Effect of Rice Mill Processing Waste Water on Mahanadi River at Rajim Area of Chhattisgarh

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Abstract— The study was conducted to evaluate the water quality and rice mill impact of the River water in Mahanadi Rajim- Nawapara, Raipur district surrounding area. The water analysis Heavy metals parameters monitored at different sample site located around Mahanadi Rajim. In study used of methods physical and chemical parameters. The Heavy metal parameter like Cupper, Iron, Manganese and Zinc was determined. The suitability of River water may be assessed by comparing Heavy metal parameters of the study area with the guidelines recommended by World Health Organization, BIS.

Key words: Rice Mill, Waste Water

I. INTRODUCTION

Water is one of the most important and abundant compounds of the ecosystem. As of now only earth is the planet having about 70 % of water. All living organisms on the earth need water for their survival and growth. Thus the quality of the freshwater supply is important for virtually every aspect of our lives an adult needs to drink approximately 2 to 5 liters of water every day. Humans also use much larger amount of freshwater of cooking, cleaning industry and agriculture.[1, 2]

Rivers are the most important resources in the world in general and in India in particular, The Rivers provide water for industries, agriculture, and aquaculture, commercial and domestic purpose. Unfortunately the same Rivers are being polluted by indiscriminate disposal of sewage and industrial wastes of human activities. Mahanadi River is the most important river of the state and is also known as the life line of Chhattisgarh.[3]

Rice mill Among agro-industries, rice processing industry is the biggest industry in India. Moreover, it has the biggest area under rice cultivation. Almost all of the Rice mill effluent generation comes from parboiling of rice. It discharges processed waste water, particulate matter and solid wastes.

Heavy metals are defined as metallic elements that have a relatively high density compared to water. Heavy metals are sometimes called "trace elements". They are the metallic elements of the periodic table. Heavy metals have become of particular interest in recent decades within the framework of environmental investigation.[4] Metals occur naturally in the earth crust. The distribution of metals in the environmental is governed by the properties of the metal and influences of environmental factors.[5] Heavy metals refer to any metallic element that have relatively high density and is toxic or poisonous even at low concentration[6, 7]

Heavy metals can enter a water supply by industrial and consumer waste, or even from acidic rain breaking down soils and releasing heavy metals into streams, lakes, rivers, and groundwater. Heavy metal toxicity can result in damaged or reduced mental and central nervous function, lower energy levels, and damage to blood composition, lungs, kidneys, liver, and other vital organs. Long-term exposure may result in slowly progressing physical, muscular, and neurological degenerative processes that mimic Alzheimer's disease, Parkinson's disease, muscular dystrophy, and multiple sclerosis.[8]

II. STUDY AREA

The present study area involved the Mahanadi River of Rajim- Nawapara Chhattisgarh, India. It is situated at 20°57′54″N latitude and 81°52′54″E longitude Chhattisgarh capital, Raipur, is located 49 km away from the Mahanadi of Rajim. The water of rice mill, which is present in Rajim, falls of the Mahanadi.

Fig. 1: Mahanadi Rajim- Nawapara City map showing sampling point

III. SAMPLING COLLECTION

The samples were collected from seven sites from Rice Mill waste water. Sampling procedure involves water samples from the surface; it was collected seven samples Representative sample (1000 mL for water and 300–400 g wet weight for mud) were added in 1000 mL sample bottles, previously washed with HNO_3 solution. We are chosen 7 sample site with respect to outlet of Rice Mill and the basis of direction of River flow. The collected samples were kept under normal room temperature during the testing procedure.[9, 10] Table 1

Sample Site	Distance Location	Km
Site 1	Before Rice mill, Rajim	1 km
Site 2	Outlet point of Rice Mill	0 km
Site 3	After outlet of Rice Mill	1 km
Site 4	After outlet of Rice Mill	2 km
Site 5	After outlet of Rice Mill	3 km
Site 6	After outlet of Rice Mill	4 km
Site 7	After outlet of Rice Mill	5 km

Table 1: Different Sampling Site on the basis of River flow

IV. MATERIALS & METHODS

The analysis of water quality is carried out as per APHA norms to establish the existing water quality. The existing water quality is then compared with the water quality standards presented by WHO & BIS (IS:10500-2012).[11] The parameters like Heavy metal Iron, copper, Manganese and Zinc recorded in the laboratory by Spectrophotometer (AAS).

A. November- December

S.NO.	Parameter	Unit of measurement	WHO	BIS	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Copper	mg/L	1.0	1.5	0.06	0.04	0.00	0.00	0.00	0.00	0.00
2	Iron	mg/L	0.3	1.0	0.36	0.42	0.54	1.22	0.73	2.33	0.67
3	Manganese	mg/L	0.1	0.5	0.00	0.12	0.00	0.17	0.30	0.67	0.62
4	Zinc	mg/L	5.0	15	0.07	0.00	0.00	0.08	0.00	0.07	0.06

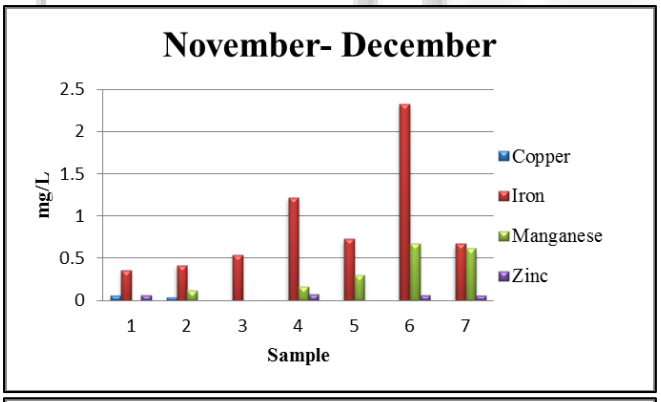
Table 2: Heavy metal on different sample site

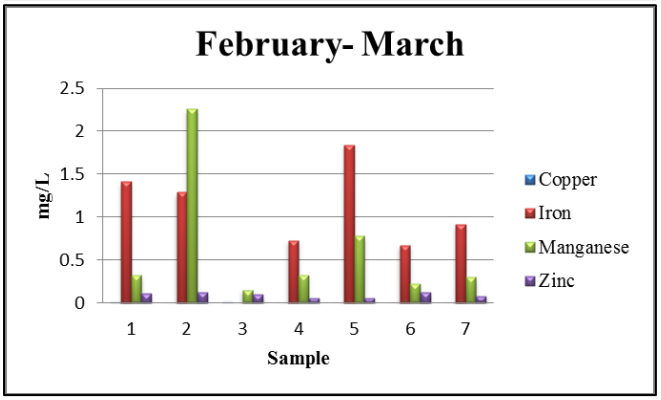
B. February- March

S.NO.	Parameter	Unit of measurement	WHO	BIS	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Copper	mg/L	1.0	1.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00
2	Iron	mg/L	0.3	1.0	1.41	1.29	0.00	0.73	1.84	0.67	0.92
3	Manganese	mg/L	0.1	0.5	0.32	2.26	0.15	0.32	0.78	0.22	0.30
4	Zinc	mg/L	5.0	15	0.11	0.13	0.10	0.06	0.06	0.13	0.08

Table 3: Heavy metal on different sample site

V. RESULTS & DISCUSSION





1) Copper- Copper was find out by the atomic absorption spectroscopy was reportedas mg/l. the obsevation Cu of sample in the November- December at different sample site of River is in the range 0.00mg/L to 0.06mg/L and in the month of Feb- March is in the range 0.00mg/L to 0.01mg/L. The maximum vaule of Cu ware recorded at (sample site1) 0.06mg/L and the minimum vaule of Cu were recorded at (sample site3, 4, 5, 6 and 7) 0.00mg/L.
2) Iron- The obsevation Fe of sample in the November- December at different sample site of River is in the range 0.36mg/L to 2.33mg/L and in the month of Feb- March is in the range 0.00mg/L to 1.84mg/L. The maximum vaule of Cu ware recorded at (sample site2) 2.33mg/L and the minimum vaule of Fe were recorded at (sample site3) 0.00mg/L.
3) Manganese- The obsevation Mn of sample in the November- December at different sample site of River is in the range 0.00mg/L to 0.67mg/L and in the month of Feb- March is in the range 0.15mg/L to 2.26mg/L. The maximum vaule of Mn ware recorded at (sample site2) 2.26mg/L and the minimum vaule of Fe were recorded at (sample site1) 0.00mg/L.
4) Zinc- The obsevation Mn of sample in the November- December at different sample site of River is in the range 0.00mg/L to 0.08mg/L and in the month of Feb- March is in the range 0.06mg/L to 0.13mg/L. The maximum vaule of Zn ware recorded at (sample site2) 0.13mg/L and the minimum vaule of Zn were recorded at (sample site3 and 5) 0.00mg/L.

VI. CONCLUSION

Water is a vital commodity for the survival of human beings, animals and vegetation and for the proper balance of the ecosystem itself. Any adverse impact on water quality due to the industrial activity will have consequences on the environment.

The production of parboiled rice involves soaking, steaming and drying and this production requires large amount of water for soaking of the paddy. The soak water contains organic material and when discharge large quantities of soak water repeatedly over a localized area where it stagnates and putrefies, causing pollution of water and River water, so the effluent should be properly treated before disposal as it may contaminate River water.

From the tests conducted above, the values obtained for Copper and Zinc for all samples i.e., well samples as well as surface water samples are within the permissible limits. But the values of Iron and Manganese are not within the acceptable limits. Iron and Manganese shows higher variations. In case of well water samples, higher values are at the near areas to the rice mill. Also, for River water samples highest values are at the discharge point and downstream when comparing with the upstream sample. So it is apprehended that River water as well as groundwater may get polluted by the waste water from the rice mill and not suitable for drinking considering Iron and Manganese as criteria.

Even though the rice mills discharge waste water after treatment, also shows variations in some parameters from standards, so it is confirmed that the treatment is not effective and they need to go for better treatment before disposal. However the study was confined to the determination of only few characteristics and that too over a short period. So to arrive at a better conclusion a long term study with more parameters is necessary to be analyzed.

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