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Physic-chemical study impact of rice mills effects on drinking water of gariyaband area Chhattisgarh

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Abstract
The study was conducted to evaluate the water quality and rice mill impact of the drinking water in Gariyaband district surrounding area. In which area are different physicochemical parameters of drinking water of rice mill area villages Gariyaband district. The water analysis of physico-chemical parameters monitored at different sample site located around village of Datar rice mill are Malgaov, Gariyabnd, Kochbay, Krra and Joba. There are sample site namely S1- Malgaov, S2-Gariyabnd, S3- Kochbay, S4 – Krra and S5- Joba. In study used of methods physical and chemical parameters. The physico-chemical parameter like temperature, pH, hardness, Dissolved oxygen,Ca hardness, Mg hardness, alkalinity, Total hardness., TDS, Electric conductivity, COD was determined. The suitability of drinking and other purposes may be assessed by comparing physical and chemical parameters of the study area with the guidelines recommended by World Health Organization, BIS. It has been found that in some parameters the water samples collected from various locations in Gariyaband district are not in the acceptable limit in accordance with the of WHO and IS 10500 drinking water quality standards.

Keywords: dissolved oxygen, drinking water, parboiled rice mills, physico-chemical parameters

Introduction
Water is the most essential component of life. It is a unique liquid in the sense that without it life is impossible. Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life. (Gorde et.al.2013) [9] It is important natural resource which covers 70% of earth that exists on planet of earth and without it, life cannot survive.
Water works as a very good medicine to eliminate many diseases from the body and hence it is called universal drug. The treatment of diseases making use of water is called Hydrotherapy which is very popular. Water is also important from health point of view, as contamination of water can cause many diseases making the life most miserable. It sustains life but can also take it away if it is not safe and protected. Various diseases and physiological disorders are known to be caused by contaminated drinking water.
Rice is life to more than half of world's population. Parboiled rice is as one of the most popular rice products. Parboiled rice is de-husked grain made by milling partially boiled raw paddy. The cooking quality of rice is improved significantly by parboiling. Parboiling increases rice yield during milling as well as rice shell-life. The process of parboiling involves soaking, steaming and drying. Conventional parboiled production generally requires large amount of water for soaking of the paddy. Water pollution is caused by the organic material (COD) in the soak water (Naresh *et al*. 2016). The modern rice mills discharge large quantities of soak water repeatedly over a localised area where it stagnates and putrefies, causing pollution of drinking water.

Materials and Methods
Study Area
Gariaband District is one of the nine new districts formed in Chhattisgarh, operational from January 1, 2012, ceremonially launched by Chief Minister Dr. Raman Singh on January 11, 2012. Gariaband district was carved out of Raipur district and has its headquarters at Gariaband town. Dhamtari and Mahasamund are the neighbours district. The district covers an area of 5822.861 sq.km. is full of natural resources. "Parry" and "Sodhur" river flows north from here and makes "Triveni Sangam" Rajim together.
Gariaband district is a Forest Landscape area. Farming is wide across the district, 49.56% area of farms in the district is irrigated. 50.41% area of district is covered by forest. The Following type of forests are in Gariaband district Teak Forest (Sagon Van) - 0.37% Saal Forest(Saal Van) - 22.66% Mixed forest - 54.51% Other forest - 22.46%

Sampling locations
The present study will be carried out during 2018 in the rice mill area of Gariyaband district in Chhattisgarh. Gariyaband is a beautiful town with laid-back environs, surrounded with Rice mills sides. Name of Rice mill is Datar Rice Mill in Gariyaband District. In which sample site located around village of Datar rice mill are Malgaov, Gariyabnd, Kochbay, Krra and Joba. There are sample site namely S1- Malgaov, S2-Gariyabnd, S3- Kochbay, S4 – Krra and S5- Joba.

Collection of samples
Samples may be collected by using a water sampler or by

using glass or polythene bottles. For a depth sample, a sampler is often necessary. For collection of a sample from the bottom, where water is shallow and a depth sampling is must, the sample can be collected by lowering a closed bottle to the bottom, opening and closing it there by hand and bringing at the surface in the study area.

The parameters analysed to assess the water quality will be broadly divided into:

- **Physical parameters:** Colour, Temperature, Transparency and Turbidity.
- **Chemical parameters:** pH, Electrical Conductivity (E.C), Total Solids (TS), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Total Hardness, Calcium Hardness, Magnesium Hardness, Nitrates, Phosphates, Sulphates, Chlorides, Dissolved Oxygen (D.O), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Fluorides, Free Carbon-di-oxide, Potassium and Sodium.

Results

In order to have an idea about the extent of drinking water in rice mill area of villages with respect to different water quality parameters.

Physico-chemical parameters Analysis of Drinking water

Colour

The rice mill area whether collected from the surrounding villages drinking water, exhibited natural colour to light brown colour. The natural colour of the water was changed due to contamination by rice mill effluents, hence the water appeared to be undesirably light brown. However, the water of the samples collected from non-polluted fields also showed a pale yellowish colour.

Table 1: Parameter Value of all Sampling Site in Gariyaband District

Parameter	Unit	S1	S2	S3	S4	S5	Average Value
Temperature	˚C	27.2	30.2	26.4	28	25.6	27.48
pH	mol/L	7.4	8.2	6.9	6.53	6.63	7.132
Turbidity	mg/L	65	78	37	33	29	48.4
Alkalinity	mg/L	45	93	73	82	71	72.8
Hardness	mg/L	48	56	86	89	66	69
EC	µS/cm	480	390	248	298	345	352.2
Chloride	mg/L	23	28	22	20	19	22.4
Ca	mg/L	102	124	72	69	76	88.6
Sulphate	mg/L	26	28	36	27	23	28
Mg	Mg/L	18	32	18	19	22	21.8
D.O	mg/L	4.5	1.6	4.7	3.3	5.3	3.88
B.O.D	mg/L	5.3	26	5.1	5.3	6.1	9.58
C.O.D	mg/L	20	142	21	35	16	46.8
Total solids	mg/L	176	186	132	116	104	140.4
Total Dissolved Solids	mg/L	450	850	855	764	779	736.6
Total Suspended Solids	mg/L	60	87	48	39	46	54.6

* S1- Malgaov, S2-Gariyabnd, S3- Kochbay, S4 – Karra and S5- Joba

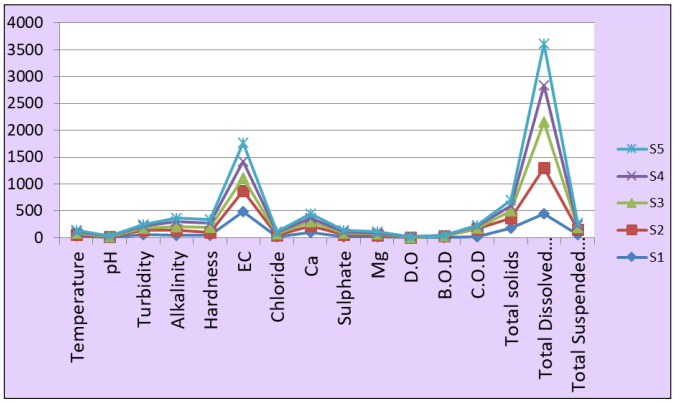

Fig 1: Graphical representation of all sampling site

Discussion

The temperature showed only minor variations from one sampling site to another (range of the values: 25.6 to 30.2 °C), but the various sample site variations were large. The mean value is water temperature 27.48 °C. In Gariyaband (S2) is highest temperature value 30.2 °C and lowest temperature value 25.6 °C in Joba village in Gariyaband District, while the values have a wide spread during April. The pH of the water samples varies over 3 units from ~ 5.0 to 8.0 with maximum variation for the sampling point S2 (8.2) and S5 (6.63) (Figure 1). The sample site average pH values 7.13 mostly meet the guideline range of 6.63 to 8.2 (WHO, 2004) for drinking water in Gariyaband district. However, the minimum values of pH in all the sites were lower than the minimum guideline value. The water could be described as slightly acidic which might not be suitable for various forms of aquatic life. The average turbidity values for the whole sample site of analysis varied from 29 (S5) to 78 NTU (S2). Considering all the measurements, the highest value recorded was 78 NTU (S2). The turbidity values had large variations (Table1) for the rice mill area of villages.

The alkalinity of the water remained in the average value of 72.8. The values were found to be low at the sites MalgaovS1 (45) which were in the Gariyaband district. The values have high alkalinity value of Gariyabdnd S2 (93). The alkalinity value determines the buffering capacity of the water body relative to other water quality components and is related to the

pH. The Hardness average values 69 for the whole sample site in Gariyaband district. Considering all the measurements has the highest value 89 in Karra village (S2) and hardness of lowest value 45 in Malgaon Village (S1). The turbidity values had large variations (Table 1) for the rice mill area of villages. The relationships that the alkalinity holds to pH and to the total hardness (sum of Ca- and Mg-hardness) are shown separately in the scatter diagrams in Graph 1. Although no clear trend could be established, it is seen from the figures that alkalinity has a clear tendency to increase with total hardness indicating that the presence of more Ca and Mg would have led to higher alkalinity. The electrical conductivity of the water remained in the average value of 352.2. The values were found to be low at the sites S1 (48) which were in the Gariyaband district. The values were high EC value of S4 (89) indicating sufficient input of ionic matter in the form of runoff or through human activities.

In the table no. 1 show on the Chloride average value are 22.4 in drinking water of Gariyaband district. The values were found to be low at the sites Joba S5 (19) and highest chloride value of 28 at the site Gariyaband (S2). The alkalinity value determines the buffering capacity of the water body relative to other water quality components and is related to the pH. In the Ca average value are 88.6 in drinking water of Gariyaband district. The Calcium (Ca) values were found to be low value 69 at the sites Karra S4, and highest Calcium (Ca) value of 28 at the site Gariyaband (S2). The alkalinity value determines the buffering capacity of the water body relative to other water quality components and is related to the pH. In the Sulphate average value is 28 in Gariyaband district which the Sulphate lowest value 23 in Joba village and highest Sulphate value 36 in Kochbey village. In the Magnesium (Mg) average value is 21.8 in Gariyaband district which the Sulphate lowest value 23 in Kochbey village and highest Sulphate value 32 in Gariyaband.

Dissolved Oxygen (DO) The DO concentrations of water body is affected by the temperature bacterial activities etc. In the present study (Tables 1 and Graph 1) the DO concentration at Gariyaband has to be found lowest value 1.6 (S2) and highest value 4.7 (S3). Biochemical Oxygen Demand (BOD) BOD values are useful in stream pollution control management and in evaluating the self-purification capacity of a stream which serves as a measure to assess the quantity of water which can be safely assimilated by the stream. In which show on the BOD average value is 9.58 in Gariyaband district which the BOD lowest value 5.1 in Kochbey village and highest BOD value 26 in Gariyaband. In which show on the COD average value is 46.8 in Gariyaband district which the COD lowest value 16 in Joba village and highest COD value 142 in Gariyaband. The solids, viz., total dissolved solids (TDS dried to constant weight at 180°C), total suspended solids (TSS dried to constant weight at 103 - 105 °C) and total solids (TS) Table 1. Basie statistics are temperature, turbidity, pH, electrical conductivity, TDS, TSS, total hardness and total alkalinity of the drinking water (Sampling period February to July 2004).

Showed high values are again nearer to the Gariaband and low values in the Malgaov village in Gariaband district. The water was calm at the middle with low level of disturbance and therefore, the water contained fewer solids - both dissolved and suspended. At all the sampling points, the TDS values were much higher than the TSS values. The highest TSS values were recorded at the sampling sites, S3 and S2 (Table 1).

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