

Peer reviewed Journal

Impact Factor: 7.265

ISSN-2230-9578

# Journal of Research and Development

*Multidisciplinary International Level Referred Journal*

Chief Editor

**Dr. R. V. Bhole**

'Ravichandram' Survey No-101/1, Plot  
No-23, Mundada Nagar, Jalgaon (M.S.) 425102

Editor

**Dr. M.N. Kolpuke**

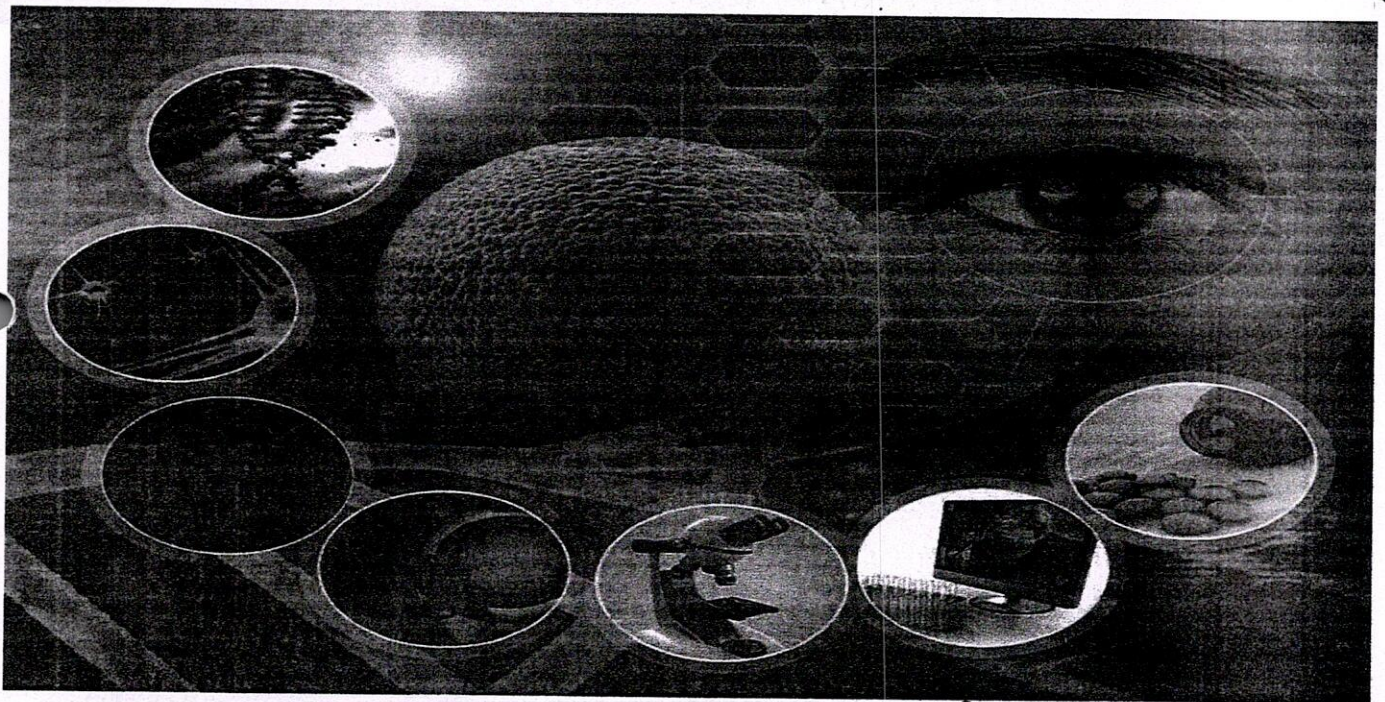
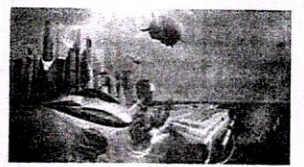
Principal,

Maharashtra Mahavidyalaya, Nilanga, Dist.  
Latur

**Dr. V.D. Satpute**

Principal,

Late Ramesh Warpudkar College, Sonpeth,  
Dist. Parbhani



107. MNK-APR-2022

108 D.H.J APR-2022

**Address**

'Ravichandram' Survey No-101/1, Plot, No-23, Mundada Nagar, Jalgaon (M.S.) 425102

24	A study on Digital Banking during post demonetization <b>Prof. Dr. S.J. Jadhav Mr. Shyamsingh V. Raghuwanshi</b>	102-103
25	A Study of Consumer Buying Behaviour in a Shopping mall with Special Reference to Treasure Bazaar in Nanded City <b>Prof. Dr. H.S. Patange, Dr. S.B. Todkar</b>	104-107
26	A Study on Investment decision in Family Business <b>Dr. Navraj Govindrao Kaldate</b>	108-114
27	Impact Of Ict On English Language Learning During Covid -19 Pandemic: An Analytical Study <b>Ankita Modak , Tanmay Singh Solanki</b>	115-119
28	Medicinalplants Used In Ethno -Veterinary Practices In Ambegaon Tehsil, Pune District, Maharashtra, India <b>Admuthe N. B. , Pokale S. T</b>	120-123
29	Biosynthesis Of Zinc Oxide (Zno) Nanoparticles Using Ruta Chalepensis Sp. Plant Leaves And Its Antibacterial Activity <b>Reshma S.Chaudhari  Dhananjay H. Jadhav Madhav.N.Kolpuke</b>	124-128
30	Study of Physical Chemical Properties of Deoni Cow Milk <b>Mr. Vilas V. Lute, Mr. Malikarjun D. Wakade</b>	129-131
31	An Overview On Dynamic Climate Change <b>Mr. S. N. Kamble</b>	132-134
32	Role of Environment Education in Sustainable Development <b>Amul M. Late</b>	135-136
33	In Creasing degradation Of Geo- Environment And Change In Land Suitability And Cropping Pattern Due To Soil Brick Industries: A Case Study Of Nakashipara Block, Nadia District. <b>Falguni Bag Subhendu Ghosh</b>	137-145
34	Implications of Strategic Leadership - An Overview <b>Dr. Akanksha Shivaji Bhanji</b>	146-148
35	Work Life Balance Of Bank Employees: A Comparative Study Of Public And Private Sectorbanks In Haryana <b>Ms. Pooja Maken D. Kavita Aggarwal</b>	149-154
36	Factors of Social Entrepreneurship <b>Dr. Nagalaxmi. B, Dr. A. Patrick</b>	155-158
37	Study Of Women Entrepreneurs Who Changed The Stereotype Thinking Of The Society <b>Dr. Anuja Prabhakar Mudholkar</b>	159-161
38	Occurrence of Cypriniformes Fishes from Lower Terna Reservoir Makani Dist- Osmanabad, Maharashtra (India) <b>Dr. K. H. Rajput</b>	162-163
39	Impact Of Digital Banking On Indian Economy <b>Dr. B. T. Chavan</b>	164-166
40	Rural Entrepreneurship <b>Mr. Mapari Subhash Kishanrao Dr. P. S. Jadhav</b>	167-170
41	Legal Provisions for Disabled Persons <b>Dr. Kavita Biyani</b>	171-174
42	Advancements in Higher Education in India: A New Academic Normal <b>Dr. Ajit M. Mulajkar</b>	175-177
43	Spatio-Temporal Changes in Cropping Pattern of Satara District (1991-92 to 2011-12) <b>Dr.Sunita M. Chavan . Prof. Sambhaji.D.Shinde.</b>	178-183
44	Faculties Of English Poetry <b>Gawande Vishnu Balkrishna</b>	184-186
45	Indian Administrative System in Modern Globalized Era <b>Dr. Sandur Vitthal Panditrao</b>	187-189
46	Biodiversity And Bio Deterioration Of Fusarium Species On Different Varieties Of Jewar And Maize <b>S.S.Kamble , Mali S.P, Dr.Bhagwan , M waghmare, S.R.Shinde , G.P.Shendge.</b>	190-193

## Biosynthesis Of Zinc Oxide (Zno) Nanoparticles Using *Ruta Chalepensis* Sp. Plant Leaves And Its Antibacterial Activity

Reshma S.Chaudhari<sup>1</sup> Dhananjay H. Jadhav<sup>2</sup> Madhav.N.Kolpuke<sup>3</sup>  
Department of Zoology Maharashtra Mahavidyalaya Nilanga  
Dist. Latur (MS) -India  
reshmachaudhari222@gmail.com

**Abstract:** Zinc oxide is an inorganic metal compound which has wide range of application in various field. Biosynthesis of nanoparticles from plants is an ecofriendly approach alternate to conventional physical and chemical method. Recently synthesis of nanoparticles using bioactive resources gaining importance due to its least cost, simplicity and effective antimicrobial activity. Present study focus on synthesis of ZnO nanoparticles using *Ruta chalepensis* plant leaves extract. The prepared ZnO nanoparticles have been characterized by UV- vis absorption spectroscopy, also prepared ZnO nanoparticles determined by the antibacterial activity against standard strains of *E.coli*, *S.typhi*, *S.aureus* and *B.subtilis*. It is observed that the ZnO synthesized in the process has the efficient antimicrobial activity.  
**Key words:** Zinc oxide nanoparticles, UV- vis spectroscopy, *Ruta chalepensis*, Minimum inhibition concentration, Antibacterial activity.

### Introduction:

Nanotechnology is the developed technology which deals the synthesis of nanomaterials. These nanoparticles are having the well defines shape and size (Kartiresan et al.,2009). Nanotechnology deals with the production and usage of material with nanoscale dimension. From the last decade, the metal nanoparticles have been intensively studied. The nanoparticles ranging between 1 to 100 nm size scale. Biosynthesis of nanoparticles has greatly reduced the use of physical and chemical methods. Use of green synthesis method is rapidly increasing due to usage of least toxic chemicals and environmentally safe to nature (M.Sundrajan et al.,2015). The bioactive resources involved in green synthesis of nanoparticles are plants and their derivatives, microorganisms like bacteria, fungi, yeast and algae. Inorganic metal nanoparticles have been of great importance due to their distinctive features such as catalytic, optical, magnetic, electronic, and antimicrobial wound healing and anti inflammatory properties. Nanoscale zinc oxide nanoparticles had been in current researches because of their potential applications like antibacterial, antifungal, wound healing, antioxidant and optic properties (Kumar et al., 2013; Happy Agarwal et al., 2017; Madhusudanan et al., 2019). Among all the metals, zinc oxide have the wide range of applications such as semiconductor, thermoelectrical, magnetic, electroluminescent material and are mostly used in the cosmetics, etc. The Zinc oxide (ZnO) nanoparticles have the good conductivity, catalytical activity, unique antibacterial and antifungal properties (Meruvu et al., 2011). Antimicrobial properties with nano sized particles are of substantial interest in the recent past. *Ruta chalepensis* is an aromatic angiospermic flowering plant belongs to Rutaceae family commonly called fringed rue. It is one of the frequently used plants for medicinal purposes (Enis Ben et al.,2009). Aerial parts of the plants such as leaves, stem and flowers were used for medicinal purpose. Leaves and young stem of plant has high content of alkaloids, furocoumarins, coumarins, flavonoids, phenols, amino acid and saponin. *Rutachalepensis* has anti-inflammatory, antihelmintic and spasmolytic effect. ZnO NPs have been reported in different morphologies like nanoflake, nanoflower, nanobelt, nanorod and nanowire [63–65]. Bio synthesis of zinc oxide nanoparticles by plant *Ruta chalepensis* has been reported. This study therefore is aimed to synthesis ZnO nanoparticles using bio method, to analyse their characteristics using spectroscopic techniques and to evaluate its antimicrobial activity.

### Materials and Methods:

#### Plant material and preparation of extract:

*Ruta chalepensis* L. leaves were collected and shed dried at room temperature and powder was prepared using mixer grinder. 5 gm of powder of *Ruta chalepensis* L. was dissolved in 100 ml of distilled water and stirred magnetically at 70°C for 1 hour. The obtained solution was allowed to cool at room temperature and filtered through Whatman No.1 filter paper. The filtrate of aqueous extract was used as reducing agent.

#### Synthesis of Zinc oxide Nanoparticles:

For the synthesis of zinc oxide nanoparticles, 0.3M zinc acetate dihydrate solution was prepared by adding 4 gm of zinc acetate dihydrate, was dissolved in 60 ml of distilled water and stirred for 10 minutes. 40ml of prepared plant extract was added into the 60 ml of zinc acetate dihydrate solution. Then the solution was stirred for 20 minute. The reacted solution was dried at 80°C overnight to yield the zinc oxide nanoparticles

and employed for calcination at 100°C for 2 hours. The brown colored zinc oxide nanoparticles obtained after calcination and these synthesized ZnO nanoparticles were used for antimicrobial studies.

#### UV-Vis spectra analysis:

The sample was measured for its maximum absorbance using UV-Vis spectrophotometry. The optical property of ZnO nanoparticles was analyzed via ultraviolet and visible absorption spectroscopy in the range of 350-450 nm.

#### Determination of antibacterial activity of Zinc oxide Nanoparticles:

##### Antibacterial activity:

Antibacterial activity of synthesised nanoparticles was carried out by agar well diffusion method against four bacterial species i.e. two Gram negative bacteria *Escherichia coli*, *Salmonella typhi* and two Gram positive bacteria *Staphylococcus aureus* and *Bacillus subtilis*. Nutrient agar plate were prepared, 100 ul of 24 hour mature broth culture of individual bacterial strain and swabbed on plate using sterile L Shaped glass rod. The well were prepared by using sterile cork borer, 4mm size well are created with the help of sterile cork borer in each Petri plate. 40 ul sample of ZnO nanoparticles was added in the well. *Sterptomycin* was used as positive control. Plates were kept in refrigerator for diffusion process about 30 minute, and then the plates were incubated at 37°C for 36 hours.

##### Determination of minimum inhibitory concentration:

Minimum inhibitory concentration of zinc oxide nanoparticles was determined using Alamer Blue Assay (Yajko et al., 1995; Rampersad, 2012) for four different bacterial species (*E.coli*, *S. typhi*, *S. aureus* and *B. subtilis*). Each well of microtitre plate was initially added with 100 ul of sterile broth. Then 100 ul of sample of zinc oxide nanoparticles was added in the first well and two fold serial dilutions of sample were made. At last, 20 ul of bacterial cell suspension was added to each well. Microtitre plate was incubated for 24 hours at 37 °C temperature for bacteria. After incubation, 30 ul of Alamer blue dye was added to each well and re-incubated for 4 hours at room temperatu

#### Results and Discussion:

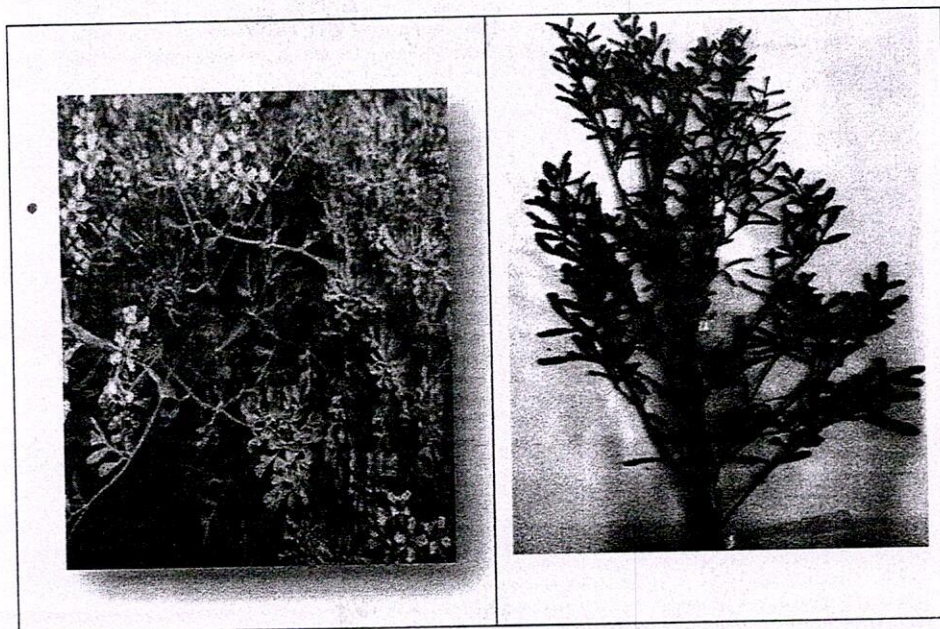


Figure.1- photograph of *Ruta chalepensis* plant

#### Habit and Habitat:

It is perennial herb widely distributed in Mediterranean area (Polunin and Huxley, 1987) and the Canary Islands. It grows on rocky slope. This plant was introduced in America after Spanish. It is cultivated in the tropics as a potherb or medicinal plant and has widely become naturalized. In tropical Africa it has been introduced in several countries, including the Cape Verde Islands, Sudan, Ethiopia, Somalia.

#### Morphometric character:

- 1) The *Ruta chalepensis* belongs to class- Magnoliopsida, order- Sapindales and family- Rutaceae.
- 2) It is an aromatic plant characterized by glabrous, alternative bipennatisect leaves, narrow obovate segments.