constant, R is the universal gas constant (8.314 J mol<sup>-1</sup>K<sup>-1</sup>) and T (K) refers to the absolute temperature of MG solution.

The plot of the Temkin isotherm model is represented in Fig.6. The values of  $K_T$  were found to be 0.688, 1.32 and 2.27L /mg corresponding to concentrations of 25, 50 and 100 mg /L respectively. The isotherm parameters of the Temkin model are represented in Table 2.

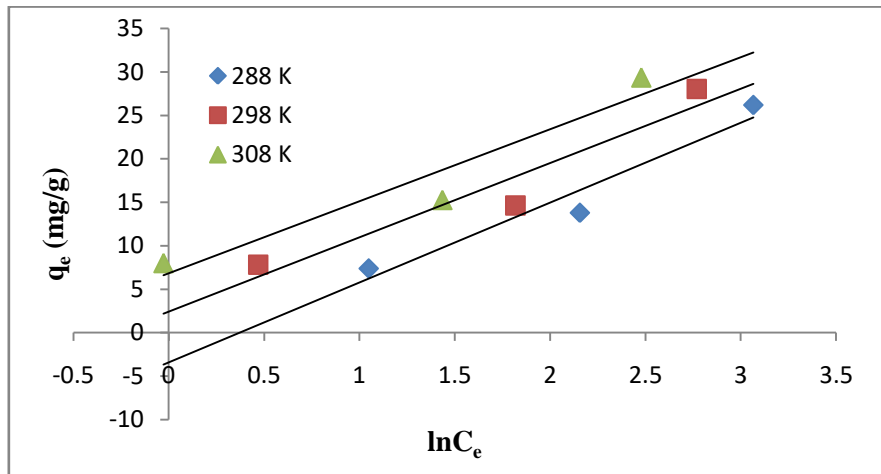


Fig.6: Plot of Temkin isotherm model

Table 2: Isotherm parameters of MG adsorption on AC-CC bead

Isotherm	T (K)	Q <sub>0</sub> (mg/g)	K <sub>L</sub> .10 <sup>2</sup> (L/mg)	R <sup>2</sup>
Langmuir	288	45.7	5.91	0.925
	298	42.2	11.2	0.903
	308	41.1	18.8	0.924
Fruendlich	T (K)	K <sub>F</sub> .10 <sup>2</sup> (gmg <sup>-1</sup> ) (mgdm <sup>-3</sup> ) <sup>-1/n</sup>	1/n	R <sup>2</sup>
	288	3.59	0.657	0.991
	298	5.82	0.550	0.988
Temkin	T (K)	K <sub>T</sub> (L/mg)	B <sub>T</sub> (Jg/mg.mol)	R <sup>2</sup>
	288	0.688	9.19	0.944
	298	1.32	8.55	0.920
	308	2.27	8.29	0.924

### 3.3 Study of kinetics of MG adsorption

The kinetic study was carried out to elucidate the mechanistic pathway and the solute-adsorbent interaction of MG adsorption with dye concentrations of 50 and 100 mg L<sup>-1</sup>. The concentration of the residual solution was measured every 10 min after starting MG adsorption on the AC-CC bead. Experimental

data were plotted using the two most popular kinetic models viz. pseudo-first-order and pseudo-second-order models.

The linear form of the pseudo-first-order model can be represented as (Sarkar et al., 2022)

$$\ln(q_e - q_t) = \ln q_e - k_1 t \tag{9}$$

$\ln(q_e - q_t)$  is plotted against 't' to determine the value of  $k_1$ .

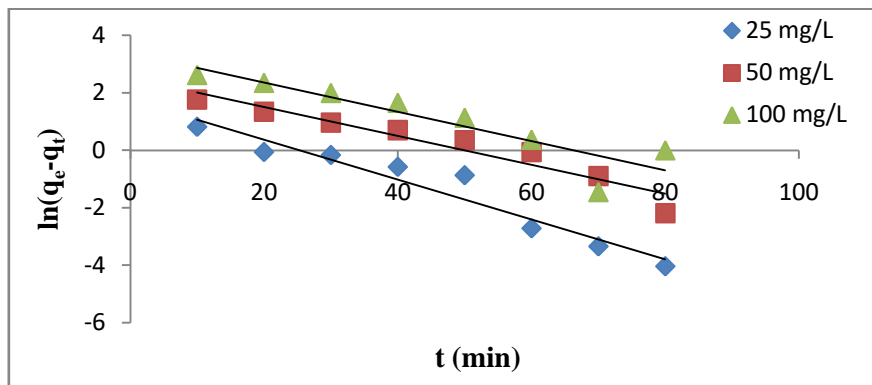


Fig.7: Plot of pseudo-first-order model of MG adsorption on AC-CC bead

The rate equation of the pseudo-second-order model can be expressed as (Sarkar et al., 2022)

$$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e} \quad (10)$$

where  $k_2$  is the rate constant. The value of  $k_2$  can be determined from the intercept of  $t/q_t$  against 't' plot.

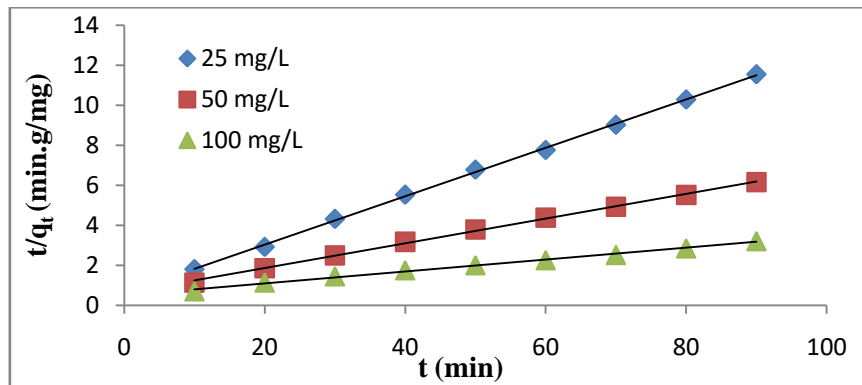


Fig.8: Plot of pseudo-second-order model of MG adsorption on AC-CC bead

Fig.8 represents the pseudo-second-order model of MG adsorption on the AC-CC bead. The linear regression values were found near unity implying the best fitting of experimental data with this model.

Table 5: Kinetic parameters of MG adsorption on AC-CC bead

Equation	Concentration (mg/L)	$K_1 \cdot 10^2$ ( $\text{min}^{-1}$ )	$R^2$
Pseudo 1 <sup>st</sup> order	25	6.94	0.934
	50	5.03	0.920
	100	5.09	0.821
Equation	Concentration (mg/L)	$K_2 \cdot 10^3$ (g/mg.min)	$R^2$
Pseudo 2 <sup>nd</sup> order	25	21.8	0.999
	50	6.13	0.999
	100	1.74	0.995

#### 4. Conclusions

The novel adsorbent activated carbon-loaded cellulose composite bead was found excellent

adsorbent towards the adsorption of malachite green. The adsorbent was synthesized from waste sugarcane bagasse and cellulose powder and therefore the process became cost-effective. The Freundlich model was found to fit best with experimental data. The maximum adsorption capacity was found to be 45.7 mg/g. The pseudo-second-order model was the best-fitted model for the adsorption of MG with rate constants  $21.8 \times 10^{-3}$ ,  $6.13 \times 10^{-3}$  and  $1.74 \times 10^{-3}$  g/mg.min for the dye concentrations of 25, 50 and 100 mg/L respectively.

#### 5. Acknowledgment

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**“FLAVONOIDS AS USEFUL AMBITION FOR A RESEARCH: A REVIEW”****S.G. Kalane<sup>1</sup>, R.E. Khadse<sup>2</sup>, S.B. Gaikwad<sup>3</sup> and S.P. Rathod<sup>4</sup>**<sup>1</sup>Assistant Professor, Department of Chemistry, Late Pundalikrao Gawali Arts & Science Mahavidyalaya, Shirpur Jain Dist. Washim. (M.S.), India.<sup>2</sup>Assistant Professor, Department of Chemistry, Late PundalikraoGawali Arts & Science Mahavidyalaya, Shirpur Jain Dist. Washim. (M.S.), India.<sup>3</sup>Assistant Professor, Department of Chemistry, Late PundalikraoGawali Arts & Science Mahavidyalaya, Shirpur Jain Dist. Washim. (M.S.), India.<sup>4</sup>Assistant Professor, Department of Chemistry, G.S.G. Mahavidyalay, Umarkedh, Dist. Yavatmal, MS, India

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**ABSTRACT**

Flavonoids are mainly contained in the skin of fruits and the epidermis of leaves. They are essential for plant growth development and reproduction as well as a major class of plant secondary metabolites. Many flavonoids showed biochemical effects on enzymes, hormones, anti-oxidant, anti-bacterial, anti-viral, anti-inflammatory, and hepatoprotective activity. This review converses with the direction of future research that may elucidate the specific role of flavonoids in biological activities and function in agriculture and pharmaceutical practice.

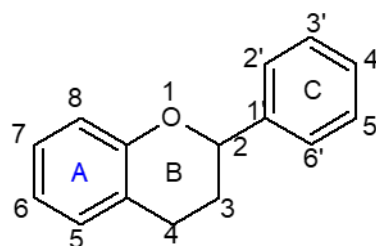
**Keywords:** Flavonoids, Secondary Metabolites, Biochemical Effect, Biological Activity.

**Introduction**

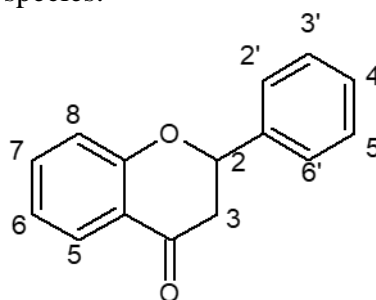
Flavonoids are one of the largest groups of polyphenolics which are widely spread in fruits, vegetables, and plant kingdoms. They are classified as chalcones, flavanones, Flavones, Isoflavones, Aurones, Neoflavones, and Bio flavones.[1] and play crucial for plant growth development and reproduction. Flavonoids are a major class of plant secondary metabolites [2]. The structural diversity of seed flavonoids has a momentous impact on seed color depending on the accumulated support in combating oxidative stress and acting as growth regulators [3, 4]. For pharmaceutical purposes, capable large production of different types of flavonoids has been made possible with the help of microbial biotechnology. This review highlights the structural features of flavonoids, their beneficial roles in human health, and their significance in plants.

**Classification Flavonoids:**

These are polyphenolic compounds containing 15-carbon atoms with two aromatic rings linked through a heterocyclic pyran ring [5].

**Fig:1. Structure of Flavonoids**

All flavonoids share the basic C<sub>6</sub>-C<sub>3</sub>-C<sub>6</sub> structural skeleton consisting of two aromatic C<sub>6</sub> rings (A+B) and a heterocyclic ring (C) that contains one oxygen atom (fig: 1). They can be subdivided into six subclasses. Several substitutions are possible with flavones, like methylation, halogenation, hydroxylation, glycosylation, and O- and C- alkylation. Most of these 7-O- glycosides. A common example of flavones includes polymethylated flavones like tangerine and nobiletin have been present in citrus species.

**Fig: 2. Structure of Flavone**

Position	5	7	3'	4'
Apigernin	OH	OH	-	OH
Leteolin	OH	OH	OH	OH
Chrysin	OH	OH	-	-

**Flavanols:**

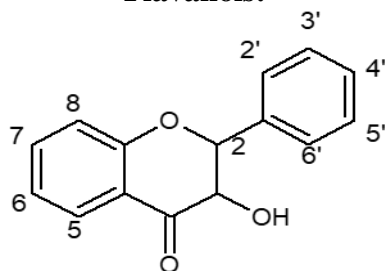


Fig:3 Structure of Flavanols

Position	5	7	3'	4'	5'
Quertuin	OH	OH	OH	OH	-
Kaemferol	OH	OH	-	OH	-
Galarrgin	OH	OH	-	-	-

**Flavanone:**

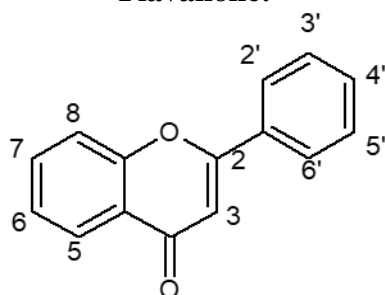


Fig: 4 Structure of Flavanone

Position	5	7	3'	4'
Naringenin	OH	OH	-	OH
Hesperetin	OH	OH	OH	OCH <sub>3</sub>

**Isoflavones:**

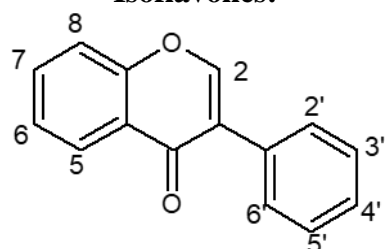


Fig: 5 Structure of Isoflavones

Position	5	7	4'
Ganistein	OH	OH	OH
Daidzein	-	OH	OH

**Flavan-3-ol:**

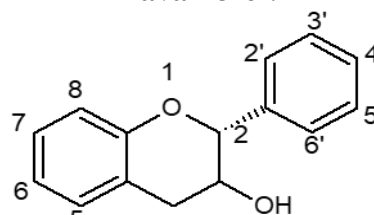


Fig: 6 Structure of Flavan-3-ol:

Position	3	5	7	3'	4'	5'
(+)-Catechin	β-OH	OH	OH	OH	OH	-
(-)-Epicatechin	α-OH	OH	OH	OH	OH	-
(-)-Epigallocatechin	α-OH	OH	OH	OH	OH	OH

**Flavanol**

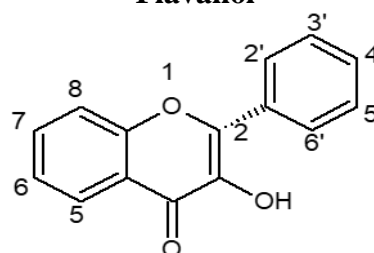


Fig: Structure of Flavanol

Position	5	7	3'	4'
Taxifolin	OH	OH	OH	OH

**Biological Significance of Flavonoids:**

Flavonoids have broad spectrum bioactivities due to their chemical structure. Flavonoids useful component in a variety of medicinal and nutritional application. Some of the biological activities include biochemical effect on enzymes and on hormones [6]anti-oxidant, anti-bacterial, anti-viral, anti-inflammatory, hepato-protective activity [7].

**Biochemical effects on enzymes and hormones:**

Flavonoids are known to inhibit a number of enzymes such as aldosereductase [8], xanthase oxidases [9], phosphodiesterase [10], Ca<sup>2+</sup>ATpase [11], lipo-oxygenase [12], and cyclooxygenase [13]. Flavanol like myricetin, quercin, and kaempferol inhibits the activity of the adenosine deaminase of endothelial cells, while flavones are inactive [14].Flavonoids have regulatory activities on hormones by binding 17 beta-hydroxysteroid dehydrogenase which regulates estrogen and androgen levels

in humans and to 3 beta -hydroxy steroid dehydrogenase which regulates progestin and androgen levels in humans [15]. Quercetin, myricetin, rutin, kaempferol, galangin, spirostanes, and robinin are potent non-toxic ITH deiodinase inhibitors in microsomal membranes and intact rat hepatocytes.

**a) Anti-oxidant Activity:**

Antioxidants are specific compounds that protect human, animal, and plant cells against the damaging effect of free radicals. Flavonoids act as antioxidants as well as inhibit the factors disease-causing. Anti-oxidant activity depends upon the arrangement of the functional group about the nuclear structure [16,17]. The antioxidant action of flavonoids includes suppressions of ROS formation by inhibition of enzymes by scavenging free radicals and regulation of antioxidant defenses [18].

**b) Anti-bacterial Activity:**

Flavonoids are synthesized by the plant in response to microbial infection and are very effective in microbial infection and effective against a wide range of microorganisms. Apigenin and Isoflavone are known for potent microbial activity. Lipophilic flavonoids may also disrupt microbial membranes [19].

**c) Antiviral Activities:**

flavonoids show antiviral activities and help in the inhibition of various enzymes associated with the life cycle of viruses. Flavon-3-ol was found to be more effective than flavones and flavanones in selective inhibition of HIV-1 and HIV-2. Baicalin another flavonoid, isolated from *Scutellaria baicalensis* also is known to inhibit immune deficiency virus infections [20].

**d) Anti-Inflammatory activity:**

Inflammation is a normal biological process in response to tissue injury. This is initiated by the migration of immune cells from blood vessels and the release of mediators at the site of damage. The action of inflammatory cells to eliminate foreign pathogens and repair injured tissues of the immune system. Hesperidin, Luteolin, and Quercetin are known to possess anti-inflammatory properties. They function in affecting enzyme systems involved in generations of an inflammatory process.

**e) Hepato-protective activity:**

Different chronic diseases such as diabetes and metabolic disruptions may lead to the development of hepatic clinical manifestations. Flavonoids in form of C<sub>3</sub> G treatment and silymarin have been reported to lower hepatic lipid peroxidation and stimulate liver regeneration respectively [21].

**f) Antifungal activity:**

Flavonoids reported antifungal activities such as neohesperidin, hesperidin, naringin, and some flavonoid derivatives obtained from citrus fruits [22]. *Fusarium semitectum*, *Aspergillus parasiticus*, *Penicillium expansum* and *Aspergillus flavus* fungi contaminate food and out these fungi, growth of *Penicillium expansum* is inhibited by flavonoid hesperitin. *Fusarium semitectum*, *Aspergillus parasiticus* and *Aspergillus flavus* fungal growth inhibited by flavonoid prunin decanoate [23].

**g) Growth Promoting Activity:**

Application of flavonoids in agriculture increases crop yield [24,25]. The activity of flavonoids is the physiological and biological plant growth and development [26]. Several mechanism of action of flavonoids when applied exogenously on plants. Recent studies of flavonoids support flavonoids are capable of modulating the activity of proteins involved in cell growth. Flavonoids may therefore act as transcriptional regulators [27,28].

**h) Pest control Activity:**

Several pesticides are being developed using flavonoids, as they are another way to synthetic pesticides. They can inhibit enzymatic activity and prevent the growth of larvae of different insect species [29,30]. Some flavonoids affect in the process of moulting and reproduction of several insects. Scientific study reported that some types of flavonoids have an effect on agricultural pests. [31-32].

**Conclusion**

This review is based upon flavonoids displays various biological activities. We have attempt for the development and evolution of research on flavonoids and conclude that flavonoids become useful ambition for the research in agriculture and pharmaceutical field.

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## SUSTAINABLE DEVELOPMENT ENHANCING ENVIRONMENT AND SOCIETY: GOALS AND IMPORTANCE

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### ABSTRACT

*Sustainable development is a set of categorized guidelines for achieving the goals of human improvement while supporting the capacity of regular frameworks to provide common assets. In particular, sustainable progress is a way of organizing societies for their long-term viability. This means considering both current and future goals, such as the protection of climate and ordinary wealth, or social and economic values. At the global scale sustainability and environmental management involves managing the oceans, freshwater systems, land and atmosphere, according to sustainability principles. Land use change is fundamental to the operations of the biosphere because alterations in the relative proportions of land dedicated to urbanization, agriculture, forest, woodland, grassland and pasture have a marked effect on the global water, carbon and nitrogen biogeochemical cycles.*

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### Introduction

In 1987, the Brandtland Commission published a report, *Our Common Future*, with the ultimate aim of linking the financial transformation of events with the issue of ecological stability. In doing so, the report acknowledged the oft-cited meaning of economic improvement as “progress in addressing present problems without compromising the ability of future people to deal with their own problems” (United Nations General Assembly, 1987, p. 43). This rather vague idea of sustainable improvement hopes to ensure long-term estimates of climate while sustaining financial progress and progress. to provide the world” (United Nations General Assembly, 1987). In any case, long before the late 20th century, researchers argued that there was no need to compromise between the manageability of nature and the monetary transformation of events.

### Environment and Sustainability

At the global scale sustainability and environmental management involves managing the oceans, freshwater systems, land and atmosphere, according to sustainability principles. Land use change is fundamental to the operations of the biosphere because alterations in the relative proportions of land dedicated to urbanization, agriculture, forest, woodland, grassland and pasture have a marked effect on the global water, carbon and nitrogen biogeochemical cycles. [3] Management of the Earth's atmosphere involves assessment of all

aspects of the carbon cycle to identify opportunities to address human-induced climate change and this has become a major focus of scientific research because of the potential catastrophic effects on biodiversity and human communities. Ocean circulation patterns have a strong influence on climate and weather and, in turn, the food supply of both humans and other organisms. In March 2009, at a meeting of the Copenhagen Climate Council, 2,500 climate experts from 80 countries issued a keynote statement that there is now “no excuse” for failing to act on global warming and without strong carbon reduction targets “abrupt or irreversible” shifts in climate may occur that “will be very difficult for contemporary societies to cope with”. Management of the global atmosphere now involves assessment of all aspects of the carbon cycle to identify opportunities to address human-induced climate change and this has become a major focus of scientific research because of the potential catastrophic effects on biodiversity and human communities.

Other human impacts on the atmosphere include the air pollution in cities, the pollutants including toxic chemicals like nitrogen oxides, sulphur oxides, volatile organic compounds and airborne particulate matter that produce photochemical smog and acid rain, and the chlorofluorocarbons that degrade the ozone layer. Anthropogenic particulates such as sulfate aerosols in the atmosphere reduce the direct irradiance and reflectance (albedo) of the Earth's surface. The decline, known as the

global dimming, is estimated to have lasted for about four years from 1960 to 1990, after which the trend has reversed. Global dimming may have disrupted the global water cycle by reducing evaporation and precipitation in some regions. It also produces a cooling effect that may have partially masked the effects of greenhouse gases on global warming.

### **Goals of Sustainable Development:**

There are three essential objectives of practical turn of events:

- To limit the exhaustion of common assets while making new turns of events.
- To make an advancement that can be kept up and supported without making further damage the climate.
- To give strategies to retrofitting existing advancements to make them harmless to the ecosystem offices and undertakings.

Worldwide associations like the United Nations, NGOs, help associations and even governments are progressively supporting endeavors to guarantee maintainable advancement objectives are acknowledged for each person no matter how you look at it. Some other most significant manageable improvement objectives set by these bodies include:

#### **1. Destruction of destitution across the world**

These associations basically center around the most un-created and low-pay nations where destitution is overflowing. They plan to destroy destitution no matter how you look at it by extending social assurance programs like school taking care of, money moves, directed food help, social protection and work market projects, for example, ability preparing, mature age benefits, wage endowments, joblessness protection, inability annuities, etc.

#### **2. Advancement of good wellbeing and prosperity**

This practical advancement objective tries to guarantee great wellbeing and prosperity for all at each phase of life. The objective considers all the principle wellbeing needs like maternal and kid wellbeing, conceptive wellbeing, ecological, transmittable and non-transferable

sicknesses, general wellbeing inclusion, and admittance to quality, protected, viable, and moderate antibodies and medications. It additionally advocates for improved wellbeing financing, expanded innovative work, reinforcing the limit of each nation occupied with wellbeing hazard anticipation and the board.

#### **3. Arrangement of Quality Education for All**

This hole should be shut to guarantee maintainable future advancement even as global networks work to guarantee quality and value in the instruction area.

#### **4. Arrangement of Clean Water and Sanitation**

Water and disinfection are on top of the graph with respect to supportable turn of events. They are basic to the endurance of people and the planet. This objective expects to deliver perspectives identifying with disinfection, cleanliness, drinking water and the quality and supportability of water assets across the globe.

#### **5. Supporting Inclusive and Sustainable Industrialization and Incubating Innovation.**

This objective considers three parts of maintainable turn of events: industrialization, foundation, and advancement. Foundation is essential since it offers the fundamental structure important to smooth the running of big business and society on the loose. Industrialization drives up monetary turn of events, yield open positions, thus, lessening levels of destitution. Advancement upgrades the mechanical capacities of modern areas and triggers the improvement of inventive abilities.

#### **Importance of Sustainable Development**

Sustainable development is a hard subject to make certain about on the grounds that it comprises of a wide scope of things. Because of the detail and intricacy of this theme, it's ideal to look at its significance comprehensively to have the option to get a handle on it without any problem.

The populace is the fundamental factor driving up economical improvement crusades. Along these lines, the significance of economical improvement can be seen from this point of view:



### 1. Gives Essential Human Needs

The blast of populace implies individuals should scramble for the restricted life basics like food, asylum, and water. Sufficient arrangement of these fundamental requirements essentially depends on foundation equipped for supporting them for quite a while.

On the off chance that administrations demand using petroleum derivative based wellsprings of energy rather than inexhaustible and reasonable choices, the expense and ecological impacts of providing these essential necessities would turn into a difficult task.

### 2. Agrarian Requirement

A developing populace implies horticulture should make up for lost time. Discovering approaches to take care of beyond what 3 billion individuals can be faltering. On the off chance that a similar impractical development, planting, water system, showering, and collecting strategies are used later on, they may end up being monetarily troubling considering non-renewable energy source assets are projected to run out.

Reasonable improvement centers around supportable farming strategies, for example, viable cultivating methods and harvest turn to advance significant returns while keeping up the honesty of the dirt, which produces nourishment for an enormous populace.

### 3. Oversee Climate Change

Environmental change can be relieved by reasonable improvement rehearses. Feasible improvement rehearses look to decrease the utilization of fossil-based wellsprings of fuel like oil, petroleum gas, and coal. Petroleum derivative wellsprings of energy are impractical since they will drain later on and are liable for the outflow of nursery gasses.

### 4. Monetary Stability

Economical advancement rehearses can make all the more monetarily feasible economies across the globe. Agricultural nations that can't get to petroleum products can use inexhaustible types of energy to control their economies.

From the improvement of environmentally friendly power innovations, these nations can make practical positions rather than limited positions dependent on non-renewable energy source advances.

### 5. Support Biodiversity

Unreasonable turn of events and overconsumption rehearses significantly sway biodiversity. The existence biological system is planned so that species rely upon each other for endurance. For example, plants produce oxygen that people need for breath.

### Conclusion

Sustainable development is important because it respects public budgets, meets the needs of individuals, reconciles ordinary wealth, reconciles ordinary wealth with individuals, and maintains common wealth for groups of people. . To keep improvement and climate in tune, we need to follow the criteria of sustainable development surrounding the 'principle of preparedness' while envisioning our business. This prevents the expected ecological impact of the task by seeking and combining remedial measures. From the assessment stage, take mitigation actions and address climate/eco frameworks by maintaining productive and environmental measures at all stages and in all aspects of development to strategically keep away from or limit climate change. Activities that assess project impacts and help in case of adaptive spoilage are fundamental in our current climate-friendly environment, and their need is critical.

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**EFFECT OF YOGA ON HEALTH RELATED FITNESS OF SUB JUNIOR GIRLS****Principal Dr. R. B. Kadam and Dr. Thakur Arjunsing Narayansing**

Rajiv Gandhi Mahavidyalaya, Mudkhed

**Introduction**

Indian traditional system of Yoga are important which comprises of various asanas and pranayama techniques. The yogic exercises are so designed that while building up the muscles, which all the exercises can do, they strengthen the bones and affect most significantly the involuntary organs of the body . while dealing with health and fitness . basic fitness components that underlie various facts of health , joints and muscles functions and body composition . high level of these components provides abundant to energy , endurance , strength and freedom in the movements of joints to carry out various activities, the practice of asanas confers a flexible body which is strong and supple as well as finely controlled . the strength is due to isometric types of exercises where in the body weight is supported by a few muscles , whose activity and hence strength increases. The suppleness comes through the intense twist and stretch of the muscles and joints .the improvements in and the precise control of muscles functions are achieved due to slow movements , muscles strength and maintaining the stretch for a length of time . this is a very significant difference between yogasanas and physical exercises i.e. the slow movements and postural stability during asana practices which confer an amount of muscular stability during asana practice which confer an amount of muscular stability and control that that cannot be matched by any other exercise technique. Hence, research has undertaken this study to evaluate the efficacy of yoga training on health related physical fitness.

**Methodology**

The present study has been conducted to investigate to the effect of yoga on health related fitness of junior sub Girls.

**Subject**

Sixty (n 60) sub junior Girls aged between 13 to 15 were selected randomly school from

Narhar Kurundkar High school Nanded for this study.

**Experimental Design**

The experimental design followed in this study was a parallel group design considering an experimental group and a control group . sixty subjects were divided randomly into two group viz. Group A(Experimented) / and group B (Control) The design of the experiment was planned in three phases.

- phase \_I; pretest
- phase \_ II; Training (Yoga practices)
- phase\_ III; Post Test and Pre Test (phase-I)

As the purpose of this study was to measure the health related Physical fitness of sub junior Girls standard tests were administered for this purpose . the components of AAHPERD health related physical fitness test was administered to measure health related physical fitness experimental and control groups were exposed to pre test.

**Treatment Stimuli**

After the pre testing was over, all the subject of experimental group underwent a one and half month (6 weeks) training of yoga practices along with their as usual regular exercise daily for forty five minutes except Sunday and holidays.

The total 60 subjects were divided into groups. Group A- Experimental and Group B- control . both the group participated in their regular training schedule. Additionally, the subjects of Group A underwent special training programmer of yoga practice. The subjects of Group B i.e control group were engaged in training as per their schedule but not allowed to participate in yoga programme.

The controlled subjects, altogether did not receive the above mentioned yoga training, were kept busy with some recreational activities for forty five minutes daily in the evening except Sunday and holidays during the total period of experiment.

### Post Test ( Phase III)

Finally, when the treatment or training period of 6 weeks was over the post test on health related physical fitness was assessed for both the group design ( Rothstein, 1985) for two group of equal numbers was adopted for this study . the scores in each criterion measure after the experiment of 6 weeks .

### Variable Selected for the study

To obtain pertinent information about yoga for health related fitness, the following dependent and independent variables were selected. Before and after experiment following variables on all the subjects were assessed with the help of some standard test items:

Variables	Tools/ method used
Abdominal muscles strength/ endurance	Sit ups
Flexibility	Sit and Reach
Body fat%	Skin fold caliper
Cardiovascular endurance	One mile run/ walk

### Major findings

The result of  $2 \times 2 \times 4$  Factorial ANOVA revealed that\_

- Yoga Group showed significant superiority over the Control group in improving abdominal muscles strength (CD=0.50,p<0.01)

- Yoga Group showed significant superiority over the control group in cardiovascular endurance(CD=0.44,pz0.01)
- Yoga group showed significant superiority over the Control group in flexibility(CD=0.53,p<0.01)
- Yoga group did not exhibit significant superiority over the control group in body fat % (CD=0.09,p>0.05)

### Conclusion

Based on the result , this study warrants the following conclusions:

Yoga Programme contributes to improve health related physical fitness sub junior Girls.

### Recommendations

This piece of research recommends that \_ Yoga programme as developed in this study can be incorporated while imparting training to sub junior Girls and boys

### Contribution To The Knowledge

This investigation developed a Yoga training programme that could be applicable for the sub junior girls school , adds a quantum of Knowledge to the literature of physical education and sports especially for Indian sub junior girls Yoga programme as developed in this study can be incorporated while imparting sports training to sub junior Girls.

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**GREEN SYNTHESIS AND CHARACTERIZATION OF ZnO NANO PARTICLE****Sanjukta Roy<sup>1\*</sup>, Shrikant Kalane<sup>2</sup>, D.K. Mahawar<sup>3</sup> and Biswajit Nath<sup>1</sup>**<sup>1</sup>Department of Chemistry, Science College, Kokrajhar, Assam, India-783370<sup>2</sup>Department of Chemistry, Late Pundalikrao Gawali Mahavidyalaya, Sirpurjain, Maharashtra, India<sup>3</sup>Department of Chemistry, University of Rajasthan, Jaipur, Rajasthan, India.Corresponding author: <sup>1\*</sup> sanjukjr7@gmail.com**ABSTRACT**

Zinc Oxide (ZnO), as a material with attractive properties, has attracted great interest worldwide, particularly owing to the implementation of the synthesis of nano- sized particles. The synthesis of ZnO nanoparticles using plant's part is always an attractive and eco-friendly method. Researchers in nanotechnology highlight the possibility of green chemistry pathway to produce technologically important nanoparticles. The present study is focused on synthesis and characterization ZnO nanoparticles from the plant *LeucasCephalotes*. Synthesis nano-particles were characterized through UV-Vis spectroscopy, X-ray fluorescence(XRF) & Fourier transform spectroscopy (FTIR) analysis.

**Keywords:** nanoparticle, green synthesis, environmentally friendly, characterisation.

**1. Introduction**

Nanotechnology is the most innovative field of 21<sup>st</sup> century. Researches in this field has gained momentum in the recent years by providing innovative solutions in different scientific disciplines. This technology is capable of providing miscellaneous novel applications that ranges from innovative fabric compounds, food processing and agricultural production to sophisticated medicinal techniques. It is considered as the synthesis, characterization and exploration of materials in the nanometer region(1-100nm). At this level, the properties and functions of living and anthropogenic systems are defined. In this technology the pertinent materials are those whose structure exhibit new and considerably enhanced physicochemical and biological properties as well as distinct phenomenon and functionalities as a result of nano scale size. This nano scale size generally confers larger surface areas to nanoparticles. Nanoparticles are known as controlled or manipulated particles at the atomic level(1-100). They show size-related properties significantly different from bulk materials [1]

The current existing nanoparticles are classified by their chemical composition namely

- (1) Metallic nanoparticles,
- (2) Nanoparticles of metals and non-metals,
- (3) Semiconductor nanoparticles,

(4) Carbonnanoparticles (fullerenes, nanotubes, graphenes {1,5},diamond),

(5) nanoparticles of organically modified layered silicates and aluminosilicates (nanoclays of different composition etc.) [2]. Among a variety of nanoparticles, ZnO nanoparticles have advantages because of the extraordinary physical and chemical properties. In materials science, zinc oxide is classified as a semi- conductor whose covalence is on the boundary between ionic and covalent semi-conductors. It has high luminescent efficiency, a wide band gap(3.36eV), and a large excitation binding energy (60meV) has triggered intense research on the production of nanoparticles using different synthesis methods and on their future applications. ZnO has high chemical stability, high electrochemical coupling coefficient, broad range of absorption and high photostability so it is a multifunctional material. ZnO crystallizes in two main forms, hexagonal wurzite and cubic zincblende. The wurzite structure is most stable at ambient conditions and thus most common. The zinc blende forms can be stabilized by growing ZnO on substrates with cubic lattice structure. ZnO are available as powders and dispersions. These nanoparticles exhibit antibacterial, anti-corrosive, anti-fungal and UV filtering properties. Zinc is a Block D, Period 4 element while Oxygen is a Block P, Period 2 element. Some of the synonyms of

zinc oxide nanoparticles are oxydatum, zincoxicum, permanent white, ketozinc and oxozinc[3].

ZnO nanomaterials can be used in industry as nano-optical and nano-electrical devices, in food packaging and in medicines as antimicrobial, antitumor agent. Zinc oxide is also used in the manufacture of rubber and cigarettes (used as a filter), as an additive in the manufacture of concrete. The piezo and pyroelectric properties of ZnO mean that it can be used as a sensor, convertor, energy generator and photocatalyst in hydrogen production. Because of its hardness, rigidity and piezo electric constant it is an important material in the ceramic industry, while its low toxicity, biocompatibility and biodegradability make it a material of interest for biomedicine and in pro-ecological systems. In addition, ZnO –NPs have emerged as a suitable tool in drug delivery and sensing horizon[4].

ZnO nanoparticles can be synthesized by various approaches including sol-gel method, chemical precipitation, mechanical milling, organometallic synthesis, microwave method, spray pyrolysis, thermal evaporation, and mechanochemical synthesis. Biosynthesis of nanoparticles is an approach of synthesizing NPs using microorganisms and plants having biomedical applications. The importance of biological synthesis is been emphasized globally at present because chemical methods are capital intensive, toxic, non-eco-friendly and have low productivity. Potential biological system from plants or microbes is being used for biosynthesis of nanoparticles. Nanoparticles synthesized from biometric approach show more catalytic activity and limit the use of expensive and toxic chemicals[5].

Recent studies have shown that ZnO nano particles exhibit a higher degree of cancer cell selectivity with the ability surpass the therapeutic indices of some commonly used chemotherapeutic agents in similar studies [6, 7]. Research on ZnOnano particles as antibacterial agent has become interdisciplinary linking physicists, biologists, chemists and medicine, hence it is the wide spread of their applications. One of these essential applications is in the food industry as an antibacterial agent in food packaging and

towards food borne pathogens. Nano materials possess great concern in food technology for their high reactivity, enhanced bio availability and bio activity and have creative surface possessions [8].

P. Kaur et al. 2011 [9] and P. Narayanan et al., 2012 [10] studied that ZnO- NPs can exhibit antipathogenic properties and kill common as well as major food borne pathogens. The bacterial activity of ZnO- NPs (8-10nm size) against E.coli DH5a and S. Aureas was examined and found to be effective at 80-100gm L-I. This concentration disrupted the cell membrane causing cytoplasmic leakage. They tested the antibacterial activity of ZnO nanoparticles against some human pathogens such as P.aeruginora, E. coli, Saureus and E.faecal. They reported that ZnO nanoparticles have strong antibacterial activity towards these human pathogens. ZnO NPs have recently shown promise as cholesterol biosensor, dietary modulators for hydrolase activity relevant to controlling diabetes and hyperglycaemia ,as well as cell imaging [Wang H, et al.,2009,Dhobale S, et al.,2008]. ZnO NPs show promises in modulating allergic reactions via inhibition of mast cell degradation [11].ZnO nanoparticles have also been shown to exhibit strong protein adsorption properties, which can be used to modulate cytotoxicity, metabolism or other cellular responses[12].One more feature of ZnO NPs as stated that their ability to induce reactive oxygen species (ROS) generation, which can lead to cell death when the anti oxidative capacity of the cell is exceeded.

The antibacterial mechanism of ZnO nanoparticles involve the direct interaction between ZnO nanoparticles and cell surfaces affecting cell membrane permeability, afterwards these nanoparticles enter and induce oxidative stress in bacterial cells, which results in the inhibition of cell growth and eventually cell death; the demonstrated antibacterial activity of ZnO NP recommends its possible application in the food preservation field [13]. Micro-organisms facilitate synthesis of nanoparticles. A number of studies are available on using fungi as ZnO synthesizers. Jain et al isolated 19 fungal cultures from rhizospheric soil. Among those cultures

*Aspergillus aeneus* isolated NJP12 showed highest potential for extracellular synthesis of ZnO under ambient conditions. In another study, fungal filtrate of “*Aspergillus niger*” was used by Jacob and co scientists for the production of ZnO. The synthesized nanoparticles were spherical in shape with an average diameter of 39.4-114.6nm. However, a number of studies are available on using bacteria as green synthesizer for ZnO; for example, bacterial strain “*Aeromonas Hydrophila*” formed spherical and oval shaped nanoparticles with an average diameter of 57.22nm. *Lacto bacillus sporogenes* was reported to produce ZnO of diameter of 5-15nm [14].

In the recent years, the biosynthetic method using plant extracts has received more attention than chemical and physical methods and even than the use of microbes, for the nano-scale metal synthesis due to the absence of any requirement to maintain an aseptic environment. Earlier authors reported that the ZnO NPs were synthesized from *Calotropis procera* aqueous leaf extract, which acts as a reducing and stabilizing agent. ZnO NPs were also been synthesized from *Ocimum Teniflorum* plant extract, *P. caerulea* leaf extract. Green synthesis of ZnO nanoparticles using *Aloe Vera* and also using *Abrus precatorius* seeds extract have been reported.

A variety of synthetic techniques are used for the synthesis of ZnO. These techniques can be divided into three types, that is, chemical, biological, physical methods. Chemical synthesis can further be divided into liquid phase synthesis and gas phase synthesis. Liquid phase synthesis include precipitation, coprecipitation method, colloidal methods, sol-gel processing, water oil microemulsions methods, hydrothermal synthesis, solvothermal, sonochemical and polyol method. And vapour phase fabrication includes pyrolysis and inert gas condensation methods. In a typical precipitation and coprecipitation method, a reducing agent (mostly inorganic alkalis) is allowed to react with the zinc salt. A resultant soluble or insoluble precipitate is produced that is afterwards washed and calcined at different temperatures to obtain the

particular nanoparticles with desired morphology and characteristics. An advantage of sol-gel methods is the insurance of highly pure and uniform structure ZnO. Formation of thorn like ZnO in sol-gel methods was reported by Khan and companions.  $[\text{Zn}(\text{CH}_3\text{OO})_2 \cdot 2\text{H}_2\text{O}]$ , sodium hydroxide (NaOH), and CTAB were used as precursors. Obtained nanoparticles were less than 50nm which showed significant antimicrobial activity. In solvolysis and hydrothermal processes, originators are dissolved in hot solvents (other than water) or water under moderate to high pressure (1-1000 atm) and moderately high to high temperature (100-1000°C). These processes are used to synthesize a variety of zinc nanostructures such as thin films, bulk powders, spheres (3D), rods (2D), and wires (1D).

Physical methods of ZnO nanoparticles include high energy ball milling, melt mixing, physical vapour deposition, laser ablation, sputter deposition, electric arc deposition and ion implementation.

Green routes are used for the synthesis of ZnO because of the least possible number of chemicals utilized that produces least amount of pollutants and are energy efficient as well as cost effective. A number of natural moieties such as plants, fungi, algae, bacteria and viruses are used to synthesize the ZnO.

Plants and plants extract as machinery for metal nanoparticles synthesis are fascinating as they eliminate the need of using hazardous materials as well as the tedious process of culturing and downstream processing. However, plant extracts are more attractive because the methodology is much simpler and cost-effective. Nanoparticle synthesis driven by plant extracts is perhaps the most explored biological source. Plants have the ability to synthesize nanoparticles both via in vivo and in vitro methods. In vitro approaches make use of plants extracts to bio-reduce a particular zinc salt (zinc nitrate, sulfate, chloride and many other) and provide a control over size and shape of the nanoparticles. Basically, plants contain a number of primary and secondary metabolites, for example, tannins, terpenoids, saponins, starches, polypeptides, flavonoids, and phenolic, that act as an excellent reducing

as well as capping agents. Mild solvents like water, ethanol or methanol are used for the extraction of the plant metabolites, which are allowed to react with zinc salt solution under different conditions to obtain a maximum yield.

This present study of project states a green approach for the synthesis of ZnO nanoparticles employing aqueous leaf extract of *Leucascephalotes*. Plant extract was used as the biological reduction agent for synthesizing zinc oxide nanoparticles from zinc nitrate hexa hydrate.

## 2. Materials and methods

### 2.1 Collection and Preparation of Leaf Extract:

Leaves of *Leucascephalotes* leaves are collected from the local area of Kokrajhar. The leaves are washed thoroughly and kept in sunshine for 7-8 days to dry completely. The dry leaf's then crashed and boiled with distilled water for 30 minutes and then the extract is decant in a beaker at kept at 4°C in refrigerator for further use.

### 2.2 Collection of Lab equipment's and Lab setup:

All the necessary materials related to the project work are taken from the laboratory. Beaker, glass rod, funnel, 500ml round bottom flask, 1000 ml beaker, thermometer is needed for the project work. Magnetic stirrer collected from stock of the Chemistry Department and make ready to use.

### 2.3 Chemicals:

Zn(NO<sub>3</sub>)<sub>2</sub>.6H<sub>2</sub>O is taken as precursor for preparation of ZnO nanoparticle.

### 2.4 Synthesis of Nanoparticle:

ZnO nanoparticles to be prepared from Zinc Nitrate solution using leaf extract as a reducing agent by heating on a magnetic stirrer heater.

### 2.5 Analysis and Characterization:

The product of the sample is analyzed and characterized through UV-Vis spectroscopy, XRF and FTIR analysis.

### 2.6 Selection Of The Plant Extract

*Leucascephalotes* is a small plant from the Family Lamiaceae, which is a common weed which also has uses as an edible vegetable and herbal remedy. It has many

common names including guma, dronpuspi, or drone puspi. Dronpuspi is a famous ayurvedic medicinal herb that grows as a weed, especially after a period of rain. It is collected for use as a leafy vegetable in rural areas as well as for its medicinal uses. The traditional use of this herb is for treating snake bite, cough and its other wide uses are like treating liver disorders, jaundice, asthma etc. Therapeutically, it has properties of antimicrobial, insecticidal, fever reducing, larvicidal and inflammation reducing herb.

### 2.7 Chemical Precursors For Zinc Nanoparticle:

Zinc nanoparticles are prepared from variety of zinc compound. Zinc acetate, zinc nitrate, etc. Randomly zinc nitrate is selected for my project to prepare zinc oxide nanoparticle.

### 2.8 Preparation Of Leaf Extract Of Leucas Cephalotes-

The leaves of leucas cephalotes (20gm) were thoroughly washed, dried and then boiled in 200ml distilled water for 15 min. The resulting extract was cooled, filtered using Whatman No.1 filter paper and used as the extract solutions [15, 16, 17].

### 2.9 Synthesis Of Zinc Oxide Nanoparticle-

For the ZnO nanoparticles synthesis, 500ml of leucas cephalotes leaf extract was taken in a 1000ml beaker and boiled to 60-80°C using magnetic stirrer heater. 20 gm of Zinc nitrate was added to the leaf extract of *Leucascephalotes* at (60-70)°C and kept on the magnetic stirrer for several hours until the extract solution reduced to somewhat 100ml. After that, the reduced extract solution is boiled on a burner to reduced it to deep reddish paste. When the solution turns out to deep paste, vigorous stirring was done. Zinc oxide nanoparticles obtained in the form of light brown coloured powder. This powder is mashed in ceramic mortar pestle to get finer nature for characterization purpose [15, 16, 17].



### 3 Result and discussion

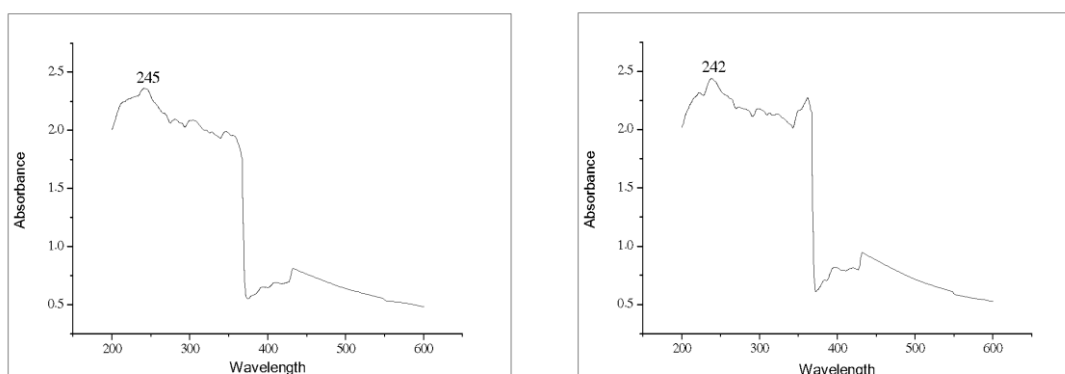
#### 3.1 Characterization of synthesized Zinc Oxide nanoparticles –

The prepared samples are characterized by various recent sophisticated techniques available in Gauhati University, BN College Dhubri and Science College, Kokrajhar and whose facilities are obtained in this short period of time.

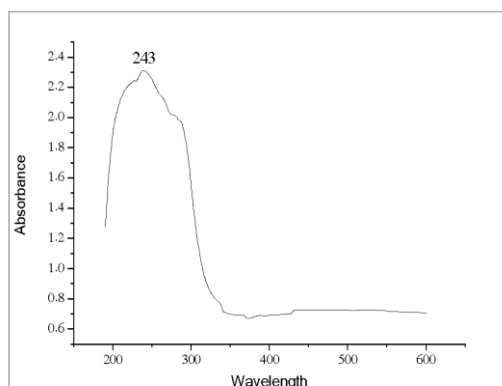
##### 3.1.1 UV-Vis Analysis-

The synthesized Zinc oxide sample is analysed through Double beam UV-Vis spectrophotometer of LABTRONICS, model LT-2700 and the spectra along with UV-Vis spectra of ZnO powder is depicted

in **Fig. 1** and **Fig. 2** respectively. A dilute solution of the sample is prepared in distilled water and absorbance per wavelength is determined the UV-VIS spectrophotometer. The absorbance obtained matched with the absorbance of the ZnO powder. The absorbance of the particles shows maxima at 220 to 245 nm, which are characteristics peak for zinc oxide nanoparticle. The prepared compound shows UV-Vis absorption peak at 230, 242, 243 and 245 which is in compliance to the characteristic peak of ZnO nanoparticle.



**Fig. 1:** UV-VIS Spectra of synthesized ZnO nanoparticles

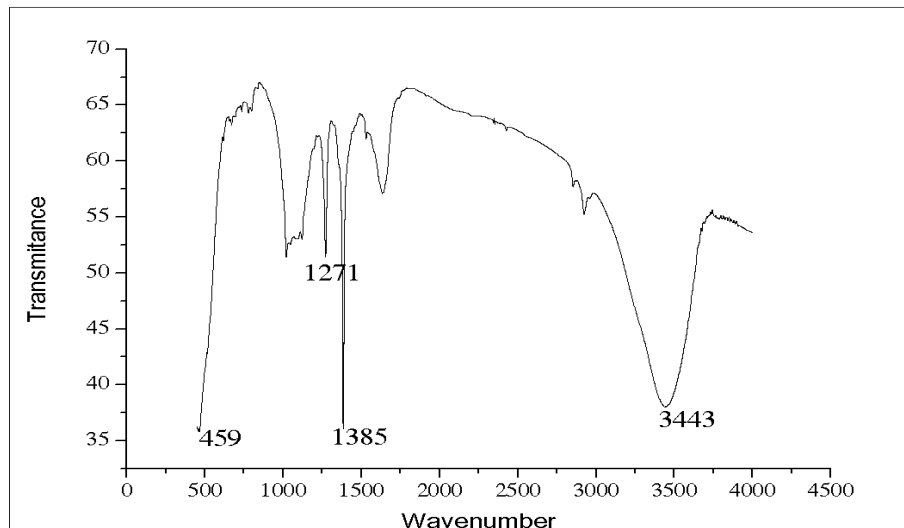


**Fig. 2:** UV-Vis spectra of ZnO powder.

##### 3.1.2 FTIR Analysis-

The FTIR spectra of the prepared ZnO nanoparticle are taken in the Chemistry Department of BN College, Dhubri in Perkin Elmer(USA) FTIR spectrometer Model C-107727 in the range 500-4000  $\text{cm}^{-1}$  FTIR

spectrophotometer. The spectra is portrait in **Fig. 3**. The transmittance at wavenumber 459 and 1271 shows the characteristics peak for ZnO nanoparticle. Transmittance at 1385 and 3443 wavenumbers are the characteristic peak for  $\text{H}_2\text{O}$  absorbed by the sample form the environment.

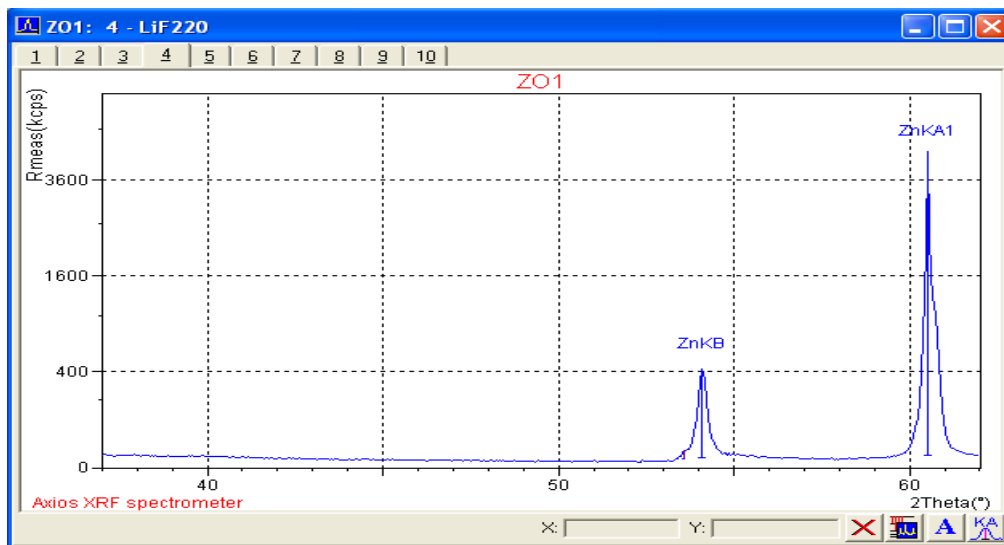


**Fig. 3:** FTIR Spectra of ZnO nanoparticle.

### 3.1.3 XRF Analysis-

The qualitative elemental analysis of the sample is carried out by XRF analysis done from SAIF, Gauhati University in Axios XF

Spectrophotometer. The characteristic intense peak of Zn in the XRF spectra reveals the formation of ZnO in the sample.



**Fig. 4:** XRF spectra of ZnO nanoparticle

## 4 Conclusion

In this study, the green synthesis of zinc oxide nanoparticles using leaf extract of leucas cephalotes provides an environmentally friendly, simple and efficient route for synthesis of nanoparticles. Zinc oxide nanoparticles have been successfully synthesized using this method. The prepared zinc oxide nanoparticles are in nano size shaped and were characterized using XRF,

FTIR and UV-Vis absorption techniques. XRD, and SEM is not determined due to constrain of time. Zinc oxide nanoparticles prepared from above mentioned route are expected to have more extensive application in biotechnology, sensors, medical, catalyst, optical device, coatings, drugs delivery and water remediations. The antimicrobial activity of the prepared ZnO nanoparticles is also not undertaken due to time constrain.

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## AN EFFICIENT AND ONE SPOT SYNTHESIS OF FLUORINATED THIADIAZOLE DERIVATIVE UNDER ULTRASONIC IRRADIATION

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### ABSTRACT

*We have developed an efficient and one-pot synthesis of fluorinated 1,3,4-Thiadiazole by using fluorinated aromatic carboxylic with thiosemicabazide in the presence of phosphorus oxychloride as a catalyst under ultrasonic irradiation with silica-supported. The synthesis compound was characterized by <sup>1</sup>H NMR, IR, and mass spectroscopic techniques. The present approach offers the advantages such as less reaction time, simplicity of the workup procedure, low cost, and mild reaction condition.*

**Keywords:** One Pot, 1,3,4-Thiadiazole, thiosemicarbazide, ultrasonic irradiation

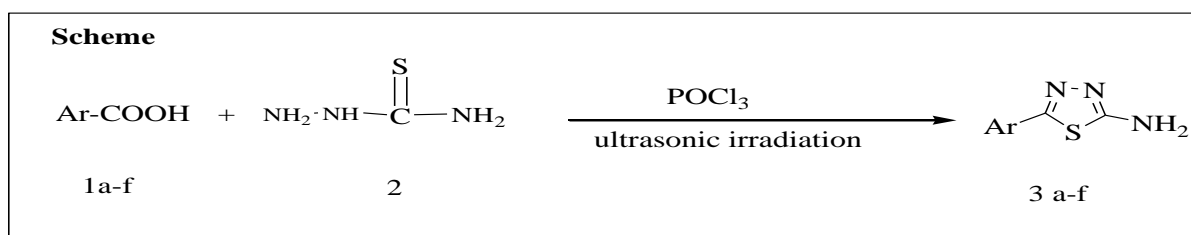
### Introduction

Heterocyclic compounds containing nitrogen, and sulfur atoms played an important role in pharmaceutical sciences. Most of the known organic compounds contain heterocyclic rings in their structure. Heterocyclic moieties are found in many compounds that have biological activity that depends mainly on their molecular structure [1,2], Due to the importance of nitrogen-containing heterocycles in the pharmaceutical industry, medicinal chemistry, various drug development areas, and their importance in material science enough importance is given to their synthesis and characterization.

Nitrogen-containing heterocyclic scaffolds have extensive therapeutic uses such as antimicrobial (3), Antibacterial<sup>4</sup>, anticancer<sup>5</sup>, anti-inflammatory<sup>6</sup>, anti-HIV<sup>7</sup>, anti-malarial<sup>8</sup>. 1,3,4-thiadiazoles derivatives are five-member with exciting isomeric forms of thiadiazoles<sup>9</sup>. Compounds containing a 1,3,4-thiadiazole template have

received momentous attention in chemical, medicinal, and pharmaceutical research as this structural scaffold is found in a variety of drugs. 1,3,4-thiadiazole and its derivatives are showing immense importance in medicinal chemistry research due to biological activity as well as producing useful intermediates in several organic preparations.

In the present day, the development of superior synthetic methodologies for industrial applications is becoming immensely significant, especially for the synthesis of organic heterocyclic scaffolds with important medicinal, pharmaceutical, and agrochemical activities. 1,3,4-Thiadiazoles are heterocyclic scaffolds incorporated in many compounds presenting various pharmacological activities such as anticonvulsant<sup>10</sup>, antiviral<sup>11</sup>, anti-inflammatory<sup>12,13</sup>, anticancer<sup>14</sup>, antibacterial<sup>15</sup>, antimicrobial<sup>16,17</sup>, antiproliferative<sup>18,19</sup>, antioxidant<sup>20</sup>, antitubercular<sup>21</sup>, antitumor<sup>22</sup>, anticancer<sup>23</sup>.



## Materials and Methods

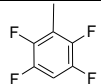
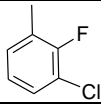
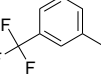
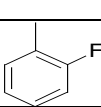
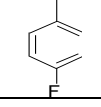
**General:** All solvents and reagents were purchased from Merck India Ltd and are of AR Grade and used without further purification. Melting Points were determined by the open capillary method and reported as uncorrected. The completion of reaction and purity of the synthesized compounds were checked by TLC (0.5 mm thickness) using silica gel-G coated Aluminum plates (Merck).

## Synthesis of Fluorinated 1,3,4-thiadiazol-2-amine **3** (a-f) under ultrasonic irradiation.

The mixture of fluoro substituted aromatic carboxylic acid (0.01 mole), thiosemicarbazide (0.01 mole), Silica oxide, and 5 ml of phosphorus oxychloride were added. The mixture was subjected to ultrasonic irradiation at 110°C for 15 for 15–20 min. The completion of the reaction was monitored by TLC. After completion of the reaction, the RBF was removed from the oven. The reaction mixture was poured onto crushed ice dropwise with continuous stirring, neutralized by saturated KOH. Then filter, dried, and re-crystallized from ethanol.

## Results and Discussion

**Table .1.** Physical data of synthesized compounds **3**(a-e) under ultrasonic irradiation

Entry	Compound	Ar	Reaction Time (min)	Yield (%)	M.P.(°C)
1	3a		15	91	222
2	3b		20	88	236
3	3c		15	90	155
4	3d		20	90	165
5	3e		15	88	236

An efficient, simple, and one-pot procedure is reported for the synthesis of fluorinated 1,3,4-Thiadiazole derivative in the presence of phosphorus oxychloride under ultrasonic irradiation technique. 1,3,4-Thiadiazole derivatives are synthesized by fluorinated aromatic carboxylic acid under above of mention conditions. The formation of substituted 1,3,4-Thiadiazole derivative was confirmed by recording their IR, <sup>1</sup>H NMR, and mass spectral data. The compound 5-(3-Chloro-2-fluoro-phenyl)-[1,3,4]thiadiazol-2-ylamine (**3a**). does not show absorption band at

1702 (carbonyl stretching) broad band at 703 (C-S-C) is present. It shows absorption band at 1009, 1487, and 1607 cm<sup>-1</sup> is for C-F, C=C, C=N, and stretching respectively. <sup>1</sup>H NMR of compound **3a** showed a broad singlet in the region of  $\delta$ :7.40 which is due to de-shielded caused by the four fluorine proton, the singlet at 8.00 for the NH<sub>2</sub> of thiadiazole. The mass spectrum of **3a** showed a molecular ion peak at m/z 230 which is in agreement with the molecular formula C<sub>8</sub>H<sub>3</sub>F<sub>4</sub>N<sub>3</sub>S. in conforming to the Molecular Structure of **3b**.

### Conclusions

In conclusion, we have reported an efficient and one-pot method for the synthesis of fluorinated 1,3,4-Thiadiazole by using fluorinated aromatic acid and thiosemicarbazide in the presence of phosphorus oxychloride under ultrasonic irradiation. This method offers several advantages, including the low cost, high yields, clean reactions, and short reaction time for the synthesis of one-pot synthesis of 1,3,4-thiadiazole. These derivatives have been given a key to more modifications in pharmacophore replacements.

### Data Availability

#### 5-(3-Chloro-2-fluoro-phenyl)-[1,3,4]thiadiazol-2-ylamine (3a)

Yield 84 %, m.p. 151°C; IR spectrum  $\text{cm}^{-1}$ : 703 (C-S-C stretching), 3385 ( $\text{NH}_2$  stretching); 1487 (C=C Ar stretching), 1607 (C=N stretching), 1009 (C-F stretching);  $^1\text{H}$  NMR spectrum,  $\delta$ , ppm: 7.40 (dd,  $J=7.96, 8.4$ , 1H),

7.52 (1H, d,  $J=7.96$ , 1H), 8.00 (s, 2H), 8.16 (d,  $J=8.4$ , 1H). (MS:  $m/z$ : 230 (M+H)

#### 5-(2,3,5,6-Tetrafluoro-phenyl)-[1,3,4]thiadiazol-2-ylamine (3b)

Yield 82 %, m.p. 222 °C; IR spectrum,  $\nu$ ,  $\text{cm}^{-1}$ : 793 (C-S-C stretching), 3313 ( $\text{NH}_2$  stretching); 1413 (C=C Ar stretching), 1595 (C=N stretching), 1030 (C-F stretching);  $^1\text{H}$  NMR spectrum,  $\delta$ , ppm: 8.02 (s, 1H), 8.01 (s, 1H). (MS:  $m/z$ : 250 (M+H)<sup>+</sup>.

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### Conflicts of Interest

Authors do not have any conflict of interest with any person, institution, or agency

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# 1-BUTYL-3-METHYL IMIDAZOLIUM CHLORIDE MEDIATED ONE-POT THREE COMPONENT SYNTHESIS OF PYRIMIDO[4,5-D][1,3,4]THIADIAZOLO[3,2-A]PYRIMIDINE-6,8(7H)-DIONE AND THEIR ANTIOXIDANT EVALUATION

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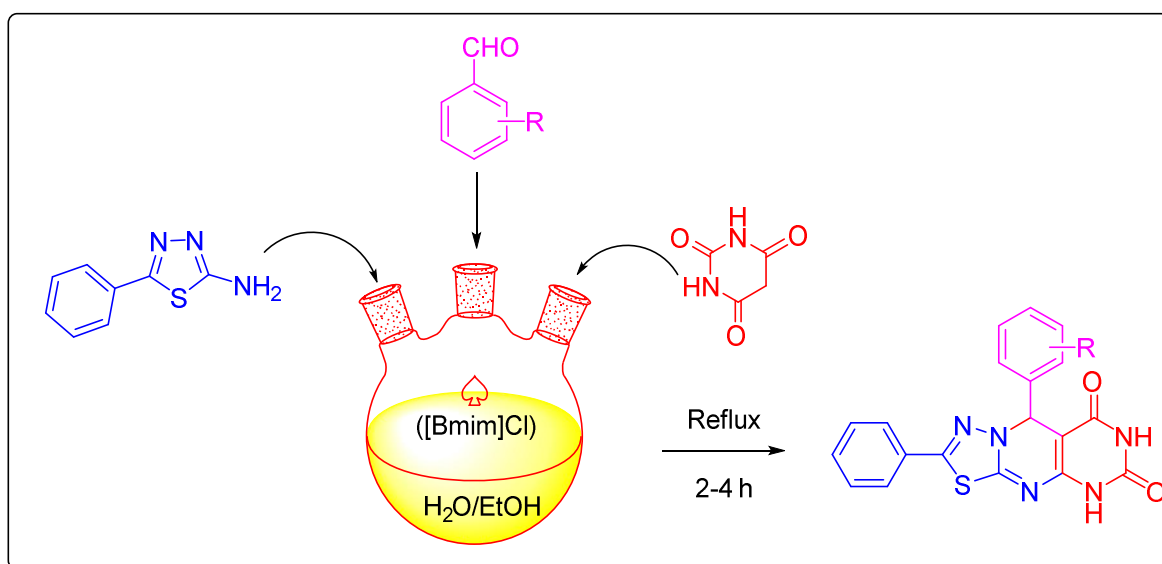
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## ABSTRACT

A green, most efficient procedure has been developed for the synthesis of 9-substituted derivatives of 9-(4'-phenyl)-2-phenyl-5,9-dihydro-6-*H*-pyrimido[4,5-*d*][1,3,4]thiadiazolo[3,2-*a*]pyrimidine-6,8(7*H*)-dione from a multicomponent one pot three component condensation of 2-amino-5-phenyl

1,3,4-thiadiazole, barbituric acid was refluxed 1-Butyl-3-methyl Imidazolium Chloride([Bmim]Cl) in water-ethanol with different substituted aromatic aldehydes. The formed compounds were screened potent Antioxidant activity.



**Keywords:** 2-amino-5-phenyl 1,3,4-thiadiazole, Barbituric acid, Aromatic Aldehyde, MCR's.

## Introduction:

Heterocyclic compounds have broad attention towards organic chemistry due to availability in natural products and medical as well as biological properties [1]. The literature survey reveals that various thiadiazoles have resulted in many potential drugs and are known to exhibit a wide range of pharmacological and biological properties like antimicrobial [2], anti-inflammatory [3] and anticancer [4].

In a multicomponent reaction (MCRs) three or more reactants are converted into a higher molecular weight compound in a one pot method. The MCR has become very popular in

the today's Chemistry. Thiadiazolo[3,2-*a*]pyrimidinedione derivatives occupies an important position in chemistry and biology. The most chemist widespread has growing interest to the development of Thiadiazolo[3,2-*a*]pyrimidine dione due to the diverse pharmacological as well as biological properties such as antifungal activity [5], antitumor [6], antioxidant [7], anticonvulsant [8], antihypertensive [9], analgesic [10], anti HIV activity [11], antibiotics [12]. In addition to these derivatives show diverse application in agrochemical industry and pharmaceutical industry

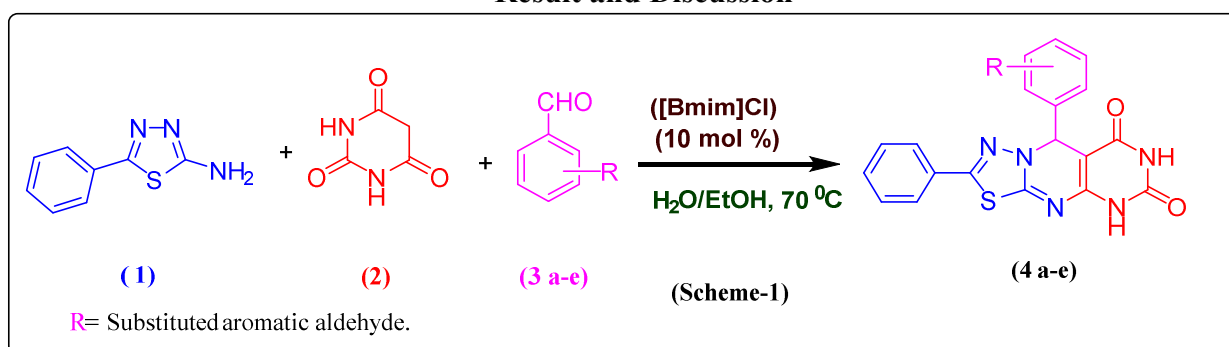


Thiadiazolo[3,2-*a*]pyrimidinesynthesiswas reported using the various catalyst such as 2-[5-(4-methoxyphenyl)4-*H*-1,2,4-triazole] acetic acid[13], NaOH in ethanol[14], SBA-15[15]. Some of the method reported above use expensive catalysts, strong acidic conditions, higher temperature, require long reaction time, resulting cumbersome product isolation procedure.

Recent days, 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl), act as a phase transfer catalyst (PTC) and it perform much organic transformation under mild condition. Thus new

route utilizing a MCR protocol, for the synthesis of triazolo [1,5-*a*] pyrimidinedione can attacks considerable attention in the search of method for rapid entry of these heterocycles. Consequently, we thought that there is scope for further innovation towards milder reaction condition, short reaction time and better yield in choosing 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) for this multicomponent reaction (MCRs). The mild Lewis acidity associated with 9-dihydro-6 *H*-pyrimido[4,5-*d*][1,3,4]thiadiazolo[3,2-*a*]pyrimidine-6,8(7*H*)-dione having potent antioxidant activity.

### Result and Discussion



Our firstly efforts were focused on optimization reactioncondition. The reaction mixture of 2-amino-5-phenyl 1,3,4-thiadiazole, barbituric acid was refluxed1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) in water-ethanol with different substituted aromatic aldehydes, was considered as a model reaction (**Scheme1**) for investigating the effectiveness of different polar and non polar solvent using catalytic amount of molecular iodine (10 mol%). Solvent optimization clearly suggested that H<sub>2</sub>O/EtOH is the best solvent for the desired transformation due to fast reaction rate and high yield (Table1, entry 6). The other polar protic solvents gives moderate yield (Table1, entry 5). While other aprotic solvent like THF, DMF, ethylene dichloride and 1,4-dioxane displayed slow reaction rates leading lower yield(Table1, entry 1-4).

We have carried out the model reaction using different stoichiometric amount of catalyst. The catalyst screening result are summarized in Table 2. It was observed that the excellent yield was achieved by using 10 mol% of 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) (Table 2,entry 5).

After investigating the influence of different parameters on the model reaction, we turned our attention towards the 9-substituted derivatives of 9-(Substituted phenyl)-2-phenyl-5,9-dihydro-6*H*-pyrimido[4,5-*d*][1,3,4]thiadiazolo[3,2-*a*]pyrimidine-6,8(7*H*)dione(**4a-e**)using one pot three component reaction of 2-amino-5-phenyl 1,3,4-thiadiazole(**1**)barbituric acid (**2**)was refluxed1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) in water-ethanolwith different substituted aldehydes (**3a-e**), and the result are summarized in Table 3. With the both electron-poor and electron-rich benzaldehydes (Table 3, entries 1-3 and 4-5 ), the corresponding 9-substituted of pyrimido[4,5-*d*][1,3,4]thiadiazolo[3,2-*a*]pyrimidine-6,8(7*H*)dione derivatives (**4a-e**)were obtained to excellent yields. These synthesized products (**4a-e**) were completely characterized from IR, <sup>1</sup>H-NMR, Mass and <sup>13</sup>C-NMR spectroscopic technique and also elemental analysis.

The overall, mechanismtakes place according to Knoevenagels-Micheal reaction (**Scheme-II**).

**Table 1.** Optimization of the reaction conditions using different solvents.<sup>[a]</sup>

Entry	Solvent	Reaction Time (h)	Yield (%) <sup>[b]</sup>
1	1,4-dioxane	6.0	35
2	Ethylene dichloride	8.0	40
3	THF	9.0	45
4	DMF	6.0	50
5	EtOH	5.5	65
6	H2O/EtOH	4.0	80

<sup>[a]</sup> **Reaction conditions:** 2-amino-5-phenyl 1,3,4-thiadiazole (1 mmol), barbituric acid (1 mmol) with substituted benzaldehydes (1 mmol) and 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) in water-ethanol were refluxed at 70°C.

<sup>[b]</sup> Isolated yields.

**Table 2:** Optimization Study for the amount of 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl)<sup>[a]</sup>

Entry	Catalyst (mole %)	Temperature (°C)	Reaction Time (h)	Yield % <sup>[b]</sup>
1	01	70	4.0	40
2	02	70	4.0	50
3	05	70	4.0	60
4	08	70	4.0	72
5	10	70	4.0	80
6	15	70	4.0	80
7	20	70	4.0	80

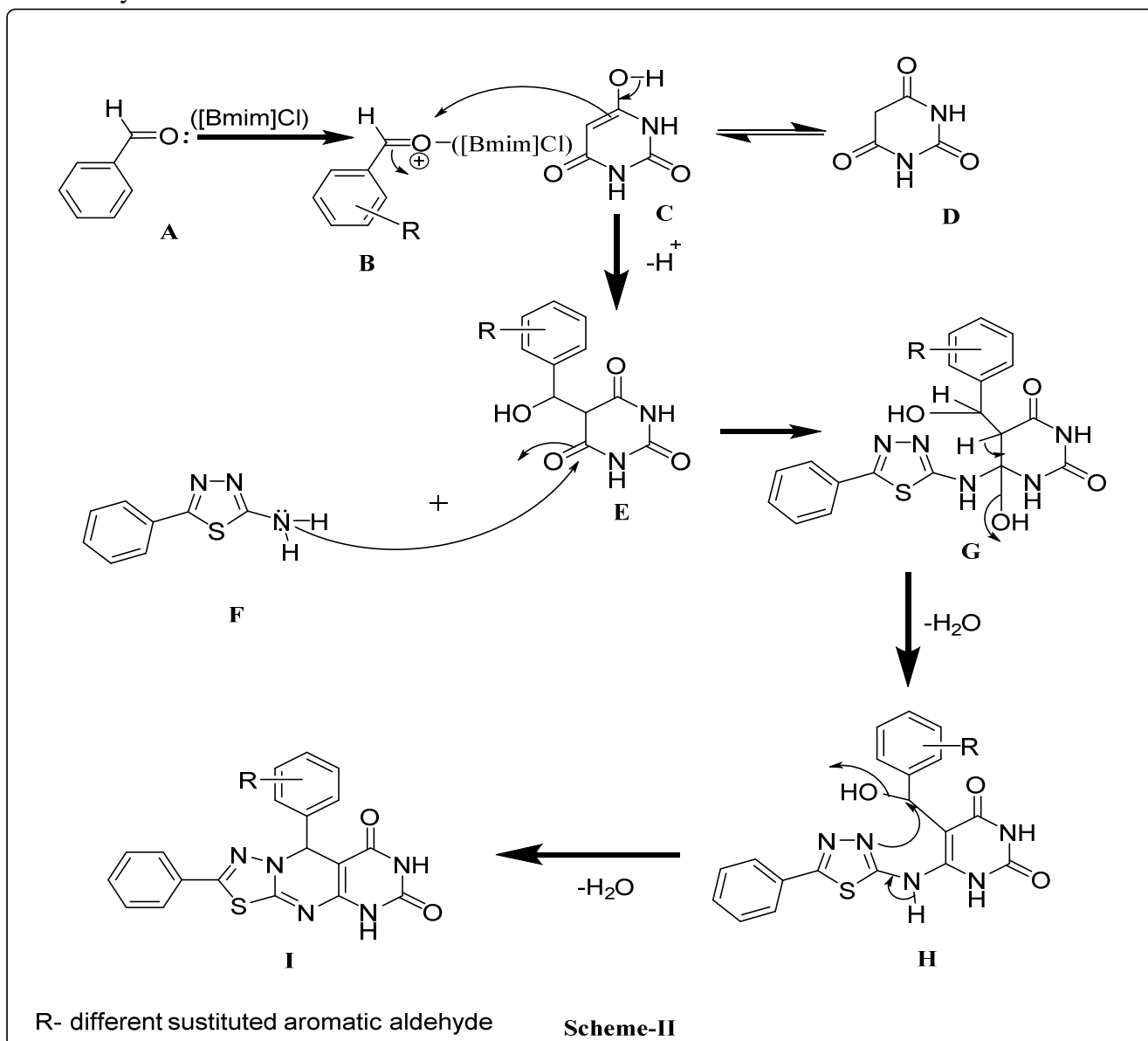
<sup>[a]</sup> **Reaction conditions:** 2-amino-5-phenyl 1,3,4-thiadiazole (1 mmol), barbituric acid (1 mmol) with substituted benzaldehydes (1 mmol) and 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) in water-ethanol were refluxed at 70°C.

<sup>[b]</sup> Isolated yields.

**Table 3:** Three component reaction of 2-amino-5-phenyl 1,3,4-thiadiazole(1), barbituric acid(2), and aromatic aldehydes (3a-e) for the synthesis of (4a-4e).<sup>[a]</sup>

Entry	Aldehyde (3a-e)	Products (4a-4e)	Time (h)	Yield (%) <sup>[b]</sup>	M.P. (°C)
1			3.0	68	201-203
2			3.5	80	211-213
3			4.0	78	341-343
4			3.5	80	226-228
5			3.0	78	231-233

<sup>[a]</sup> **Reaction conditions:** (1) (1 mmol), (2) (1 mmol), (3a-e) (1 mmol) and acetonitrile in Iodine were refluxed at 70°C.  
<sup>[b]</sup> Isolated yields.



### Experimental

Open capillary tubes were used for melting points of isolated synthesized compounds and are uncorrected. Perkin-Elmer FTIR spectrophotometer was used for IR (KBr) spectra of compounds. Mass spectral data were recorded on liquid chromatography mass spectrometer (Shimadzu 2010Ev) using ESI probe. The  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra were recorded on various spectrometers at 300 & 400 MHz using TMS as an internal standard.

### General procedure for the synthesis of 9-(4'-phenyl)-2-phenyl-5,9-dihydro-6H-pyrimido[4,5-d][1,3,4]thiadiazolo[3,2-a]pyrimidine-6,8(7H)-dione (4a-e) :

A mixture of 2-amino-5-phenyl 1,3,4-thiadiazole (1) barbituric acid (2) was refluxed 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) in water-ethanol with different substituted aldehydes (3a-e), to isolate the respective products (4a-e). The reaction mixture was cooled to room temperature and poured into ice cold water. The solid obtained was filtered, washed with water and recrystallized by ethanol to give (4a-e). The reaction was

monitored by TLC. These synthesized products (**4a-e**) were completely characterized from IR, <sup>1</sup>H-NMR, Mass and <sup>13</sup>C-NMR spectroscopic technique and also elemental analysis.

#### Spectral Analysis:

##### 2,9-diphenyl-5,9-dihydro-6H-pyrimido[4,5-d][1,3,4]thiadiazolo[3,2-a]pyrimidine-6,8(7H)-dione(**4a**) :

M.P.201-203<sup>0</sup>C, Yield 68%. IR (KBr/ cm<sup>-1</sup>) 3228 (-NH),1701,1623 ( 2 C=O);<sup>1</sup>H NMR (400MHz, DMSO-d<sub>6</sub> /ppm) δ 6.8 (s, 1H, -CH),δ6.7-7.9(m, 10 H, Ar-H),δ 10.8 and δ 11.4 (2 bs,2H,-NH); EI-MS (m/z: RA %): 375 (M<sup>+</sup>, 100%),. Elemental analysis calculated dataforC<sub>19</sub>H<sub>13</sub>N<sub>5</sub>O<sub>2</sub> S; C, 60.79; N,18.86. Found:C, 60.81; N,18.88.

##### 9-(4'-methoxyphenyl)-2-phenyl-5,9-dihydro-6H-pyrimido[4,5-d][1,3,4]thiadiazolo[3,2-a]pyrimidine-6,8(7H)-dione(**4b**) :

M.P.211-213<sup>0</sup>C , Yield 80%. IR (KBr/ cm<sup>-1</sup>) 3209 (-NH),1731,1674 ( 2 C=O),1269(-O-R);<sup>1</sup>H NMR (400MHz, DMSO-d<sub>6</sub> /ppm) δ 3.07 (s, 3H, -Ar-OCH<sub>3</sub>), δ 6.40 (s, 1H, -CH),δ 7.0-8.5(m, 9H, Ar-H),δ 11.1 and δ 11.3 ( 2 bs, 2H,-NH); EI-MS (m/z: RA %): 305 (M<sup>+</sup>, 100%). <sup>13</sup>C NMR (400 MHz, DMSO-d<sub>6</sub>/ppm ) δ: 163,160, 151, 150, 155, 143, 140, 128,127,90,57, 51, 40, 39, 38. Elemental analysis calculated dataforC<sub>20</sub>H<sub>15</sub>N<sub>5</sub>O<sub>3</sub>S; C, 59.25; N,3.73. Found:C, 59.26; N,3.75.

##### 9-(4'-hydroxyphenyl)-2-phenyl-5,9-dihydro-6H-pyrimido[4,5-d][1,3,4]thiadiazolo[3,2-a]pyrimidine-6,8(7H)-dione(**4c**) :

M.P.341-343<sup>0</sup>C, Yield 78% .IR (KBr/ cm<sup>-1</sup>) 3450 (-OH),3274(-NH) 1720, 1670 (2C=O);<sup>1</sup>H NMR (400MHz, DMSO-d<sub>6</sub> /ppm) δ 6.86 (s, 1H, -OH), δ 6.8 (s, 1H, -CH),δ7.4-8.3(m, 9H, Ar-H),δ 10.8 and δ 11.1 ( 2 bs, 2H,-NH); EI-MS (m/z: RA %): 391 (M<sup>+</sup>, 100%),. <sup>13</sup>C NMR (400 MHz, DMSO-d<sub>6</sub>/ ppm ) δ: 168,164, 163,155, 150, 138, 132, 129,123,115,114.Elemental analysis calculated dataforC<sub>19</sub>H<sub>13</sub>N<sub>5</sub>O<sub>3</sub>S; C, 58.30; N,17.89. Found:C, 58.32; N,17.92.

##### 9-(3'-bromophenyl)-2-phenyl-5,9-dihydro-6H-pyrimido[4,5-d][1,3,4]thiadiazolo[3,2-a]pyrimidine-6,8(7H)-dione (**4d**) :

M.P.226-228<sup>0</sup>C, Yield 80%. IR (KBr/ cm<sup>-1</sup>) 3136 (-NH),1697,1604 (2C=O);<sup>1</sup>H NMR (400MHz, DMSO-d<sub>6</sub> /ppm) δ 5.7(s, 1H, -CH),δ 7.0-8.2(m, 9H, Ar-H),δ 10.4and δ 11.1 ( 2 bs, 2H,-NH); EI-MS (m/z: RA %): 456 (M<sup>+</sup>+3,

100),. <sup>13</sup>C NMR (400 MHz, DMSO-d<sub>6</sub>/ppm ) δ: 169, 168,167, 164, 161,156, 152, 150, 146, 135,134, 130, 129,126, 121, 120. Elemental analysis calculated dataforC<sub>19</sub>H<sub>12</sub>N<sub>5</sub>O<sub>2</sub>BrS; C, 50.23; N,15.42. Found:C, 50.25; N,15.44.

##### 9-(2',4'-dichlorophenyl)-2-phenyl-5,9-dihydro-6H-pyrimido[4,5-d][1,3,4]thiadiazolo[3,2-a]pyrimidine-6,8(7H)-dione(**4e**) :

M.P.231-233<sup>0</sup>C, Yield 75%.IR (KBr/cm<sup>-1</sup>) 3132 (-NH),1693,1600 (2C=O);<sup>1</sup>H NMR (400MHz, DMSO-d<sub>6</sub> /ppm) δ5.7(s, 1H, -CH),δ7.11-8.39(m, 8H, Ar-H),δ 10.47 and δ 11.29 ( 2 bs, 2H,-NH); EI-MS (m/z: RA %): 443 (M<sup>+</sup>+1, 100%),. <sup>13</sup>C NMR (400 MHz, DMSO-d<sub>6</sub>/ppm) δ: 168, 167(C=O), 160,149 (C-4b), 135,134,133,130,129 128, 126, 121, 78,40,39,38. Elemental analysis calculated dataforC<sub>19</sub>H<sub>11</sub>Cl<sub>2</sub>N<sub>5</sub>O<sub>2</sub>S; C, 51.36; N,15.76. Found:C, 51.38; N,15.78.

#### Antioxidant Activity

##### A) DPPH (1, 1-diphenyl-2-picrylhydrazyl) radical scavenging assay:

DPPH (1,1-diphenyl-2-picrylhydrazyl) radical scavenging assay was performed as per earlier reported method<sup>[16]</sup>. The reaction cocktail was prepared by mixing individual newly synthesized organic compounds is added to equal volume of 0.1 mM solution of DPPH radical in absolute ethanol. After 20 minutes of incubation at room temperature, the DPPH reduction was calculated by reading the absorbance at 517 nm using UV-Visible spectrophotometer. Ascorbic acid (1mM) was used as reference compound.

The compound (**4d and 4e**) shows remarkable antioxidant activity against DDPH radical scavenging activity with reference of ascorbic acid (91.4 ± 0.020).

##### B) OH radical scavenging assay

Hydroxy radicals scavenging activity was measured with Fenton's reaction (Rollet – Labelle et al., 1998). The reaction mixture contained 60 µl of FeCl<sub>2</sub> (1mM), 90 µl of 1,10-phenanthroline(1mM), 2.4 ml of phosphate buffer (pH 7.8),150 µl of 0.17M H<sub>2</sub>O<sub>2</sub> and 1.5 ml of individual newly synthesized organic compounds (1mM).The reaction mixture was kept at room temperature for 5 minutes incubation and the absorbance was recorded at

560 nm using UV-Visible spectrophotometer. Ascorbic acid (1mM) was used as the reference compound.

The compound (**4c**, **4d** and **4e**) shows good OH radical scavenging activity as compared with Ascorbic acid ( $89.5 \pm 0.019$ ).

**Table 4:** Antioxidant activity of tested compounds (4a-4e).

Entry	Compound Code	% Radical scavenging activity	
		DPPH radical scavenging	OH radical scavenging
1	<b>4a</b>	$42.2 \pm 0.80$	$56.1 \pm 1.20$
2	<b>4b</b>	$68.6 \pm 0.84$	$66.2 \pm 1.65$
3	<b>4c</b>	$65.9 \pm 1.79$	$75.2 \pm 1.32$
4	<b>4d</b>	$88.4 \pm 1.30$	$80.9 \pm 0.22$
5	<b>4e</b>	$71.4 \pm 0.71$	$79.2 \pm 1.30$
6	<b>Ascorbic Acid (Standard)</b>	<b><math>91.3 \pm 0.020</math></b>	<b><math>89.5 \pm 0.019</math></b>

## Conclusion

In conclusion, we have developed an efficient, green and easy protocol for synthesis of 9-substituted derivatives of 9-(Substituted phenyl)-2-phenyl-5,9-dihydro-6H-pyrimido[4,5-d][1,3,4]thiadiazolo[3,2-a]pyrimidine-6,8(7H) dione by reaction of corresponding substituted aldehydes, 2-amino-5-phenyl 1,3,4-thiadiazole and barbituric acid in presence 1-Butyl-3-methyl Imidazolium Chloride ([Bmim]Cl) in water-ethanol. The product can be easily isolated by simple workup technique, short time, less expensive, requires ambient reaction condition, and give excellent yield. Among these synthesized compounds showed potent Antioxidant activity.

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**ENVIRONMENT AND PHYSICAL EDUCATION: ATTUNEMENT IN HEALTH AND FITNESS****Dr. Pramod N. Humbad**Director of Sports & Physical Education, M. E. S. Arts & Commerce College Mehkar Dist. Buldhana

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**ABSTRACT**

*Sports occupy a special place in modern life, with millions of people around the world watching and participating in their favorite games. Ironically, despite the relaxation and health benefits of exercise, it can also be harmful to the environment. To remedy this, professional teams and colleges across the country are transforming sport into a positive force for ecological change by adopting sustainable practices. "If you build a stadium in the middle of a city and can hold 80,000 people a day, the environmental impact is enormous." University of North Carolina Natural Resources "Trash, water and air pollution are undeniable. to reduce adverse effects. A significant impact of football matches is air pollution, mainly from transportation and tailgating. Two years ago, Bunds and Jonathan Casper, an associate professor at the School of Parks, Recreation and Tourism Management, conducted an air pollution study at his Carter Finley stadium in North Carolina. The research ended with some interesting results.*

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**Introduction**

Like many good ideas in the academic spirit, this special issue was conceived through a thematic symposium. At the 1st Critical Health Study (CHESS) Conference in Queenstown, New Zealand, May 2018, given a simple (and optimistic) conversation, "Human Health: Environmental Coordination in Health Education" (Fitzpatrick et al., 2019). ; instead of whining that "somewhere the grass is (or could be) greener", "new grass is growing". The aim was to expand the possibilities and practices of educational and embodied connections to environmental knowledge about place, space and nature in the fields of health, sport and physical education. (Trout, 2008, p. 63) or a deep sensory, even spiritual sense of caring for others, focusing on the concept of the environment and the connections between body, mind, culture, nature, land and water. Matching (Brymer et al. 2010). At the time, Nicole was working on blue space research and how ideas about participating in national parks and green spaces intermingled with discussions about health and fitness through advertising and her social media. Rosie has worked with Australian Aboriginal elders on health, nutrition and nutrition education, and shared her environmental knowledge with her community on garden and farm trips. Through this practice with future teachers, imaginary opportunities for adaptation were realized and students were introduced to a new curriculum with learning

tasks that incorporate and leverage Australian curriculum sustainability and Aboriginal skills. A cross-sectional analysis was performed. While we accept that a person's surrounding conditions constitute part of what we are referring to as 'environment', we want to call for a more expansive and political approach to the concept. The Introductory paper of this Special Issue takes this up in more detail to examine how within the field of health and physical education the term environment is often used in a generalist sense to describe a particular context that could influence performance or participation. In Sport, Education and Society, articles have examined sports or athlete environments, or non-competitive environments (e.g. Dhillon et al., 2020), but few have examined the relationality of environment to pedagogy. The exceptions are Sanderud et al.'s (2020) work on Bildung and children's perspectives on nature-play relationships in snow-covered playgrounds which examines the way movement memories are entangled in the geographical materiality of weather. Other examples include recent valuable scholarship on informal sport (O'Connor & Penney, 2021), exercise and the environment (Hitchings & Latham, 2017), eco-motricity (Pazos-Couto et al., 2021), outdoor education (Dyment & Potter, 2015; Quay, 2016) and sustainability (Truong, 2017), all of which has included notions of the environment and nature as a unique and important (yet often marginalised) intersection with movement and physical education. This collection of literature

explores both long-standing issues in the field, particularly those related to the marginalization of outdoor education, and recent empirical developments that track changes in social and cultural practices regarding health and sport participation. I'm looking into Point out. There are many other publications that complement this section and can be used for inspiration. For example, eco-friendly exercise, recreation and therapeutic landscapes (Olafsdottir et al., 2017), the natural environment, physical activity and health (Jansen et al., 2017; Merchant & Wiltshire, forthcoming), equity in children's health, etc. is. Questions and surveys on access to green spaces. Space (Feng & Astell-Burt, 2017). Also the Sustainable Development Goals (Barakat et al., 2016) and social, environmental and commercial health decisions that address health equity, policy and promotion. A framework of factors (Baum, 2007; Maani et al., 2020; Friel et al., 2011; Schwerdtle et al., 2020). The first article in this issue clarifies our position on environmental sustainability by outlining four statements.

- We live in a world that is constantly changing and challenging established approaches to human and environmental health care (Patrick et al., 2015). Our attunement must focus on the premise that the environment shapes health and that human health depends on the natural world.

- Health, physical education, and environmental knowledge must be integrated through a holistic and participatory approach that recognizes changes in social and cultural practices in both the built and natural environments. This includes, among other things, a sensitivity to narrative and place ontology. In particular, indigenous peoples and indigenous land ontologies like country and practices like Dadiri or deep listening to build emotional relationships of 'love, compassion and solidarity' (Atkinson, 2002) (Renshaw & Tooth, 2017).

This Special Issue on environmental attunement introduces seven papers that interact with a variety of various insights and practices of nature-subculture and embodied connections to area throughout fitness, recreation and bodily schooling. We have organised the papers into 3 topics that discover

opportunities for: (i) notions of the surroundings and `nature` in studies and exercise; (ii) opportunities and demanding situations of translating surroundings, sustainability and `nature` from coverage and curriculum files into exercise; and (iii) philosophical and theoretical hyperlinks to emplaced and embodied mastering – past-present-future. These are never distinctive topics and readers will comprehend different styles of theoretical and empirical opportunity in addition to essential geographical and contextual nuances that want to be explored in addition. Because of this, we are hoping that this series conjures up in addition submissions via an prolonged name for papers that interact with the demanding situations and the opportunities of ways we'd method the complicated environmental, ecological, political and cultural elements that form fitness, recreation and bodily schooling in modern times.

Sports are closely tied to nature. Healthy sports require a healthy environment. For many athletes, this proximity to nature is a source of motivation and inspiration.

Sports facilities, events, activities and the manufacture of sporting goods have an impact on the environment. Energy use, air pollution, greenhouse gas and ozone depleting emissions, waste disposal, waste use and impacts on biodiversity are all issues that the sport community must address. UNEP has been actively involved in work on sport and the environment for over ten years. UNEP is committed to: Use the popularity of sports to promote environmental awareness and care among the general public, especially young people. Promote the development of green sports facilities and the production of green sports equipment.

Six hours before each game, the researchers used fixed and mobile air quality monitors placed around the tailgate seat. Monitors recorded relative humidity, ozone, temperature, and carbon dioxide levels. A spike in air pollution was recorded when fans gathered three hours before his start of the game. The main culprits are charcoal grills, old generators and especially idling cars."It's kind of late to get to and from the event, so there's a lot of

idling cars and clouds of air," Vans explained. We've seen a few games where it doesn't drop to low levels."

These pre-game pollutants were more than 20 times worse than acceptable levels for moderate air quality. Pollution levels also increased significantly as many fans left the game in their cars. Pollution inside the stadium does not appear to be affected by fan activity outside. The stadium itself produced excellent air quality. Both professional and college sports teams are working to reduce their environmental footprint by implementing sustainable practices, including solar panels at their facilities.

## Conclusion

Taken together, the contributions in this special issue have taken various theoretical and empirical approaches to the concept of environmental sustainability in the fields of health, sport and physical education. All central topics of reader sports education and society. As noted in the abstract, there are many important geographical and contextual differences and similarities beyond this original collection that can be explored further. Therefore, we are responding to this first edition by expanding the call for papers to address the challenges and opportunities of how we can address the complex environmental, ecological, political and cultural factors that shape health. , hopes to inspire more diverse submissions...sports and sports practice in today's world.

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## A CLOUD COMPUTING AND ITS IMPACT ON ENVIRONMENT

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### ABSTRACT

After Corona-19 Pandemic the entire world is constantly expanding in online mode due to which energy consumption rises to meet the demand, but there are benefits too, which must be set against the costs. According to Greenpeace India estimates that the technology sector could consume 20% of the world's total electricity by 2025 and also the new technologies, such as artificial intelligence, also requires great deal of computing power. Despite these claims, companies such as Microsoft have stated that the growth of cloud storage has had a minimal impact on energy consumption and further improvements in efficiency will negate the impact of ever-expanding storage and processing. This paper is study of Cloud Computing and its impact on environment.

**Keywords:** Cloud Computing, Environment, Sustainability, Environmental pollution, Green ICT, Information and Communications Technology, ICT innovation.

### I. Introduction

Cloud computing is defined by the National Institute of Standards and Technology (NIST) as “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” [1]. The large companies such as Google and Amazon began using “cloud computing” term in the year 2006 to describe the new paradigm in which people are increasingly accessing software, computer power, and files over the Web instead of on their desktops [2]. In 2008, onwards businesses have tended to adopt computing solutions as a tool for improving business management, in terms of both efficiency and management, boosting productivity, cutting costs and streamlining product management. Furthermore, according to a study commissioned by Microsoft and conducted by Accenture and WSP Environment & Energy, cloud computing also has environmental benefits and can help businesses to cut their energy consumption and carbon emissions by around 30%. The report points out that large data centres like those run by Microsoft and

Google benefit from economies of scale and operational efficiencies. Small businesses with approximately 100 employees that switch from on-site servers to the cloud could reduce their energy consumption and carbon emissions by up to 90%, according to researchers. For medium-sized companies with around a thousand employees the savings range from 60% to 90% [3].

This is a study on Cloud computing is its impact on environment. Many things are discussed positive and negatives of Cloud computing and it issues related energy consumption, cost effectiveness and many more.

### II Related Literature

For cloud computing powerfull servers are required which consumes vast amount of electricity to run servers 24/7 to provide services, an efficient cooling mechanism to maintain the temperature of datacenters. Due to this large utilization of electricity by Cloud Data Center (CDC's) the world is facing the challenges of sustainable energy economy. The amount of energy utilized by the CDCs is increasing regularly as shown in Figure 1 and it is expected to be 8000 Tera Watt hours (TWh) by 2030 [4].

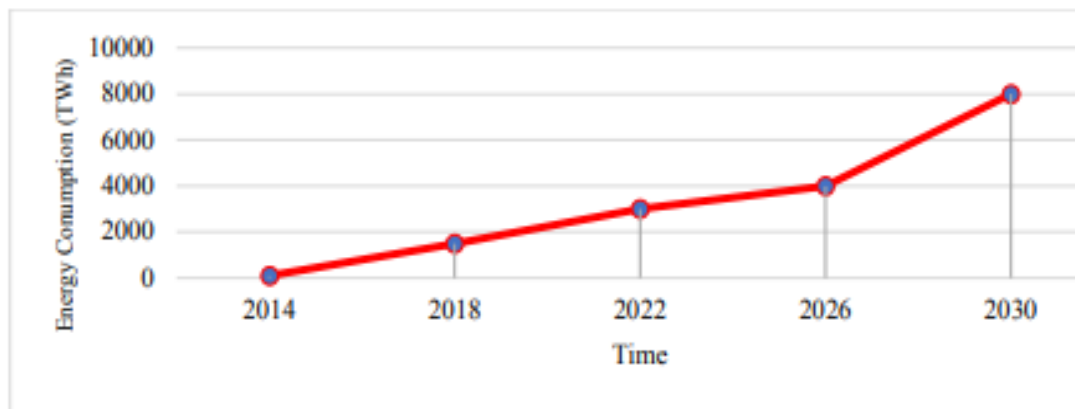


Figure 1: Energy Consumption in Cloud Datacenters

Between 7% and 12% of the world's electricity was thought to be consumed by Internet use in 2012, according to estimates from [5, 6], 1.4% of global electricity generation is used by data centres, compared to 1.6% for computer usage. According to [7], Data Centers are consuming 1.4% of the world electric production against 1.6% related to computers usage. Trends in ICT sector tends to increase the part of ICT consumption in the global energy consumption, which is an alarming signal for environment protection. In fact, the majority of IT infrastructures still use dirty energy sources like coal, gasoline, or nuclear power.

Therefore, one of the main issues with cloud computing service delivery is energy usage. Given that they use it for cooling and computation, data centres have very high energy and power needs. This energy has very high costs and produces a lot of carbon emissions. Data centres are located all over the world, and their combined annual growth rate of 12%. Their overall energy consumption represents 1.4% of global EEC. [8].

It will be ideal for climate-related issues if data centres lower their energy use because energy is a key factor in difficulties related to global warming. Therefore, reducing energy consumption will boost system productivity and dependability. Additionally, energy efficiency helps to protect the environment while simultaneously lowering costs. As a result, it is difficult to reduce the energy usage of cloud data centres and cloud computing systems, and the problem is getting worse with time. Effective action must be taken to address

this scenario so that environmental issues can be resolved quickly [8].

The industry's production of electronic waste also has an additional negative influence on the environment when it comes to cloud computing. As equipment is frequently replaced as soon as more effective technology becomes available for commercial reasons, 50 million metric tonnes of e-waste were produced globally in 2018. The often dangerous coolant chemicals used in server rooms and the data centres' battery backups are two additional environmental effects of data storage [9]. These batteries' components are frequently mined in an unsustainable manner, and if the disposal of the toxic batteries and the chemical coolants is not handled appropriately, it might have catastrophic effects on the local ecology.

### III. Environment & Cloud Computing Benefits

For both individuals and businesses, cloud computing is more capable and adaptable than local computer resources. It also offers geographic redundancy, which makes data loss rare even in the case of a natural disaster. Energy usage would reduce by 87% if frequently used software programmes were moved to the cloud, according to a 2013 research paper financed by Google. Additionally, cloud computing is a key enabler of both remote and at-home working, which lowers the need for commuting and, thus, reduces emissions [10].

Despite a 550% increase in computer processing at its data centres between 2010 and 2018, only a 6% rise in energy use was noted, according to Google. It may be possible to deliver the anticipated growth in data centre capacity without materially raising energy requirements if demand growth and efficiency improvements are broadly in balance [11].

Since a small number of major firms control the majority of the cloud computing market, public pressure to reduce their environmental impact is more likely to succeed. The top five most valuable corporations in the world include all three of the main cloud computing providers. Particularly in reaction to their sustainability and environmental initiatives, Amazon, Google, and Microsoft have received both praise and criticism. Through the usage of renewable energy and the purchase of carbon offsets, Google has been carbon neutral since 2007. Nearly the past 12 years, the company has offset over 19 million metric tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e).

Amazon used more renewable energy than 50% of the time in 2018; as a result, they announced and started building four additional wind farms in Sweden, Ireland, and the US. These wind farms should provide enough electricity to power approximately 260 000 US

homes for an entire year when coupled with their nine already-existing renewable energy projects. However, a Greenpeace study from February 2019 charged Amazon of breaking its promise to use only renewable energy, saying that some of the company's largest data centres in Virginia are only fueled by 12% renewable energy. In response to the report, Amazon reaffirmed their promise to using only renewable energy, and they went further by promising to be carbon-neutral by 2040[12].

The need to provide efficient mass data processing and storage capacity will keep growing in the coming decade. The energy footprint of data centres will either increase or remain stable depending on whether demand growth outpaces advancements in energy efficiency. To meet the anticipated rise in demand, it is crucial that big businesses invest in cutting-edge cooling and storage systems. The ideal scenario is for this to coexist with further investments in renewable energy, reducing the negative environmental effects of emissions from this industry as it grows.

Following table 1 showing research paper which shows how energy consumption can be minimized using various techniques and approaches for the betterment of environment and sustainability.

**Table 1: Energy saving approaches in cloud computing**

Authors	Technique Used	Aim	Approach Applied
(Buyya et al, 2010)	Resource allocation and scheduling adaptive utilization	Qos, Minimize energy consumption, Green resource allocator	Cloud Sim toolkit
(Li et al 2013)	load balancing of actual resources present across virtual Machines and load migration across virtual machines	Balanced resource utilization and power saving	An algorithm on Cloud Sim toolkit
(Ghribi et al, 2013)	Resource Migration and virtual machine scheduling	Energy saving based upon the load on the system	The algorithm on Java simulator
(A.Choudhary et.al., 2015)	Energy efficient dynamic allocation of virtual machines	The overall utilization of computing resources for reducing the energy consumption of datacenter	Conceptual Model
(A. Ahmed, et.al, 2017)	First Fit Algorithm, Ant Colony Algorithm	VM minimize the amount of processing power consumed by host machines and the consumed energy will be reduced	Cloud Sim Simulator

(Buyya et al 2018)	Thermal-aware Scheduling, Capacity Planning, Renewable Energy, Waste Heat Utilization, energy-aware resource management technique	a decrease in carbon footprints of cloud data centers, energy efficiency of power infrastructure and cooling devices by integrating them	Conceptual model
(J Sylvia et.al.2022)	Green computing for IT	to reduce the environmental impact of computers by reducing contaminants in the atmosphere, water, and land.	Conceptual model

**Conclusion**

In the end, cloud computing is more energy-efficient than the alternative and promotes the development of both environmentally friendly services and the economy. Consumers should demand the highest environmental standards coupled with long-term plans for green investments because it does have an impact on

the environment. As we move to the future, voicing and establishing these requirements will be the only safe, sustainable way to guarantee low environmental effect alongside the rise of cloud computing. We can have it all if we demand greater transparency and improved international standards.

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## SUPPLY CHAIN FINANCE OPPORTUNITIES FOR INDIA'S SMALL AND MEDIUM-SIZED ENTERPRISES

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### ABSTRACT

*Small and medium-sized enterprises (SMEs) in India account for 120 million jobs and employ 33 percent of the country's workforce. SMEs account for 6.11 percent of India's GDP and 24.63 percent of its exports. According to India Matters, more than 20% of MSME are situated in rural regions, suggesting that the MSME sector employs a sizable number of rural workers. Even However, small enterprises in India face significant challenges due to factors such as a lack of access to capital, long days of pending sales, and little usage of technology. There is a lack of data about the significance of the supply chain for small businesses in India. The overarching goal of this research is to learn more about Indian MSMEs and the ways in which they might benefit from financial support.*

**Keywords:** Supply Chain Financing, Micro Small and Medium Enterprises, Management.

### Introduction

India's largest segment of business is the MSME. In 2017, they were responsible for 28.90% of GDP. There are about 63.05 million SMEs in the United States (rural 32.4 million, urban 30.9 million) that employ

110.9 million people, making them critical to the prosperity of the country. Small Business Categorization: Each nation has its own categorization system, which is based on the number of workers, investment, and sales. (Annual Report, Ministry of MSME, Government of India, 2018- 19) Exports will no longer be included in a company's total revenue under the new definition for India's MSMEs, which was implemented on June 3, 2020, with effect on July 1, 2020, in order to revive the country's economy, which was slowed by the nation's lockdown to combat the spread of the unique "corona virus."

In growing economies like Many small and medium-sized businesses (SMEs) contribute significantly to India's GDP. Manufacturing firms account for 21% of all,, whereas 79% are service firms. Even though many MSMEs are still unregistered and unorganised, this figure is likely to be higher than previously thought. Because MSMEs aren't subject to as much regulation and reporting, external credit rating, or risk evaluation as companies, bank lending remains cautious despite government stimulus. Rather than rely on banks or other financial institutions that require extensive documentation, appraisals, or other forms of security, microbusinesses in need of quick

access to

capital often turn to family members, friends, or local moneylenders who are willing to make quick loans with little or no documentation. (www.ifc.org).\*\*\*

Large and small firms alike should be made more aware of the benefits of supply chain financing. Supply chain financing has generally been tepid in the Indian industry, compared to Western nations like the United Kingdom, Italy, France, Germany, and Spain. Accordingly the UK's Supply Chain Financing contributes an amazing \$12 to GDP for every \$100 in GDP. As a result of large corporations using the Prisoner's Dilemma to pay their suppliers late,." The benefit of Supply Chain Financing is immense, and it has the potential to reduce working capital expenses by as much as 50%.

Successes with corporations and banks have been achieved in recent years in India. transactions, setting certain precedents. Bank of Baroda and Maruti Suzuki have formed a dealer financing arrangement. An important factor in the segment's low non-performing assets (NPAs) is the SCF's fundamental structure, which banks credit for this. Director of Dun & BradSteeet, www.smeworld.asia, Mr.Manish Sinha) Rather than a substitute for bank lending, supply chain finance serves as a supplement to the bank lending function. In India, firms, small and medium- sized businesses, the trade community, and banks must all get training in supply chain financing. Many changes have occurred in India's legal

system, infrastructure, and technology in the last few years.

In the wake of the RBI's TReDS rules, numerous Fintech businesses have jumped into the fray. Most of these firms are start-ups with minimal resources, therefore their growth is gradual. As soon as huge firms become involved, things will shift dramatically in FinTech. Financial technology (FinTech) is more important than TReDS since it is aimed at businesses rather than consumers. Over the past five years, banks have been more interested in Supply Chain Finance and will continue to grow in popularity and quantity in the future.

### Statement Of The Problem

Small and medium-sized businesses (SMBs) and corporations alike face the challenge of maintaining a low Cash-to-Cash Cycle (MSMEs). The following formula can be used to determine the creditworthiness of your company:  $CCC=(DSO+DII)-DPO$ . It is safe to assume that a company with a low or negative Cash Conversion Cycle will be able to meet its financial obligations on time.

An organisation that has a high or positive cash conversion cycle indicates that it is unable to pay its bills on its own. It is possible to have weekly supply chains even if your company's days payable outstanding is high, as long as your channel partners' and used as working capital.

In nations like India, this is the present state of affairs.. Small businesses have a harder time turning their sales into cash as the supply chain extends the number of days their sales are still outstanding. Small and medium-sized businesses (SMEs) are forced to extend their days sales outstanding in order to compete and thrive in the open account trading environment. A company's credit terms can range from 30 to 90 days, with some even going up to 120 days. Publishers D&B (2018, D&B). In addition to having a high number of days with unpaid sales, MSME will have a hard time raising capital because of their small size and lack of resources, commercial banks in India are unable to meet benchmark standards. As a result, MSMEs face an uphill battle to stay afloat. They're also concerned about their credit score, which is understandable. They

accounted for 28.90 percent of the country's GDP as of 2017. (GDP).

More than 110 million people are employed by 63.05 million MSMEs in the country, which is critical to the country's economic well-being. India's 2018-19 fiscal year (Annual Report, Ministry of MSME). When it comes to running a business, corporations need to rely on supply from the small and medium-sized enterprises (SMEs). India's government has proposed a variety of measures to assist small and medium-sized businesses, including subsidies, sovereign guarantees for MSMEs' loans, and specialised programmes like the MUDRA loan. In spite of all these factors, the real need is for consumers to support small and medium-sized businesses (SMEs). They can't get their money because it's stuck in the supply chain at every stage, from procurement to delivery. In a cash-to-cash cycle, the distributor/dealer has the money from the supplier, the retailer has the money from the distributor/dealer, and the buyer has the money from all three. There was an absence in the literature because of the obvious issues in the Indian trade: no one had looked at how a company's cash conversion cycles impact its performance

### Review of Literature

Many studies have been done on supply chain finance throughout the world, but only a few have focused on the market in India with its significance of supply chain financing for small firms. For this reason and others, we examined a wide range of e-published materials and regulatory requirements. Listed below are the articles that have been peer-reviewed..

**Ashok Kumar Panigrahi (2013)** "A Case Study of Indian Cement Manufacturing Companies Cash Conversion Cycle and Firm Profitability" Company size and ratios are examples of regulating variables that affect cash conversion cycle. An asset and equity return does not have to be positive if the cash conversion cycle is negative, according to the study. Before a company's payables are paid, inventories can be sold and receivables collected. Companies are under no obligation to reduce their inventory, receivables, or payables.

**Harman Preet Singh, Virinder Kumar Sambher & Anurag Agarwal (2015)**, E-Supply Chains and Channel Financing, the Emerging New Technology According to the report, supply chain financing improves a company's return on investment and provides value to small businesses. Channel partners must work together for success, research shows. Final point: a key component of supply chain finance is virtual platform integration...

**International Finance Corporation (2018)**, The International Finance Corporation of the World Bank Group estimates the amount of debt that India's small and medium-sized businesses (SMEs) need. Intelicap and the World Bank Group collaborated on this study. In India, supply chain finance is critical for (SMEs).

**Pallavi Vartak & Vishal Hotchandani (2019)**, Fourteen Bombay Stock Exchange-listed companies' financial performance was examined in the study "Working Capital Management and Firm Performance-Evidence from Indian Listed Firms" from 2009 to 2018. Analysis of the explanatory variables was done. The use of multiple regression and Pearson's correlation models. This study found that cutting the average receivables, inventory turnover, and the time it takes to convert cash to cash can help a company's management create value for its shareholders.

**Lokeswari E (2019)**, research on "Efficiency Analysis of Working Capital Management" found that businesses with negative cash conversion cycles produce higher profits than those without. This is because negative cash conversion cycles generate better returns on invested capital than positive cash conversion cycles do."

### Objectives of the Study

1. An understanding of India's supply chain finance development and regulatory framework.
2. Research and propose solutions to the problem of late payment collection in India's small businesses.
3. An investigation into the impact of a company's cash conversion cycle on the company's financial performance.
4. To investigate the importance of supply chain financing in India's small businesses.

### Hypothesis

The researcher employed two null hypotheses to examine the influence of the Supply chain finance's importance is established by inspecting how well the anchor company's sales are doing and how much money it makes.

H0: In Indian corporations, sales turnover is unaffected by the cash flow cycle.

H1: The cycle of cash management has little impact on the profitability of Indian corporations..

### Scope of the Study

Most of the firms studied were those whose financial statements appeared in periodicals like Annual Reports. The study's purpose is to use these indicators and data to determine the extent of the target from Fiscal Year 2015 to Fiscal Year 2020. The time period covered by the assumptions was further condensed to include just the fiscal years 2017 through 2019.

### Research Methodology and Sampling

**Methodology:** Exploratory research using a combination of quantitative and qualitative methods is the basis of the present investigation. Annual reports from selected companies, the International Finance Corporation, economic daily newspapers, and MSME-website all contributed to the data for this research.

**Sample Design:** Selection of firms with a market capitalization more than Rs.3000 crore and enterprises with negative and positive cash conversion cycles is a challenging undertaking since Supply Chain Finance in India is still in its infancy.

**Tools for analysis:** Financial ratios, as well as analysis of variance and correlation, have been used throughout the study.

### Limitations of Study

There are several problems with the study. This study is not exempt from the constraints of statistical methodologies. Reverse factoring, or "payable financing," is likewise covered under the Factoring Act 2011 under the larger term "factoring" in the Indian context. Only a few commercial banks and a few fintech companies are involved in channel financing, whereas supply chain financing is sparse. The data set is



currently only accessible in India due to a lack of cooperation and a lack of operators. As a consequence, our study relies on material that has been culled from a variety of sources, including academic papers, books, and magazines.

### Analysis and Discussion

Since Supply Chain Finance is still in its infancy in India, the study will focus on both quantitative and qualitative analysis.

Small firms in India might benefit greatly from supply chain financing. Two sites in India were identified by the researcher as potential sources of supply chain financing data. One is on Delayed Payments, and the other is about our study of the cash conversion cycle of corporations and the effect it has on their financial statements.

**Days Sales:** - Due to the absence of a supply

chain finance strategy in India, outstandings are taking a long time to clear. Banking and financial institutions are lending, but the trading community is only partly supplied by products such as "reverse factoring" and "dealer financing". Out there, there's still a vast ocean of opportunity. Section 20/21 of MSME Development Act, 2006 created MSME-SAMADHAAN, a state-level MSME facilitation council. It's a computerized system for keeping track of payments to SMEs that have been delayed. An estimated amount of Rs.13765.51 crore has been collected in unpaid invoices by small and medium-sized enterprises (SMEs). With 20631 applications pending and a value of Rs.6643.73 crore, supply chain financing is clearly in demand. There are other customers from the public sector.

**Table 1 MSME SAMADHAAN Delayed Payment Monitoring Portal applications submitted by small and micro enterprises.**

SN	Respondent Name	MSEs submitted Applications.	Applications visible to council 15 day after	Application disposed by MSEFC Council	Amount Payable (Rs. In Cr)..	Disposed Amount (Rs. In Cr)
1	Central Ministries	642	265	40	313.85	16.83
2	Central Department	1050	419	52	341.64	9.97
3	Central PSU	3014	1107	195	2269.65	71.46
4	Railway Zone	338	162	18	118.67	1.69
5	Railway Division	291	148	17	53.37	0.73
6	Ordnance Factory	89	25	20	59.66	39.05
7	State Govts.	4008	1262	244	2357.33	62.23
8	State PSUs	1349	527	93	1373.38	18.2
9	MSME Unit	3180	3462	242	432.54	51.85
10	Individual	1955	527	138	166.13	9.31
11	Proprietorship	8117	3462	563	1043.09	40.64
12	Others	22709	8885	1824	5236.2	320.51
	Grand Total	46742	18697	3446	1376.51	642.47

Source: MSME SAMADHAAN Delayed Payment Monitoring Portal (Fig as on 29th June 2020) (<https://samadhaan.msme.gov.in>)

### Conclusion

To make the most efficient use of their working capital, companies in India exploit the potential of small businesses by delaying payments. This causes the supply chain's cash conversion cycle to swell, resulting in underperformance for all

parties involved, including the company. Corporations take advantage of small businesses not because they are hesitant to pay, but rather because they want to extract the most value for their money possible out of their transactions with them.

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**EFFECT OF ELECTROMAGNETIC RADIATION ON PLANTS - A REVIEW****P.Y. Anasane and D.L. Arakh<sup>1</sup>**G S Gawande Mahavidyalaya, Umarched<sup>1</sup>  
arak@gsgcollege.edu.in, anasane@gsgcollege.edu.in**ABSTRACT**

*This research can be used to determine the potential detrimental effects that electronics can have on living organisms and the environment to eventually help create a solution to reduce or eliminate this harm. The purpose of this experiment is to find out if electromagnetic (EM) radiation from electronics affects plant growth. Global warming is becoming an increasingly prominent issue. It is commonly disputed whether electronics and the radiation they emit are harmful towards the growth of organisms. As this cannot be tested on a human, we chose plants which are a key element of Earth. To be specific, this research was conducted on basil plants. The plants exposed to EM radiation were taller, thinner, and a much lighter shade of green compared to the unexposed plants. With the help of this experiment, the effects of EM radiation on the growth of organisms can be seen and studied. Further study is necessary to determine if the EM radiation affected the plants on a molecular level, as well as understand how they adapt or if they die.*

**Keywords:** Radiations, EM.

**Introduction**

Plants are the main producers of oxygen and organic compounds. Ensuring the health of these organisms is vital. Recent technologies could be damaging them, which is what this research intends to find out. After experimentation, it can be concluded that EM radiation did affect basil plant growth. The plants exposed to EM radiation were **taller, thinner, and a much lighter shade of green** compared to the unexposed plants. With the help of this experiment, the effects of EM radiation on the growth of organisms can be seen and studied.

Much of the ecosystem relies on plant growth. Cell phones emit microwave (type of light) radiation. Cell phones transmit about one to two watts of power in the range of 824 - 1780 MHz. Computers emit infrared radiation in the range of 410.0048 - 900.0074 THz due to processes such as the device becoming heated, the Bluetooth antenna, and the display. Multiple experiments have been conducted, using lentils to soy beans to chili plants, to be able conclude EM radiation does affect plant growth with varying results, mostly negative. Due to mixed results from previous studies, scientists still debate much on whether EM radiation affects plant growth or not.

**Literature Review**

Effect of Mobile Phone Radiation, EMR from TV, cell phone and FM towers affects the biotic system such as animals, birds, plant, etc. EMR effects are relatively larger in flying birds, sparrows, pigeons and bees in comparison with humans. The reason is that the overall body structure of bird is small having less weight. They get heated up very frequent and these radiations can cause adverse effects on their navigational system. Some effects are given in the next section.

**Research Work**

This experiment was conducted indoors with the use of two different areas. The first area, identified for the EM plants, had electronics and was in front of a window for adequate sunlight. In this experiment, we used three laptops and two phones that added up to a minimum of 2878 MHz of radiation.

This experiment was conducted as a triplicate. The physical characteristics observed in the EM plants were weak stems, brittle leaves, and an extremely light shade of green. Plant height was significantly higher but was maintained for a longer period in the control plants compared to the EM plants for all studies. This study examined the effects of EM radiation on plant growth by placing a cup near electronics and a cup away from all electronics. Two identical cups were set up in each area and plant growth was measured daily for a period of some days.

EM radiation also affected plant germination since all of the EM plants had more sprouts overall, though they died much faster. The average of the maximum number of sprouts for the EM cups was 6.3, while the average of maximum sprouts for the control cups.

### Conclusion

In the control trial, no significant differences were observed between the plant growths in each box. In the next five trials when electromagnetic radiation at 2.4 GHz was introduced to one box, the plants exposed to electromagnetic radiation consistently had significantly lower mean plant heights.

The height of the plants also differs greatly between the groups. This shows that EM radiation tends to make plants grow a lot faster, though they died much quicker. The results both contradict and agree with previous experiments. The basil grew slightly taller when exposed to EM radiation, similar to the experiment conducted in Vidarbha. However, the plants also died much quicker, supporting the other experiments. EM radiation affects plants in many different ways, both positive and negative. The germination levels increased by 57.5%, though human error could have played a role since none of the control plant 3 seeds sprouted.

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**DETECTION OF INTERLEAVED SC-FDMA SIGNALS USING COGNITIVE RADIO****Dr. N.D. Jambhekar**

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**ABSTRACT**

*It is a goal of SC-FDMA to increase the transmission cost and to open the door for a wide range of instinctive media to be accommodated without any impedance. Methods for determining a person's reach currently include Energy perceiving confirmation, Matched channel Waveform perceiving proof, Cyclo-work area bound prominent confirmation, Feature characterization. Interleaved single-supplier rehash division (SC-FDMA) structures can be spotted using this paper's method. An assessment of cyclo-fixed for interleaved SC-FDMA alarms is required for a sign divulgence system. To pique the interest of additional clients, two hypotheses are used that show the non-appearance and proximity of the number one client.  $H_0$  and  $H_1$  are commonly referred to as these.. Gaussian evaluation is used in this study to determine the limits of the metric scatterings accumulated for both hypotheses. Gaussian evaluation accuracy is supported by methods for evaluating histograms that are both imitated and speculative. To illustrate the proposed strategy, each Rayleigh and white Gaussian commotion channel is depicted. Customers of all ages and backgrounds, proximity of pilot alarms, metric window stretch of time as well as square-length results are examined for confirmation. In order to overcome the indisputable existing constructions, such as the ceaseless store of cyclic prefix (CP), the proposed plan of exposure appears to force conspicuous confirmation by assessing and examining their presentations. The multi-layered nature of the proposed system is less important than the noteworthiness disclosure strategy and less important than the CP territory philosophy, while maintaining practically the vague execution of affirmation as the nes methodologies at low SNR.*

**Keywords**— SNR cognitive radio, Spectrum sensing, Single-carrier frequency-division multiple access (SC-FDMA).

**INTRODUCTION**

Efforts are made to increase the speed of transmission, as well as to increase the chances of receiving different types of natural media without any interference. Optional data rate clients synchronous transmission is masterminded because of its own requirements because of the arrival open at any rate. Broadcasting on a high-energy radio station is a great way to overcome this lack of open reach (CR). These messages are sent to both Helper customers (SUs) and unlicensed clients as well as essential customers (Discharge) whenever the ideal band of repeat is open or then unfilled in this approach. Compass perception is particularly important for viewing the discharge space and selecting the openness of reachable openings, both of which are required for transmission. There is a lot of attention paid to the percentage of customers, proximity of the pilot flag, the metric window length, and the square window length. To see how openness would fare against other existing systems, such as the CP and the essentiality domain, we looked at and evaluated their grandstands to see how openness would fare. Openness can be introduced at a lower Pointer to Disruption (SNR) level, but the complexity of this procedure is less than that of an imperativeness certification system, and it is even less significant than that of CP domain strategy. There's a lot of effort put into this paper. In the second section, a chart is shown. Interleaved SC-affirmation FDMA's plan is presented in space III. The reenactment results are

shown in section IV, and this paper is concluded in section V.

**LITERATURE SURVEY**

In radio design correspondences [1], we have proposed an improvement that is rising to deal with the radio arrive at need and the resolute need in the hypothetical radio movement. Far-away structures' shifting and dynamic movement ensures that the errand terminals and dynamic arrivals share the constraint of radio seeing for those terrified and conceivable uses of radio reach, which is why the perspective adjustment is taken care of during this activity. Excellent exchanges and frameworks association is another new movement that gives a way to manage comprehend another development for obscure channels, for example, space fluctuating qualities will battle those channel's hindering impacts by outfitting them with dissipated terminal devices so the constructions collaborates with signal planning or streamed transmission, as outlined by the correspondence improvement viewpoint. Using these advancements in a way that encourages greater sharing as well as a better understanding of the process is misguided here. Psychological radio frameworks are tested in a specific location and at a specific time when the major (insisted) customer's substance silly wide reach is observed. Having a clear understanding of the use of satisfying degree

perceiving guaranteed about nearby hypothetical radio plans improves the quality of affirming seeing fundamental clients. Wise radios can be used to depict the rich consistent seeing techniques of reach and the layout to run perceiving for mental radios within a predetermined framework. Sharing's greatest trades are analysed in distant hand-off structures. The coding process of mental space-time-repeat can be comfortable with displaying the most absurd open doors for expansion. This method adapts to the novel's arrival state by altering the development of code. For the purpose of this paper [2], cyclostationarity, significance, and worked with station-based execution relationship [2] are examined. A real presentation appraisal for centrality imperativeness assertion, made station revelation is presented. In order to go listening to school radios, you must make these three decisions. For possible markers, basic verbalizations for probability identification and fake alerts are in the works. – MSC locator and Unearthly Connection Thickness (UCT) are two developments that show cyclo-stationarity for prominent proof subject to cyclo-fixed (SCD).

The profitable game is offered by MSC finders and 802.22 RF get data base assistants in displaying it in contrast to existing identifiers. Because of the aggravation excusal quality of the cyclo-fixed arrive at, the cyclo-stationarity-based pointers are unwelcome to ask for in the commotion deviation. In order to show the optical relationship between the introduction and reenactment results and speculative characteristics, we plot the working properties of beneficiaries. Accurate zero-autocorrelation gathering and obvious phoney caution rate procedures for the identification of an LTE sign [3] are the best methods for achieving a mental radio (CR) and discovering the examination client (PU) signal's focal point. This shows that the scope is being used to its full potential. Sign openness systems include the unquestionable affirmation of fragmentary Fourier change (FrFT), cyclic prefix an area, imperativeness segregating evidence, and cyclo-fixed obvious confirmation. Clear confirmation from articulated widened length progress (LTE) signals has been developed in this paper. Consistent Plentifulness Zero Autocorrelation (CAZAC) gathering is used to depict a poly stage code for the space of the LTE

signal because of the more erratic relationship nature of such a standard. The trustworthy counterfeit alarm rate reduces the effect of unsettling influence control, allowing for greater openness. Individuals from three other frameworks are surveyed to see if the strategy proposed has any amusement effects.

Radios for students and academics This paper proposes an OFDM decentralised successive demand subject to auto-relationship [4] for a run for critical client signal considering Symmetrical Recurrence Division Multiplexing (OFDM) utilising co-convincing of their auto-affiliation. Using the log likelihood degree test is the most irrational way to estimate the auto-relationship coefficient when SNR is low (LLRT). In the proposed paper, this was mentioned. Local identifier execution is bankrupted down with the help of speculative appraisal for both additional substance white Gaussian commotion (AWGN) and multipath channels. Results are celebrated with a burst of happiness. The close by identifier execution is regarded as ignoring shadowing because it is triggered by this command. According to the Consecutive Locator plan, an unidentified focal customer is seen in the percentage of associate customer administration (SD). Customers' support has allowed the company to expand its work area and change its product line. Due to the deferral in Consecutive Identification, the amount of data needed for underutilised ID is reduced. It is in the mix local area (FC) that all of the individual locaters' decision appraisals solidify. Spreads and hypotheses will be used to support the proposed strategy's implementation. The fixed model size (FSS) test is used to examine the Neyman-Pearson and SD plots for undefined missed location probabilities and false alarms.

Based on interleaved SC-FDMA signals that are semi-periodic, an assessment can be made about whether SU signals can be transmitted on the subcarrier explicitly accommodated PU, or not. Neyman-pearson test can be used to connect the two hypotheses  $H_0$  and  $H_1$  metric. This pair of hypotheses demonstrates that PU conveys nonappearance and proximity. The situation of one incredible client metric is explained first, and then

the situation for multiple users is depicted with the appropriate preprocessing method.

Breaking point  $v$ . serves as a reminder to the enchanted client that this is the point at which things begin to fall apart. The length of the window allows for the creation of a complex and precise system for verifying and recognising time deals. As time-space signals are the only link between the PU ( $v$ th client) and the premium client, the PU closeness is achieved by separating the destined subcarriers of different clients. Zero-cushioning or standard separating are the two methods to play out this test in this situation.

Semi-periodic interleaved SC-FDMA signals can be used to determine whether the subcarriers explicitly reserved for the PU are allowed to be used for the transmission of SU signals.

It is used to create an easier-to-understand variety of access, low PAPR, and a better-executed framework by using SC-FDMA, which transmits hinders that successfully demonstrate Quick Fourier change (FFT). Controlling both the  $H_0$  and  $H_1$  hypotheses is possible with the help of the Neyman-Pearson test. These two hypotheses show that PU signals non-appearance and proximity. The client's interest is piqued by the parameter's mention of a specific range. Sifting through predefined subcarriers of various clients is used to test the proximity of the PU ( $v$ th client), as this ensures that the premium client is only connected to the time-space signal periodicity. An optional client sign can be transmitted without crashing due to the lack of and proximity to the essential client signals.

#### IV. CONCLUSION

Interleaved SC-FDMA signals are demonstrated in this paper using an obvious confirmation methodology. Semi-periodicity of these signs indicates that they may be revealing. With regard

to metric dispersing, the number of clients, the proximity of pilot banners, the metric window length and square length are gathered. Reenactment reduces the specificity of the image of the wrapped up limits. In this particular demand plan, AWGN and multipath Rayleigh channels are specifically targeted. The performance is tested for a wide range of Square lengths, as well as for a wide range of customers, and for extremely high data rates. CP affirmation ( $L_{cp}=1/4$ ) and CP revelation ( $L_{cp}=1/8$ ) plans of SC-FDMA were presented in the presentation. There was a noticeable difference between these methodologies and the proposed affirmation structure when it came to the assessment of SNR increment.

It's possible to increase the openness plan's effectiveness by extending the window's reach and increasing the number of clients.

These factors are taken into account in order to determine the number of customers, pilot hail proximity, the metric window length, and the square length. Duplication is used to investigate the specific image of quite far. For AWGN and multipath Rayleigh channels, there is a specific verification procedure. A variety of Square lengths, as well as a variety of clients and data rates, are tested. Isolated and unquestionable proof, CP domain ( $L_{cp}=1/4$ ), CP insistence ( $L_{cp}=1/8$ ) plans of SC-FDMA are the introduction and mind-boggling thought of the proposed techniques. Compared to these methods, the ID system that we proposed had a higher certification probability as the SNR assessment increased. With a larger window length and a higher customer proportion, a better plan can be created for an area.

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