PROJECT REPORT OF MINOR RESEARCH PROJECT

ON

"Isolation, Identification and Molecular Characterization of Metal Toxic Resistance Microbes present in Industrial Effluents"

Submitted to UGC, CRO, BHOPAL

ज्ञान-विज्ञान विमुक्तये

SUBMITTED BY

Dr. Zehra Hasan
Principal Investigator
&
Dr. Bhawana Pandey
Co-Principal Investigator

DEPARTMENT OF BIOTECHNOLOGY & MICROBIOLOGY
BHILAI MAHILA MAHAVIDYALAYA, HOSPITAL SECTOR, BHILAI
DISTT. DURG (C.G.)

Objectives

The main objectives of this work: -

- Survey of Sample collection sites in Durg-Bhilai (Twin City), Chhattisgarh.
    - To isolate microorganisms from various industrial effluents.
    - To identify the isolated microorganisms by staining and various biochemical method.
    - To perform antibiotic sensitivity test of five antibiotics against isolated microorganisms.
    - To analyse Physio-Chemical character of industrial effluents.
    - To study metal toxicity of industrial effluents.
    - To perform metal toxicity test of isolated microorganisms.
    - To isolate DNA from microorganisms showing heavy metal resistivity.
    - To purify isolated DNA and perform quantitative and qualitative estimation.
    - To transform prepare r-DNA of isolate heavy metal resistant microorganism into competent *E.coli* host.
    - To screen transformed metal toxicity resistance against different heavy metals.
    - To study applications of microbes in waste water recycling.

Summary

Water isthe most abundant compound existing in Solid, liquid and gaseous state. At standard temperature and pressure, it occurs in dynamic equilibrium between the liquid and gaseous state. Water Pollutionrefers to thecontamination of water bodies, (eg. lakes, rivers, oceans and groundwater) resulting from direct or indirect discharge of chemical and physical pollutants into water bodies without adequate treatment to remove harmful compounds. All the waste materials which when added above beyond the capacity to be broken down by water thereby degrading the quality of water are referred as water pollution. Pollution can occur naturally when energy and other materials are released, degrading the quality of the water for other users, such as when water flows through soils with high acidities, volcanoes, algae blooms, storms, and earthquakes cause major changes in water quality and the ecological status of water. But more than that human actions are responsible for the pollutants that enter the water. Heavy metals impose an unacceptable risk to humans or other targets that use or are linked to the environment.Heavy Metals are common pollutants found in drinking water throughout the seven continents arising scientific and public concern on human health. The continents identified by convention rather than any strict criteria are (from largest in size to smallest): Asia, Africa, North America, South America, Antarctica, Europe and Oceania. India lies in the south-central peninsula of the Asian continent. Emerging industrialization in the past few decades has supported high economic growth but simultaneously caused severe environmental pollution, which adversely affected water quality. One-third of the total water pollution comes in the form of effluent discharge, solid wastes and other hazardous wastes. Although various norms and guidelines are prescribed for all industries byCentral Pollution Control Board (CPCB) but still the environmental situation is not satisfactory. Several evidences support mismanagement of industrial wastes in India. Various defaulting industries are petrochemical industries, sugar mills, distilleries, leather processing industries, paper mill, agrochemicals and pesticides manufacturing industries and pharmaceutical industries.

In India, Major industrial regions of Chhattisgarh have become the power generation and steel hubs of central India. The disposal and dumping of the industrial solid wastes may lead to leaching problem and resulted in the heavy metal contamination of the water.

It is well known that a long-time exposure of water and sediment to heavy metals can produce considerable modification of their microbial populations, reducing their activity and

their number. The aim of the present study was to isolate and identify heavy metal resistant bacteria from Industrial Effluents from Durg-Bhilai and acclimatized activated sludge, to be used for bioremediation of heavy metal contaminated wastewater at their highest expected levels.

Considering the ecological benevolence of microorganisms in bioremediation of heavy metals and their associated toxicity generally caused by lead, zinc and copper, in the present study, water samples were collected from Bhilai Steel Plant, Bhiai (S-1), Bhilai Food corporation, Bhilai (S-2), Kedia Distillery, Bhilai (S-3), Paper Industry, Rasmada, Durg (S-4), ACC cement, Jamul, Bhilai (S-5), Dairy Industry, Devbhog, Durg (S-6), Biofertilizer Factory, Patan, Durg (S-7), IB Group of Oil refinery, Durg (S-8), Glucose Industry, Durg (S-9), Rice Bran Oil Mill, Dhamdha, Durg (S-10), where emission of heavy metals and other pollutants in industrial effluents have been reported for several years. Water samples were collected from the above mentioned industries. Heavy Metal (Lead, Copper and Zinc) resistant bacteria were isolated from Industrial effluents and identified by staining and biochemical test. Bacteria were sent to CMBT Bhopal for Molecular Identification. Physical and Chemical parameters of industrial waste water was studied and the bioremediation of Heavy Metals by Heavy Metals -Resistant Bacteria was studied.

Samples will be collected from 10 different industries surrounding Durg- Bhilai (Twin city), These industries are: Bhilai Steel Plant, Bhilai (S-1), Bhilai Food corporation, Bhilai (S-2), Kedia Distillery, Bhilai (S-3), Paper Industry, Rasmada, Durg (S-4), ACC cement, Jamul, Bhilai (S-5), Dairy Industry, Devbhog, Durg (S-6), Biofertilizer Factory, Patan, Durg (S-7), IB Group of Oil refinery, Durg (S-8), Glucose Industry, Durg (S-9), Rice Bran Oil Mill, Dhamdha, Durg (S-10). All water sample show that they are polluted. Studies of pH show that all water samples are acidic and temp are moderate. Electrical conductivity is high in S-2 (1665 µmoh/cm) and lowest in S-3 (1231 µmoh/cm). Total Disolved Solids is high in S-4 (279 mg/l) and low in S-1 (26 mg/l). Alkalinities are high in S-4 (106mg/l) and low in S-2 and S-5 (72 mg/l). Dissolved Oxygen is high in S-9 (69.4 mg/li) and low in S-1 (5.6 mg/l). Biological Oxygen Demand is high in S-10 (221.8 mg/l) and low in S-1 (8.4 mg/l). Chemical Oxygen Demand is high in S-7 (48 mg/l) and low in S-10 (18.33 mg/l).

In all the samples Lead, Copper and Zinc are present. Zinc are present in higher amount in S-1 and S-6 (0.66 mg/l) and low amount are found in S-4(0.1 mg/l). Copper are present in high amount in sample S-1 (1.62 mg/l) and and low amount are found in S-9 (0.11 mg/l).

Lead are present in higher amount in S-1 (1.55 mg/l) and low amount are found in S-6 (0.02 mg/l). Bacteria are isolated in presence of heavy metals (Lead, copper and Zinc). In all sample bacterial colony are found. High numbers of bacteria are found in S-1 in presence of lead (5). Lead resistant bacteria are present in high number in S-1 (5). Copper resistant bacteria are found in high number in S-5 (4). And Zinc resistant bacteria are found in high number in S-2 (4).

On the basis of frequency six bacteria are selected. Two Lead resistant Bacteria are selected from Bhilai Steel Plant. Two Copper resistant bacteria are selected from Paper Effluent, Rasmada, Durg (S-4) and Biofertilizer Factory, Patan, Durg (S-7). Zinc resistant bacteria are selected from Biofertilizer Factory, Patan, Durg (S-7).

Antibiotics test are preformed in selected bacteria. Bactracin are inhibiting only B-1. Ampicilin are highly inhibited the B-4 and B-5. Amoxicillin are also highly inhibited the B-1 and B-4. Penicillin is highly inhibiting the B-6. Rifampicillin are highly inhibited the B-1 and B-3.

In the presence of lead B-1 bacteria (0.35) show high growth as compared to B-2 (0.21). In the presence of Copper B-4 bacteria (0.23) show high growth as compared to B-3 (0.16). In the presence of Zinc B-6 bacteria (0.30) show high growth as compared to B-5 (0.18). On the basis of above test selected three more resistant isolated bacteria B-1(Lead), B-4 (Copper), B-6 (Zinc). Further test are carried by these selected Bacteria. Selected Bacteria are sending for the identification. Selected Bacteria are sending for the identification in CMBT Bhopal. The results show that B-1 Bacteria is Gram Negative, Rod shape *pseudomonas aeruginosa,* .B-4 Bacteria is Gram negative, and rod shape *Escherichia coli.* B-6 Bacteria is Gram positive, rod shape, *Bacillus subtilis.*

In Estimation of Exo-Polysaccharide test supernatant show less precipitation and Pellet show more precipitation. In Estimation of Exo-Polysaccharide test supernatant show less precipitation and Pellet show more precipitation. In Estimation of Exo-Polysaccharide test supernatant show less precipitation and Pellet show more precipitation.

Dubois Test of *Pseudomonas aeruginosa* show that supernatant without metal (0.32) show low Exo-Polysacharide production as compared to supernatant with metal (0.45). Pellet without metal (0.51) show low Exo-Polysacharide production as compared to supernatant

with metal (0.69). Pellet show more Exo-Polysaccharide production as compared to supernatant. Dubois Test of *Escherichia coli* show that supernatant without metal (0.40) show low Exo-Polysacharide production as compared to supernatant with metal (0.66). Pellet without metal (0.48) show low Exo-Polysacharide production as compared to supernatant with metal (0.70). Pellet show more Exo-Polysaccharide production as compared to supernatant. Dubois Test of *Bacillus subtilis* show that supernatant without metal (0.31) show low Exo-Polysacharide production as compared to supernatant with metal (0.55). Pellet without metal (0.42) show low Exo-Polysacharide production as compared to supernatant with metal (0.73). Pellet show more Exo-Polysaccharide production as compared to supernatant.

To study the Effect of Temperature shows that *Pseudomonas aeruginosa* Without Pb show maximum concentration in 37˚C (0.33) and lowest in 0˚C (0.02). *Pseudomonas aeruginosa* with Pb show maximum concentration in 37˚C (0.21) and lowest in 0˚C (0.02). *Escherichia coli* without Cu show maximum concentration in 37˚C (0.23) and lowest in 0˚C (0.016). *Escherichia coli* with Cu show maximum concentration in 37˚C (0.21) and lowest in 0˚C (0.01). *Bacillus subtilis* without Zn show maximum concentration in 37˚C (0.26) and lowest in 0˚C (0.03). *Bacillus subtilis* with Zn show maximum concentration in 45˚C (0.30) and lowest in 0˚C (0.01). All three bacteria are show maximum growth in 37˚C accept *Bacillus subtilis* With Zn and lowest growth in 0˚C.

To study the Effect of pH shows that *Pseudomonas aeruginosa* without Pb show maximum concentration in 7 pH (0.22) and lowest in 1 pH (0.02). *Pseudomonas aeruginosa* with Pb show maximum concentration in 7 pH (0.21) and lowest in 1 pH (0.02). *Escherichia coli* without Cu show maximum concentration in 7 pH (0.32) and lowest in 1 pH (0.02). *Escherichia coli* with Cu show maximum concentration in 5 pH (0.18) and lowest in 1 pH (0.01). *Bacillus subtilis* without Zn show maximum concentration in 11 pH (0.18) and lowest in 1 pH (0.02). *Bacillus subtilis* with Zn show maximum concentration in 9 pH (0.23) and lowest in 1 pH (0.047).

To study the Effect of Salts shows that *Pseudomonas aeruginosa* without Pb show maximum concentration in 5 M (0.35) and lowest in 4 M (0.12). *Pseudomonas aeruginosa* with Pb show maximum concentration in 1 M (0.28) and lowest in 5 M (0.10). *Escherichia coli* without Cu show maximum concentration in 2 M (0.24) and lowest in 5 M (0.05). *Escherichia coli* with Cu show maximum concentration in 2 M (0.25) and lowest in 5 M

(0.07). *Bacillus subtilis* without Zn show maximum concentration in 1 M (0.30) and lowest in 4 M (0.19). *Bacillus subtilis* with Zn show maximum concentration in 1 M (0.27) and lowest in 5 M (0.08).

Study the accumulation of metal zinc sulphate with *Bacillus subtilis* show highest accumulation (0.116) and Lead acetate with *Pseudomonas aeruginosa* show lowest accumulation (0.20) after 25 hr of incubation. All heavy metal are accumulated in the presence of Bacteria.

T-Test analysis of accumulation of heavy metal shows that *Pseudomonas aeruginosa* absorb significant lead acetate in 5, 10, 15 and 25 hr of incubation except 20hr of incubation it not significantly absorb. *Escherichia coli* Absorb significant copper sulphate in 15 and 20 hr except 5, 10 and 25 hr of incubation it not significantly absorb. *Bacillus subtilis* Absorb significant zinc sulphate in 5, 10, 15, 20 and 25 hr of incubation. Study show that zinc sulphate with *Bacillus subtilis* show highest accumulation.

After the accumulation test resistant bacteria sample are sent for indentification in CMBT, Bhopal, M.P. 16s RNA and PCR results for Identifications confirm that lead resistant bacteria is *Pseudomonas aeruginosa,* Copper resistant bacteria is *Escherichia coli* and zinc resistant bacteria *is Bacillus subtilis.*

The results show that *Pseudomonas aeruginosa* are Potential lead resistant bacteria *Escherichia coli* are Potential copper resistant bacteria and *Bacillus subtilis* are Potential Zinc resistant bacteria. These three bacteria is use for bioremediation of these heavy metals in future.

Due to continuous unsustainable levels of human and natural exploitation, search for alternative techniques for treatment of the lead, copper and zinc contaminated wastewater came into existence. The lead, copper and zinc bioremediation approach has attracted much attention because it is environment friendly, safe, and economical.

From the present study it can be concluded that the *Pseudomonas aeruginosa* can be used for bioremediation of lead, *Bacillus subtilis* can be used for bioremediation and removal of Zinc and *Escherichia coli* can be used for Bioremediation of Copper with minimum cost and high efficiency.

Waste water irrigation led to the accumulation of heavy metals in soil and consequently into the Vegetables. Consumption of these vegetables with elevated levels of heavy metals may lead to high level of body accumulation causing related health disorders. Thus regular monitoring of heavy metal contamination in the vegetables grown at waste water irrigated area is necessary and consumption of contaminated vegetables should be avoided in order to reduce the health risk caused by taking the contaminated vegetables. The waste water treatment technology should involve steps to remove heavy metals causing risk to human health.

Due to the enormous benefits and drawbacks of each of the existing remediation technologies/processes, there is a need for the implementation of an integrated remediation technology/multiple technology which can have great potential. This can be attained through further heavy metal remediation research, which will help to enhance decisions that are science-based. To achieve a safe and economically viable remediation option for heavy metals in water and wastewater systems, there is need to review and assess the current costs and market share of the established remediation processes. The application of this may offer enormous environmental public health and cost benefits.

Isolated strains characterized with remarkable tolerance against lead, copper and zinc, could be potential agents for the development of a industrial waste water inoculants applicable in bioremediation of heavy metals polluted sites. The genetic modification of bacteria can open new horizons of bioremediation in heavy metal pollution. Genetic upgrading may help to expand the field of accessible methodologies to refining processes. Regardless, the genome sequencing of microorganisms and the use of proteomics, genomics, metabolomics, can offers insights into some metabolic pathways in order to discover genes, proteins, metabolites that could be involved in heavy metal tolerance.

Molecular identification confirms that these three bacteria can be used for bioremediations of lead, copper and zinc. These studies are further used for bioremediations of heavy metals and molecular identification of these three bacteria is use for phylogenetic analysis and transformation of bacteria for better and further study.

BHILAI MAHILA MAHAVIDYALAYA

HOSPITAL SECTOR, BHILAI NAGAR (C.G.) 490 009
Affiliated to Pt. Ravishankar Shukla University, Raipur (C.G.)
Recognized Under Section 2(f) and 12(B) of the UGC Act 1956

Ph : 0788-2242699
0788-2210078
Website : www.bmmbhilai.com

No. BMM / 2016/423 Date : 29/09/16

To

The Education officer,
U.G.C. (C.R.O-2)
Tawa Complex, Bittan Market,
E-S, Arera Colony, Bhopal.

Subject:- Submission of Final Project REPORT.

Ref - F.NO. MRP F.NO. MS-35/202002/XII/13-14/CRO

Respected Sir,

Please find enclosed following documents in reference to F.No: **MS-35/202002/XII/13-14/CRO** dated **30/8/14** allotted to Dr. Zehra Hasan as Principal Investigator and Dr. Bhawana Pandey, Co Principal Investigator , on the topic "**Isolation, Identification and Molecular Characterization of Metal toxic resistance microbes in Industrial Effluents**.

1.Annexure VI -Final Report.

2. Report about work-done till 31.08.2016

This is for your information and necessary action please.

Thanking you,

Zehra Hasan
Dr. Zehra Hasan
Principal Investigator

Bpandey
Dr. Bhawana Pandey
Co-Principal Investigator

Yours Sincerely,
Zehra Hasan
Dr. Zehra Hasan
Principal

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002.

Annual/Final Report of the work done on the Major/Minor Research Project. (Report to be submitted within 6 weeks after completion of each year)

1. Project report No. 1st /2nd /3rd /Final _____**FINAL**_____

2. UGC Reference No. ___ F.No: **MS-35/202002/XII/13-14/CRO** dated **30/8/14**

   Period of report: from **01/09/2014 to 31/08/2016**

3. Title of research project "allotted to as Principal Investigator and Dr. Bhawana Pandey, Co Principal Investigator , on the topic "**Isolation, Identification and Molecular Characterization of Metal toxic resistance microbes in Industrial Effluents**

4.

5. **(a)** Name of the Principal Investigator: **Dr. (Mrs.) Zehra Hasan**
   Deptt. and University/College where work has progressed
   Bhilai Mahila Mahavidyalaya, Hospital Sector, Bhilai
   (b) Effective date of starting of the project - **01/09/2014**

6. Grant approved and expenditure incurred during the period of the report:
   a. Total amount approved Rs. 3,30,000/-
   b. Total expenditure Rs. 2,40,000/-
   c. Report of the work done: (Please attach a separate sheet)

   i. Brief objective of the project - **ENCLOSURE 1**

   ii. Work done so far and results achieved and publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publication - **ENCLOSURE 2**

   iii. Has the progress been according to original plan of work and towards achieving the objective? if not, state reasons: **Yes**

   iv. Please indicate the difficulties, if any, experienced in implementing the project- **Nil**

v. If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the Commission on a separate sheet. **Completed, Period 01.09.2014 – 31.08.2016**
Summary ENCLOSURE 3

vi. If the project has been completed, please enclose a summary of the findings of the study. Two bound copies of the final report of work done may also be sent to the Commission –
Submitted

vii. Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as (a) Manpower trained (b) Ph. D. awarded (c) Publication of results (d) other impact, if any
One Student Registered for Ph. D.

Zehra Hasan

SIGNATURE OF THE PRINCIPAL INVESTIGATOR

Zehra Hasan

REGISTRAR/PRINCIPAL

Pgandey

SIGNATURE OF THE CO-INVESTIGATOR

BHILAI MAHILA MAHAVIDYALAYA

HOSPITAL SECTOR, BHILAI NAGAR (C.G.) 490 009
(Managed by Bhilai Education Trust)
(Affiliated to Hemchand Yadav Vishwavidyalaya, Durg)
Recognized Under Section 2(f) and 12(B) of the UGC Act 1956
NAAC Accredited with B Grade

Ph : 0788-2242699
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Website : www.bmmbhilai.com

No. BMM / 2016/423 Date : 29/09/16

MINOR RESEARCH PROJECT

MS-35/202002/XII/13-14/CRO Bhopal

TO WHOM SO EVER IT MAY CONCERN

This is to certify that all the equipments and books which were purchased by Dr. Zehra Hasan for her Minor Research Project MS-34/202002/XII/13-14/CRO Bhopal, dated 30/08/2014. Titled "Isolation, Identification and Molecular Characterization of Metal Toxic Resistance Microbes present in Industrial Effluents" have been submitted in the college.

Dated- 29.9.16

Zehra Hasan
Principal

Bhilai Mahila Mahavidyalaya

Annexure III
University Grants Commission
Central Regional Office
Bhopal 462016

STATEMENT OF EXPENDITURE IN RESPECT OF MINOR RESEARCH PROJECT

1. Name of Principal Investigator: Dr. Zehra Hasan
2. Department Of PI: Physics
   Name of College: Bhilai Mahila Mahavidyalaya
3. UGC approval Letter No. and Date: **MS-35/202002/XII/13-14/CRO Bhopal**
4. Title of Research Project: Isolation, Identification and Molecular Characterization of Metal Toxic Resistance Microbes present in Industrial Effluents
5. Effective date of starting the project: 29/11/2014
6. A. Period of Expenditure: from Dec 2014 to August 2016
   B. Details of Expenditure

S.N	Item	Amount Approved	Expenditure
1	Books and Journals	50000.00	50,499/-
2	Eqiupments	100000.00	102105/-
3	Contingency	25000.00	25009/-
4	Field Work/Travel/(Give detail in performa)	10000.00	20050/-
5	Chemicals and Glasswares	60000.00	60113/-
	Total	2,45,000/-	2,57,776/-

7. If as a results of check or audit objection some irregularity is noticed at later date, action will be taken to refund, adjust or regularize the objected amounts.
8. It is certified that the grant of Rs. 2,45,000/- (Rupees Two Lakh Forty Five Thousands only) received from the University Grants Commission under the scheme of support of Minor Research Project entitled "Isolation, Identification and Molecular Characterization of Metal Toxic Resistance Microbes present in Industrial Effluents". Vide UGC letter no. **MS-35/202002/XII/13-14/CRO, dated 30/08/2014** has been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission.

Zehra Hasan

Signature of Principal Investigator

Zehra Hasan

Principal

FLORA AND FAUNA
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PHYSIO-CHEMICAL ANALYSIS OF INDUSTRIAL EFFLUENTS OF WASTE WATER FROM DURG BHILAI, CHHATTISGARH

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MATS University, RAIPUR (C.G.) India
[2,3]Bhilai Mahila Mahavidyalaya,
BHILAI NAGAR, (C.G.) India
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ABSTRACT

In this study Samples will be collected from 10 different industries surrounding Durg- Bhilai (Twin city), These industries are: Bhilai Steel Plant, Bhiai (S-1), Bhilai Food corporation, Bhilai (S-2), Kedia Distillery, Bhilai (S-3), Paper Industry, Rasmada, Durg (S-4), ACC cement, Jamul, Bhilai (S-5), Dairy Industry, Devbhog, Durg (S-6), Biofertilizer Factory, Patan, Durg (S-7), IB Group of Oil refinery, Durg (S-8), Glucose Industry, Durg (S-9), Rice Bran Oil Mill, Dhamdha, Durg (S-10). Industrial effluents are characterized by their abnormal turbidity, conductivity, chemical oxygen demand (COD), total suspended solids (TSS), biological oxygen demand (BOD), and total hardness. pH of all samples was acidic. EC range between all samples was 1231-1666 (µmoh/cm). BOD of S-10 is shows highest (222.6mg/L) and S-1 shows lowest BOD (8.4mg/L). S-7 Show highest COD (48mg/L) and S-10 shows lowest COD (19mg/L). All Industrial Water samples compared with the WHO and US-EPA standards established for drinking water. The result shows that all samples are contaminated.

Figure: Nil References:10 Table:01
KEY WORDS**:** Industrial effluents, Distillery, Turbidity, Conductivity, Chemical Oxygen Demand

Introduction

Environmental pollution has been recognized as one of the major problems of the modern world. The increasing demand for water and the dwindling supply has made the treatment and reuse of industrial effluents an attractive option. Industrial effluents are of concern because they colour the drains and ultimately the water bodies. They also diminish the water quality. Industrialization is vital to a nation's economy because it serves as a vehicle for development. However, there are associated problems resulting from the introduction of industrial waste products into the environment. Many of these products are problematic because of persistence (low biodegradability) and/or toxicity. Worldwide water bodies are the primary means for disposal of waste, especially the effluents, from industries that are near them.

These effluent from industries have a great deal of influence on the pollution of the water body, these effluent can alter the physical, chemical and biological nature of the receiving water body[8]. The initial effect of waste is to degrade the physical quality of the water. Later biological degradation becomes evident in terms of number, variety and organization of the living organisms in the water [3]. Industries turn out wastes which are peculiar in terms of type, volume and frequency depending on the type of industry and population that uses the product[5]. Industrial waste is the most common source of water pollution in the present day[6] and it increases yearly due to the fact that industries are increasing because most countries are getting industrialized. The extent of discharge of domestic and industrial waste is such that rivers

receiving untreated effluent cannot give dilution necessary for their survival as good quality water sources. The transfer of unfavorable releases from industries is detrimental to human and animal health and safety [8]. There is thus a challenge of providing water in adequate quantity and of required quality to minimize hazards to human health and conserve the water bodies and the environment.

Heavy metals are widespread pollutants of great concern as they are nondegradable and thus persistent. These metals are used in various industries from which effluents are consequently discharged into the environment. Introduction of metals in various forms into the environment can produce numerous modifications of microbial communities and affect their activities[2]. Common sources of heavy metal pollution include discharge from industries such as electroplating, plastics manufacturing, fertilizer producing plants and wastes left after mining and metallurgical processes[10]. In present study we analysis the physio-chemical and heavy metal concentration of ten industrial effluents of Durg- Bhilai Chhattisgarh.

Material and Methods

Collection of Sample

Collect the waste water of 10 industries. Bottles selected were 250ml capacity with ground glass stoppers within overhanging rim to protect the mouth of the bottle from extraneous contamination. The mouth was covered with two layers of Kraft paper the bottle was sterilized dry in a hot air oven or in an autoclave. When water was collected from a tap. The mouth of the tap was flamed with a blow lamp. Water was allowed to run for five minutes before filling the bottle completely. The stopper should be opened immediately before filling and it is then put back in the mouth of the bottle. The manipulation should be done with all aseptic precaution.

Determination of Physical Parameters

Analysis the Color, odour, Temperature, Taste, pH, and TDS of industrial waste water.

Determination of Chemicals Parameters

Analysis of electrical conductivity, Alkinity, BOD, DO, COD of industrial waste water.

Results and Discussion

In this study Samples will be collected from 10 different industries surrounding Durg-Bhilai (Twin city), these industries are: Bhilai Steel Plant, Bhiai (S-1), Bhilai Food corporation,Bhilai

TABLE- 1: Physiochemical analysis of industrial waste water

Parameters	Samples									
	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
Colour	Colourless	Colourless	Colourless	Moudy	Colourless	Colourless	Brown	Colourless	Colourless	Colourless
Odour	Odourless	Odourless	Odourless	Rotten	Odourless	Odourless	Rotten	Odourless	Odourless	Odourless
Tastes	tasteless	Tastless	tasteless	tastless	tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless
pH	5.85	6.38	6.45	6.05	6.28	6.85	6.38	6.75	6.65	6.58
Temp	20^0C	24^0C	23^0C	21^0C	24^0C	26^0C	24^0C	22^0C	23^0C	24^0C
EC (µmoh/cm)	1589	1666	1231	1645	1610	1527	1578	1619	1497	1389
TDS	28mg/L	55mg/L	50mg/L	278mg/L	155mg/L	60mg/L	48mg/L	124mg/L	59mg/L	47mg/L

Alkaninity (mg/L $CaCO_3$)	93mg/L	73mg/L	86mg/L	106mg/L	73mg/L	79mg/L	99mg/L	81mg/L	88mg/L	79mg/L
DO	5.4mg/L	25.6mg/L	66.2mg/L	6.6mg/L	39.2mg/L	15.6mg/L	9.2mg/L	23.6mg/L	69.2mg/L	31mg/L
BOD	8.4mg/L	42.6mg/L	33.4mg/L	43.6 mg/L	28.4mg/L	32.6mg/L	8.9mg/L	42.6mg/L	37.4mg/L	222.6mg/L
COD	45mg/L	25mg/L	41mg/L	34mg/L	27mg/L	32mg/L	48mg/L	35mg/L	22mg/L	19mg/L

(S-2)**,** Kedia Distillery, Bhilai (S-3)**,** Paper Industry, Rasmada, Durg (S-4)**,** ACC cement, Jamul, Bhilai (S-5)**,** Dairy Industry, Devbhog, Durg (S-6)**,** Biofertilizer Factory, Patan, Durg (S-7)**,** IB Group of Oil refinery, Durg (S-8)**,** Glucose Industry, Durg (S-9)**,** Rice Bran Oil Mill, Dhamdha, Durg (S-10). Effluents and underground drinking water of the surrounding area were analyzed for various important characteristics such as temperature[9] , pH[7], electrical conductivity[7], total soluble solids[1], total dissolved solids (Richards, 1954), biological oxygen demand[4] and heavy metals concentration[1]. pH of all samples was acidic. EC range between all samples was 1231-1666 (µmoh/cm). BOD of S-10 is shows highest (222.6mg/L) and S-1 shows lowest BOD (8.4mg/L). S-7 Show highest COD (48mg/L) and S-10 shows lowest COD (19mg/L).

Conclusion

Industrial wastewaters entering a water body represent a heavy source of environmental pollution. It affects both the water quality as well as the microbial and aquatic flora. With competing demands on limited water resources, awareness of the issues involved in water pollution, has led to considerable public debate about the environmental effects of industrial effluents discharged into aquatic environments. Industrial effluents are characterized by their abnormal turbidity, conductivity, chemical oxygen demand (COD), total suspended solids (TSS), biological oxygen demand (BOD), and total hardness. The characteristics of effluents varied with the Industry. In all samples BOD, COD was above permissible limit. pH was acidic in all samples.

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