Dr. Mihir Dilip Herlekar

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Profile

Environmental researcher with more than nine years of collective research, academic and professional work experience. Expertise in environmental monitoring and analysis, green synthesis of nanoparticles and its application for wastewater treatment. Skilled in data interpretation, statistical analysis and report writing. Proficient in initiating and executing independent research and can work very well in a team.

Education

Ph. D. Botany
University of Mumbai, 2018.
Thesis Title: “In situ Nanoremediation of Lakes using Biologically Synthesized Metal Nanoparticles” under guidance of Dr. S. S. Barve

M. Sc. Environmental Science
The Institute of Science, University of Mumbai, Ist Class, 2006
Dissertation Title: Toxic Trace Metal Analysis Methods

PG Diploma in Environmental Pollution Control Technology
Garware Institute of Career Education and Development, University of Mumbai, Ist Class, 2004
Dissertation Title: Phytoremediation: The Green Cure

B. Sc. Microbiology
MVLU College, University of Mumbai, IInd Class, 2002

Professional Experience

07/2018 – present

Assistant Professor
Department of Environmental Science at The Institute of Science, Dr. Homi Bhabha State University, Mumbai

- Conducting lectures and practical related to Environmental pollution – Causes, Monitoring and Control; Green chemistry; Green and environmental nanotechnology; Sustainable agricultural practices; Instrumentation techniques for environmental applications; Research methodology, Scientific communication, Green building certification process, Statistics etc.
- Mentoring students for dissertations (Broad topics - Environmental monitoring, Pollution control, Green chemistry, Sustainable waste management, Sustainable agriculture etc.)
- Developing curriculum for M.Sc. course in Environmental Science.
- Member of Board of Studies (BoS) committee for the subject of Environmental Science.
- Organizing and managing departmental programmes and events.

08/2021 – 11/2021 **Visiting Faculty**
School of Sustainability at XIM University, Bhubaneswar
- Conducting practical (online mode) related to Environmental monitoring (Air, Water and Soil) for B. Sc. (Hons.) course in Sustainable Development

06/2021 – 08/2021 **Visiting Faculty**
ICMR- Regional Medical Research Centre, Bhubaneswar
- Conducting online lectures related to Introduction to Environmental Pollution, Prevention strategies, Solid and liquid waste management in India for Master of Public Health (MPH) course.

06/2017 – 02/2018 **Junior Research Fellow**
National Institute of Industrial Engineering (NITIE), Mumbai
- Writing research articles on Sewage management in Mumbai city, Evaluation of Decentralized Wastewater Treatment Systems at different locations in Maharashtra from the data collected for the project "Supporting Consolidation, Replication and Up-scaling of Sustainable Wastewater Treatment and Reuse Technologies for India (SARASWATI)", Funded by DST and European Commission.
- Writing funding proposals – a. Application of cleaner technologies for industrial pollution control - Submitted to CPCB and DST-SERB Core Research Grant; b. Application of nanoparticles for the removal of water pollutants and LCA of nanoparticles - Submitted to IUSSTF.

02/2017 – 05/2017 **Visiting Faculty**
SIES-Indian Institute of Environment Management (SIES-IIEM), Nerul, Navi Mumbai
- Courses taught - Industrial Gaseous and Particulate Air Pollution Control, Vehicular Exhaust Pollution Control, Noise and Odour Pollution Control for students pursuing PG Diploma Course in Environmental Pollution Control Technology.

10/2006 – 11/2010 **Project Assistant (Level - II)**
National Environmental Engineering Research Institute (NEERI), Mumbai Zonal Laboratory
- Environmental monitoring (water, air and soil), analysis of various parameters, statistical analysis and data interpretation.
- Key member in writing reports of various sponsored projects for sponsoring agencies like Central Pollution Control Board (CPCB), Ministry of Environment, Forest and Climate Change (MoEFCC), Municipal Corporation of Greater Mumbai (MCGM), Mumbai Metropolitan Region Development Authority (MMRDA) and WorId Bank.
- Analysis of secondary data for existing water quality surveillance programme and developed training manual for MCGM's Field staff and Laboratory analysts.

Skills

Statistical Software Used
Minitab, SPSS.

Certificates

- Qualified State Eligibility Test (SET), 2018 for Assistant Professor (Environmental Science)

Journal Publications

2022 **Noise levels in urban and rural settlements of Bhubaneswar: A Case study**
G. Ayush, A. J. Elizabeth, V. V. Patil and M. Herlekar. Nature Environment and Pollution Technology, Vol 21, No. 1, 231-239.

2021 **Comparative Toxicity Study of Chemical Pesticide and Biopesticide by Daphnia Bioassay**
Amrita Kakka, Mihir Herlekar, Shivani Awale. Nature Environment and Pollution Technology, Vol. 20, No. 2, 695-701.

2019 **Performance Evaluation of a Decentralized Wastewater Treatment System in India**
Anju Singh, Megha Sawant, Sheetal Jaisingh Kamble, Mihir Herlekar, Markus Starkl, Enrique Aymerich, Absar Kazmi.

2018 **Sewage Management Challenges in Mega Cities in India: A Case Study of Mumbai**
A. Singh, A. Kazmi, M. Starkl, S. Sayanekar, M. Herlekar. Desalination and Water Treatment, Vol. 116, 329-341.

2015 **Calcination and Microwave Assisted Biological Synthesis of Iron Oxide Nanoparticles and Comparative Efficiency Studies for Domestic Wastewater Treatment**
Mihir Herlekar, Siddhivinayak Barve. International Research Journal of Environmental Sciences, Vol. 4, No. 6, 28-36.

2015 **Optimization of Microwave Assisted Green Synthesis Protocol for Iron Oxide Nanoparticles and its Application for Simultaneous Removal of Multiple Pollutants from Domestic Sewage**
Mihir Herlekar, Siddhivinayak Barve. International Journal of Advanced Research, Vol. 3, No. 4, 331-345.

2014 **Plant-Mediated Green Synthesis of Iron Nanoparticles**
Mihir Herlekar, Siddhivinayak Barve, Rakesh Kumar. Journal of Nanoparticles, Article ID 140614, 9 pages.

2012 **Chemical Speciation and Source Assignment of Particulate (PM10) Phase Molecular Markers in Mumbai**
Mihir Herlekar, Abba Elizabeth Joseph, Rakesh Kumar and Indrani Gupta. Aerosol and Air Quality Research, Vol. 12, 1247-1260 (In Special Issue on "Aerosol and Air Quality Research in Asia")

Courses

07/2020 – 07/2020 **Online National Training on "Sustainability Commitment in Educational Campuses"**
Organized by School of Sustainable Urbanization and Air Pollution, CSE

07/2020 – 07/2020 **Certificate Program for Industry Professionals on "Climate Change and Environmental Sustainability"**
Organized by Confederation of Indian Industry – Sohrabji Godrej Green Business Centre (CII-GBC)

06/2020 – 07/2020 **Induction Training Programme for Faculty in Universities/Colleges/Institutes of Higher Learning**
Teaching Learning Centre & Research Development and Services Cell, Ramanujan College, University of Delhi under Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT), MHRD

06/2020 – 06/2020 **Online Training Programme on "Principles & Methods on the Laboratory Analysis of Septage & Wastewater"**
Environment Monitoring Laboratory, Anil Agarwal Environment Training Institute (AAETI), Centre for Science and Environment (CSE)

06/2020 – 06/2020 **Online Training Programme on "Basics of Decentralized Wastewater Treatment and Local Reuse"**
Conducted by School of Water & Waste, AAETI, CSE

05/2020 – 06/2020 **Faculty Development Programme on "Managing Online Classes and Co-creating MOOCS 2.0"**
Teaching Learning Centre & Research Development and Services Cell, Ramanujan College, University of Delhi under Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT), MHRD

05/2020 – 05/2020 **"IGBC Online Advanced Training Programme on Green Homes"**
Organized by CII-GBC

11/2016 – 11/2016 **Training programme on "Nutrient Recovery and Reuse of Human Waste for food production"**
Organized by CDD Society in collaboration with BORDA and RGRHCL at Centre for Advanced Sanitation Solutions (CASS) in Kengeri, Bangalore

10/2016 – 11/2016 **Online course on "Planning & Design of Sanitation Systems and Technologies"**
Created by EAWAG- Aquatic Research & École Polytechnique Fédérale de Lausanne (EPFL)

04/2016 – 07/2016 **Online course on "Faecal Sludge Management"**
Jointly delivered by CSE, India and UNESCO-IHE

Other Activities

02/2022 – 12/2022 **The Indira Gandhi National Open University's (IGNOU) study center at K. J. Somaiya College of Education, Mumbai**
Academic counselor
As an academic counselor, I will be conducting few offline and online practical for the enrolled students and also help them to solve their doubts for theory portion.

11/2019 – 11/2019 **Indian Institute of Tropical Meteorology (IITM), Pune**
Resource Person
As a resource person, I delivered lectures on stack monitoring, different mechanical devices for particulate matter control from industries and odour control for "Air Pollution Monitoring" Course under Green Skill Development Programme (GSDP).

02/2019 – 03/2019 **ENVIS, Environment Department, Government of Maharashtra**

Resource Person

As a resource person, I delivered lectures on basics of air and water pollution, pollution sources, impacts of pollution, monitoring of pollution for Certificate Course in Air and Water Pollution Monitoring.

Various Universities in India

External Examiner, Paper Setter, BoS Member

- External examiner for M. Sc. Environmental Science, Practical Examination - For University of Mumbai and Somaiya Vidyavihar University.
- Paper setter for – a) Dr. Homi Bhabha State University (for the subject of Environmental Science); b) University Examination of B. Sc. (Honours): Semester V for the subject of Environmental Chemistry at P. P. Savani University, Surat for the Academic year 2019-2020.
- BoS member for revising syllabus for F.Y.B. Com and F.Y.BFM course in Environmental Studies at Ramanand Arya D.A.V. College (Autonomous), University of Mumbai.

Funding Agencies and Peer Reviewed Journals

Reviewer

- Funding proposals for Biotechnology Ignition Grant (BIG) Scheme by Department of Biotechnology (DBT) and Biotechnology Industry Research Assistance Council since 2018.
- Journals - Journal of Saudi Chemical Society (Elsevier), Emergent Materials (Springerlink), Egyptian Journal of Chemistry (Scopus indexed).
- Reviewer of papers submitted to International Water Association's (IWA) World Water Congress & Exhibition for the year 2018 (Held in Tokyo) and 18th to 23rd October 2020 at Copenhagen, Denmark.

Languages

- English, Marathi, Hindi

References

Dr. Siddhivinayak Barve, *Deputy Director*, KET's Scientific Research Centre, Mumbai.
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Dr. Elizabeth Abba, *Associate Professor*, Xavier School of Sustainability, Xavier University, Odisha.
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Open Access Journal

Noise Levels in Urban and Rural Settlements of Bhubaneswar: A Case Study

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Key Words:
Noise
Health
GIS
Urban and rural settlements

ABSTRACT

Noise is an underestimated threat that can cause several short- and long-term health problems. It is increasingly becoming a potential hazard to health, physically and psychologically, and affects the general well-being of an individual. The objective of the current study was to examine noise levels at ten different locations in the city of Bhubaneswar, Odisha State, India based on the land use pattern in urban and rural setup. The paper focuses on deploying geospatial techniques using ArcGIS desktop to perform better sampling and further interpolate the statistical data using the Kriging technique to generate a surface representing the distribution of noise levels in various areas. In addition, a health impact survey enabled us to understand the perspectives of the people in and around the monitoring location where health issues like stress, headache, hypertension, and sleeping disorders emerged as some of the most common issues faced. Noise levels were in the range of 43.0 to 74.5 (A) Leq. in rural areas and 61 to 96.5 dB (A) Leq in urban areas. In the current study, noise levels in rural and urban areas exceeded the recommended noise limits as per The Noise Pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

Sound occurs due to changes in air pressure inside the ear canal that cause our inner ears to vibrate and produces the auditory sensations which our brain interprets as sound. Noise pollution is any unwanted or disturbing sound that harms the health and well-being of humans and wildlife (Jain et al. 2015). This type of interference often causes discomfort in residents, which sometimes ends up being hazardous. The effects of noise are seldom catastrophic and are often only transitory, but adverse effects can be cumulative with prolonged or repeated exposure and can significantly impair the quality of life (Capetown, n.d.).

Noise is an undervalued danger causing a lot of short- and long-term health problems (WHO n.da). Noise exposure among vulnerable groups, such as children, is an area of major concern (Jamir et al. 2014, Khatik et al. 2019). Excessive noise interferes with people's daily activities at work, school, home, and leisure time. It can disturb sleep, cause cardiovascular and psychophysiological effects, reduce performance, and provoke annoyance responses and social behavior changes (WHO n.db). Since there are direct links between noise and health, identifying sources of loud noise will assist the administration to abate high noise problematic areas, thus becoming compliant with city and other noise criteria and ordinances as defined by CPCB (2010).

Several studies in the recent past indicate that noise levels have crossed the set limits in India. 27 sites were monitored for noise level around a sensitive zone for 24 hours (Khaiwal et al. 2016). It included various categories viz. outdoor, indoor, road, and residential areas. The noise level ranged from 45 dB to as high as 120 dB exceeding the prescribed daytime standard for the sensitive zone. Further, a pan India study was conducted at 35 locations between 2011 and 2014 (Garg et al. 2017). These 35 locations were distributed among commercial zone (14 locations), Industrial (5 locations), residential (7 Locations), and the silence zone (9 Locations). This study was constructive in ascertaining the magnitude of annual average ambient noise levels, noise abatement action plans, and the formulation of revised ambient noise standards in Indian scenarios. Further noise levels were measured at 227 sites of Malda, West Bengal, India, covering major roads, some important nodes, railway stations, bus stops, rail crossing, commercial area, and residential area (Das et al. 2019). The recorded noise levels varied between 25dB to 83 dB. The study concluded that noise annoyance is sensitive to age, sex, economic folks, and facing the window to the road. Out of the total study area, 9.94% area has emerged as the most vulnerable area to noise exposition.

Bhubaneswar's foremost challenges include rapid unplanned development, especially construction, increasing pollution from vehicles and commercial establishments,

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Open Access Journal

Comparative Toxicity Study of Chemical Pesticide and Biopesticide by *Daphnia* Bioassay

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Key Words:
Neemark
Tafgor
LC_{50}
Combination ratio treatment
Two-way ANOVA
Aquatic ecosystem

ABSTRACT

A comparative study was conducted to evaluate the toxicity of a biopesticide and a chemical pesticide using *Daphnia magna* as a model aquatic faunal species. The primary survey revealed that Neemark and Tafgor are being commonly used by the farmers. The acute toxicity tests were conducted on *Daphnia magna* for two series of concentration ranges 100 ppm to 1000 ppm and 1000 ppm to 4000 ppm. The (Lethal Concentration) LC_{50} values for series 1 of Neemark and Tafgor were 522.86 ppm and 439.46 ppm, respectively, whereas it was 1840.48 ppm and 1335.97 ppm, respectively for for Series 2. A significant difference in the mortality rates between Neemark and Tafgor in the concentration range of 1000 ppm to 4000 ppm was observed ($t = 2.483$, $p < 0.05$). A combination treatment of Neemark and Tafgor in different proportions showed that the 2:1 v/v (Neemark: Tafgor) ratio showed the lowest toxicity with a LC_{50} value of 1067.78 ppm, suggesting its preferability in application on the field. Two–way ANOVA shows that the concentration of pesticides plays a significant role in the mortality of *Daphnia* ($F = 19.729$, $p < 0.05$) and so does the combination ratio treatment ($F = 7.166$, $p < 0.05$). These results suggest that these two factors along with the selection of a suitable plant-based pesticide play a critical role in the reduction in mortality rates of aquatic organisms.

INTRODUCTION

India primarily has an agro-based economy with an 18% contribution of agriculture to the total GDP (Bharadwaj & Sharma 2013, Kekane 2013). To sustain such a large economy, the longevity of crops and their resistance to myriad pests becomes a fundamental necessity. Pesticides play a vital role in maintaining world food production. Any substance that intends to prevent, destroy, repel or lessen the damage of any pest is called a pesticide (Eldridge 2008). There have been estimates that crop losses to pests would increase by 10% if no pesticides would be used at all (Pimentel et al. 1992). The most common categories of pesticides are insecticides, herbicides, fungicides, and rodenticides (Yadav et al. 2015). The type of pesticides used depends on the type of target pests.

The Green Revolution in India has resulted in the phenomenal growth in agricultural productivity by the use of high yielding varieties, chemical fertilizers, and pesticides (Kumar 2012). The pesticide consumption in India has risen from 434 metric tonnes to 46,195.16 metric tonnes during the period 1954 to 2000 (Bharadwaj & Sharma 2013). In India, the total as well as per hectare consumption of pesticides increased significantly after 2009-10. The pesticide consumption was 0.29 kg/ha during 2014-15 which is nearly 50% higher than the use during 2009-10 (Subash et al. 2017). Two main types of pesticides viz., chemical and biological, originating from the respective sources are used to fight the menace of pests targeting high economic value crops. Some of the chemical insecticides used are DDT (Dichloro Diphenyl Trichloroethane), BHC (Benzene hexachloride), Malathion, and Carbaryl (Yadav & Devi 2017). Chemical pesticides are known to have several negative impacts on human as well as environmental health. Synthetic chemical pesticides are known to exist as residues in soil, water, food etc., which may, in turn, lead to phytotoxicity, physiological deformities, diseases, mortality, population changes, genetic disorders etc. in many living organisms. They may enter the food chain and coupled with bioaccumulation could cause grave consequences. The increased concerns about the environmental effects associated with the use of these synthetic chemical pesticides have led to the search for chemical extracts from various biological organisms having insecticidal properties (Kumar 2012). A promising alternative is the use of biopesticides. A biopesticide is a formulation derived from naturally occurring substances that control pest populations in an eco-friendly way and through non-toxic mechanisms. The sources of biopesticides could be microorganisms, plants or animals and could include living organisms, their products or

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RESEARCH ARTICLE

Performance evaluation of a decentralized wastewater treatment system in India

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Received: 31 May 2018 / Accepted: 10 May 2019 / Published online: 22 May 2019

Abstract

A Decentralized Wastewater Treatment System (DEWATS) provides an economically feasible and efficient wastewater treatment solution especially in developing countries. It has an enormous potential for developing a sustainable environmental sanitation system. In this study, the treatment efficiency of eight DEWATS plants was evaluated in the state of Maharashtra, India, for their performance in terms of selected physico-chemical parameters of the wastewater. Although the efficiency of some of the plants was lower than that reported in literature, the effluent quality of all the plants was within the permissible discharge limits of the Central Pollution Control Board for all the parameters. Comprehensive assessment of Plant I was carried in terms of its technical and socio-economic aspects. Moreover, LCA tool has been utilized to evaluate the environmental impacts of the operation stage of DEWATS. The midpoint, CML 2001 (April 2015) methodology was adopted, in which 11 impact categories were considered. From the life cycle impact assessment and interpretation, the main impacts are identified as releases of COD, P-PO_4^{3-}, and N-NH_4^+ to water bodies and disposal of sludge. Due to negligible energy consumption, the operation stage was found to be less damaging to the environment. It was concluded that DEWATS can be a good alternative for treating wastewater with negligible energy and chemical consumption.

Keywords Decentralized wastewater treatment system · Physico-chemical parameters · Coliform removal · Life cycle impact assessment · Environmental impacts · Socio-economic aspects

Introduction

In many developing countries, including India, providing extensive sewerage network and reliable and affordable wastewater treatment is a challenge (Singh et al. 2011). In India, out of the total quantity of the sewage generated, only 34.3% was getting treated in the year 1978; whereas, at present, 37.6% of it is getting treated (CSE 2011; Indiastat 2006). Centralized sewerage and wastewater treatment systems cover only a portion of larger urban areas, and on-site sanitation is often inappropriate in

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Sewage management challenges in mega cities in India: a case study of Mumbai

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ABSTRACT

This paper provides an overview of sewage management of Mumbai as a case study of a mega city in India. Mumbai generates 3,000 MLD sewage out of which 2,100 MLD gets treated. The trend of sewage generation, its treatment, the challenges faced by municipal authorities and initiatives taken along with policies and regulations has been discussed. The discharge of untreated sewage in open drains, unplanned development of the city and encroachment of squatter settlements were identified as some of the major challenges faced by Municipal Corporation. The initiatives like creating a better sewerage network through funded projects, up grading the existing sewage treatment plants (STPs) have been undertaken. The need of using advanced softwares like ArcGIS as a decision making tool for city planning has been highlighted. The role of the decentralized wastewater treatment technologies and reuse of treated sewage for non-potable purposes to overcome the challenges of sewage management has been explored.

Keywords: Sewage; STPs; Challenges; Mumbai; ArcGIS

1. Introduction

Freshwater is vital for living things on earth. It has numerous uses in household and industrial activities. It acts as a regulating factor for social and technological growth. The rate of increase in urban population has been almost 11 times since last century. It has risen from 26 million to 285 million. Due to this increase in population, the per capita freshwater availability is likely to go below 1000 cubic meters which will lead to a situation labeled as water scarcity by the end of 21st century [1]. With this increase in demand for freshwater, the quantity of sewage generated is also going to rise accordingly.

1.1. Sewage generation and treatment in world

As per The Organization for Economic Co-operation and Development's (OCED) database, in UK there is 100% sewerage network connection rate. Many of the European countries like Netherlands, Spain, Switzerland, Germany etc. have more than 90% population connected with the sewerage network. According to the available database, only 3 countries, Ireland, Slovenia and Slovak Republic have around 60–70% population covered under sewerage network connection [2].

In terms of sewage treatment also, UK treats all the collected sewage, 50% each by secondary and tertiary treatment. Amongst the countries listed in the database, almost

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Calcination and Microwave Assisted Biological Synthesis of Iron Oxide Nanoparticles and Comparative Efficiency Studies for Domestic Wastewater Treatment

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Available online at: www.isca.in, www.isca.me
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Abstract

Owing to the limitations of conventional synthesis methods for iron nanoparticles and its wide range of environmental applications, there is a need to develop green synthesis protocols by exploring newer biological resources. In this study, for the first time, Turmeric (Curcuma longa L.) leaves were used to synthesize iron oxide nanoparticles by calcination (Fe NP_{Cal}) and microwave assisted method (Fe NP_{Mw}). The characterization of magnetic nanoparticles was done by different techniques. As prepared nanoparticles were compared for their efficiency to treat domestic wastewater in terms of orthophosphate (PO_4), Chemical Oxygen Demand (COD) and Escherichia coli (E. coli) removal. Fe NP_{Mw} showed higher removal efficiency of PO_4 and COD (82% and 83% respectively) than Fe NP_{Cal} (17%, 82% respectively) in 24 hours. Fe NP_{Cal} exhibited superior antimicrobial activity than Fe NP_{Mw} and completely inhibited E. coli.

Keywords: Iron oxide nanoparticles, green synthesis, *Curcuma Longa L.*, calcination, microwave, domestic wastewater.

Introduction

Water is one of the most important and basic natural resources. Owing to increasing industrialization and exploding population, there is continuous increase in demand of water supply. On the other hand, the problem of water pollution is getting very severe, especially in developing countries with disposal of untreated sewage. This disposal has resulted in additional load of inorganic, organic and microbial pollutants which further deteriorates the water quality[1,2]. Conventionally, the pollutants from sewage are removed to a certain extent in wastewater treatment facilities (WWTFs). But, the major limitations of existing WWTFs include time required for the complete process (around 15-20 hours), installation, maintenance, labor and energy cost along with the sludge handling. So, the researchers need to develop advanced technologies which are cost effective, durable and more efficient as compared to the existing treatment options. In this context, "Nanotechnology" could help in solving the problems concerning water purification and quality[3].

Iron nanoparticles, namely nano zero-valent iron (nZVI), magnetite (Fe_3O_4) and maghemite (γ-Fe_2O_3) are widely used in the field of environmental remediation. This is mainly due to their very efficient pollutant removal capacity, fast reaction kinetics and most importantly due to magnetism which enables its easy recovery[4]. These nanoparticles, when synthesized by conventional physical and chemical methods, lose their reactivity due to aggregate formation[5] and magnetism and dispersibility on air exposure[6]. In addition to these limitations, the concern arising due to use of non polar solvents and toxic reducing agents such as sodium borohydride during synthesis have not only limited their environmental application but also have highlighted the need to develop clean, non toxic and environment friendly procedures for iron nanoparticle synthesis.

Plant-mediated synthesis of magnetic nanoparticles has remained a relatively unexplored research area with the majority of papers being published only in the last two years[7]. In the present study, for the first time, Turmeric (*Curcuma longa* L.) leaves were used as biotemplate for iron nanoparticle synthesis. India is the largest producer, consumer and exporter of Turmeric (*Curcuma longa* L.)[8]. The turmeric rhizomes are widely used but the leaves, except for its use in Indian and Malaysian cooking, are mostly treated as an agro-waste[9]. The magnetic nanoparticles were synthesized by two methods - calcination and microwave assisted synthesis. The iron nanoparticles synthesized by both these methods were characterized and tested for their efficiency to treat municipal wastewater. This is the first of its kind study that evaluates the efficiency of biologically synthesized magnetic nanoparticles for the treatment of municipal wastewater in terms of COD, *E. coli* and PO_4 removal.

Material and Methods

Turmeric (*Curcuma longa* L.) leaves were obtained from farm in Satara district in Maharashtra. The leaves were repeatedly washed with double distilled water and sun dried. These were further dried in an oven (Metalab) at 50^0 C for 48 hours, fine powdered using domestic blender and stored in air tight container and used as biotemplate. From now on, it is denoted as turmeric leaf powder (TLP).