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Evaluation of Dumped Foods Chealates in Adjacent Pond Water Through Physico-Chemical Analysis

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ABSTRACT

These days the waste food may be cooked or expired packaged foods are dumped in the soil at a particular spot that is away from the city. These materials are decomposed by the microbes and resulting contaminated water is called leachate. This can permeate through the soil, and may pollute the surface and ground water present in the vicinity. In the present study, two ponds were selected for physico-chemical analysis of water adjacent to the common waste food dumping site. One pond was 8 M away and another 10 meter. The temperature ranged from 29^{0}C to 30^{0}C, pH 6.25 to 6.58, TDS 220 mg/L to 360 mg/L, turbidity 251.25 to 286.85 NTU, conductivity 305 µs cm to 286 µs cm, alkalinity 154 mg/L to 186 mg/L, D.O. 4.6 mg/L to 6.4 mg/L, Chloride 38.65 to 32.54 mg/L, total hardness 305-380 mg/L, calcium hardness 45 mg/L to 58 mg/L, Magnesium hardness 92 mg/L to 125 mg/L respectively. Heavy metals like Fe ranged between 0.640 to 0.850 mg/L, Cadmium 0.306 mg/L to 0.525 mg/L. The heavy metals like Pb, Cu, Mn were not found in any pond water studied here.

Keywords : Waste food, Dumping point, Leachate, Surface water, Physico-chemical analysis, Heavy metal

I. INTRODUCTION

In present day we see that everybody is misusing his money for his status show. Whether, it is marriage party or any other celebration more than 40% of cooked used and used food materials are going as waste. These food materials from different parties and even hotels are being dumped to particular areas which are away from the town but are surrounded by the agricultural lands or water bodies. These food ingredients are degraded and in course of time they become leachate and along with rain water are transported to the nearby agricultural land or in the water bodies which are being used for fisheries or irrigation or for the washing of clothes. Even animals in general and Cattles in particular do drink such water which may be contaminated with the above leachates. There are reports that even in the developed countries, the dumping of non-segregated solid waste to landfill site is the most prevalent waste disposal practice (Mishra *et al*; 2014). The improper management of landfills and generation of toxic

leachate thereby exert significant impacts on surrounding fresh water and ground water (Mishra *et al*; 2019). Leachate is the aqueous effluent generated form solid waste owing to their physical chemical, biological alteration in landfills. It is considered as the chemical soup of dissolved organic compounds, different anions and cations and heavy metals. (Prasad and Bose, 2001). Heavy metals found in leachate are persistent, non-biodegradable and are degrading surface and ground water. They are considered even toxic at low level to biological system (Verma, 2013).

The principal concern about waste food and municipal landfills is focused on the pollution potential due to mobilization of the generated leachate through the sub soil into the surface and ground water (Mishra *et al*; 2019). During the rainy season, water containing the leachate from the landfill site drains into the nearby low land and surface water bodies and pollute the local environment. Physico-chemical analysis of pond water, which are being degraded due to one or other reasons have been studied by different workers such as :- Mohan *et al*; (1996); Prasad and Bose (2001); Vasanthi *et al*; (2008); Gopal Krishna (2011); Madhudhula *et al*; (2012); Jena *et al*; (2013); Devi *et al*; (2013); Chaudhary *et al*; (2014); Dixit *et al*; (2015); Parab and Pradhan (2015); Verma and Khan (2015); Das and Das (2016); Durge *et al*; (2016); Goswami *et al*; (2017); Sharma *et al*; (2017); Bhattacharya (2018).

Residents near such ponds are affected severely by the uncontrolled management of the cooked and expired packaged food materials which are being dumped near such water bodies. Therefore, it is significant to know about the contribution of the cooked and expired food wastes dumped in the soil in the form of leachate in polluting the surface and ground water in the different urban and rural areas. Given the importance of the above issues it is decisive to do more detailed systematic review and metal analysis on leachate characteristics, with particular respects to harmful components of the leachate. In the present study attempt has been made to study few selected parameters for pond water analysis which are adjacent to the dumping zone.

II. MATERIALS & METHODS

Two ponds adjacent ot common dumping points of cooked waste food as well as expired packaged were selected in the remote areas of the main town. Water samples 500ml from each pond were collected manually form the pond into polyethylene bottles. Before sampling the bottles were washed with 10% V/V hydrochloric acid, to avoid any contaminants from metal or non-metal ions. These bottles were rinsed thrice with distilled water and then at the site with the sample water. Bottles were taken out in the laboratory for different analysis.

From this water, pH, Total dissolved solids, turbidity, electrical conductivity, alkalinity chloride, dissolved oxygen, total harness, calcium hardness, magnesium hardness, total hardness by using different equipments such as pH meter, turbidity meter, electrical conductivity meters etc. For chemical analysis titrimetric method was applied.

For the determination of oxygen the sample was collected with precautions so that there should not be air space or bubble. Further, with the help of chemical reagent oxygen of the water was fixed at the point of collection itself.

For the detection of heavy metals the sample water was boiled at 200^0C in the acid solution having 8 part nitric acid, 2 part sulphuric acid, and 1 part per chloric acid until organic person of the sample was digested and evaporated(Transparent solution). This was allowed to cool at room temperature. 50 ml deionized water was added to it. Solution was filtered through Whatman filter paper No-42 into 100 ml volumetric flask. The volume was made 100 ml mark. The sample was analysed with atomic absorption spectrophotometer. Al the experiments for different parameters were done in triplicate and the means of the data were tabulated in table one. All the experiments were done in accordance with the

protocols and methods of American Public Health Organization APHA (2012).

III.RESULTS AND DISCUSSION

Present study was done just after the end of the rainy season. After rainy season in the month of late September and during October the day time temperature goes high due to clear atmosphere. The ponds selected for water analysis are tested at the distance of near about 8&10 meter respectively. Here the mean of temperature of surface water ranged between 29^{0}C to 30^{0}C in both the ponds. Similarly, the pH was also calculated. Here the mean value of pH of pond which was more adjacent was 6.25 while in the other which was just few meter away from the first one had the mean value of pH 6.58 respectively. With respect to total dissolved substance variations in the mean values for both the ponds were observed. The mean value for the adjacent pond was 360 mg/L while in the next pond water it was 208 mg/L respectively. Turbidity of the two ponds also varied and the mean values were 286.85 NTU for the first while 251.25 NTU for the second ponds respectively. Similarly, alkalinity of ponds differed and the mean values were 186.0 mg/L to 154.0 mg/L respectively for both the ponds studied here.

Dissolved oxygen of the two ponds was also calculated. From the table, it may be noted that while the amount of oxygen in one pond was 4.6 mg/L in the other it was 6.4 mg/L respectively. Similarly, the chloride content was 38.65 mg/L and 32.54 mg/L respectively. Total hardness in one pond was 380 mg/L while in the other 305 mg/L respectively. Amount of calcium was 58 mg/L in one pond while in the other it was 45 mg/L respectively. Mg^{++} was also calculated. It was 125 mg/L in one pond while 92 mg/L in the other pond respectively. Iron concentration was 0.850 mg/L and 0.640 mg/L in the above ponds. Amount of cadmium ranged between 0.525 to 0.306 respectively for the heavy metals such as Pb, Cu and Mn were note detected in the above ponds.

Discussions:

From the table, it may be noted that temperature range 29^{0}C to 30^{0}C was above than that of the WHO standard. This was also the case for the pH of the pond water that was 6.25 to 6.58. Here in one pond the level 6.25 is below the WHO standard that is 6.50, while in other pond it is slightly above to the range of the standard pH as recommended by WHO. However, amount of total dissolved substances and the turbidity of the pond water were below the standard of WHO.

Physico-chemical analysis for the above parameters of different ponds have been done by several workers like Kuamr and Nagrajan (2011); Bhalla *et al*; (2012); Lone *et al*; (2012); Nagrajan *et al*; (2012); Devi *et al*; (2013); Bhall *et al*; (2014); Manik Nandan *et al*; (2014); Hossain *et al*; (2014). These workers also studied the leachate of landfills and their impact on the ground and surface water. Present findings are in agreement with the above workers.

The dissolved oxygen in both the ponds was below the WHO standard. However, chloride, total hardness, and amount of calcium were below the WHO standard. But the amount of Mg^{++} was higher than the WHO standard. Similar findings have been reported by Parab and Pradhan (2015); Verma and Khan (2015); Jena *et al*; (2016); Das and Das (2016); Goswami *et al*; (2017); Sharma *et al*; (2017); Durge *et al*; (2018); Jahan *et al*; (2018); Mishra *et al*; (2019); and Parvin and Tareq (2021). So present findings abides with the findings of the above workers.

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Tables:

Table-1

Physico-chemical analysis of two pond water adjacent to the common waste food dumping site at Gopalganj.

Parameters	Distance	Temp.	pH	TDS mg/L	Turbidity NTU	Conductivity	Alkalinity	DO mg/L	Chloride mg/L	Total Hardness mg/L	Ca^{++} hardness	Mg^{++} hardness mg/L
WHO Standard		25^0 C	6.50	<1000	<500	µS cm <1000	<500	8.0	250	500	75	50
	8M	30^0 C	6.25	360	216.85	305.0	186.0	4.6	38.65	380	58	125
	10M	29^0 C	6.58	180	291.25	286.0	154.0	6.4	32.54	305	45	92
Analysis for heavy metals												
	Distance	Fe mg/L	Cd mg/L	Pb mg/L	Cu mg/L	Mn mg/L						
WHO Standard		0.3000	0.0030	0.0100	2.0	0.400						
	8M	0.850	0.525	0.000	0.000	0.000						
	10M	0.640	0.306	0.000	0.000	0.000						

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