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"Moringaoliefera" Coagulator: A New Fighter to Combat with Water Pollution

Dr. Kumar Kinjalk Bhardwaj*

Assistant Professor, Department of Chemistry, Govt. PG College Fatehabad, Agra, UP, 283111

Abstract – Groundwater is the most important natural resource used for drinking by many people around the world, especially in arid and semi-arid areas. The resource cannot be optimally used and sustained unless the quality of groundwater is assessed. The Proposed study is to determine the suitability of Moringaoliefera as an alternative and cheap local coagulating material in the improvement of water quality in terms of turbidity, pH, and colour and microorganism removal for Firozabad. This study also illustrates the qualitative analysis of groundwater and its suitability in the bulk samples collected from different canal catchment areas. This study suggested that groundwater is unsafe for drinking purpose without purification and quality measures should be considered while cropping in its irrigation use.

Keywords: Groundwater Quality, Canal catchment Area, Drinking, Irrigation

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1.1 INTRODUCTION

Groundwater is a life-sustaining resource that plays a central part in irrigated agriculture and influences the health of many ecosystems. But unsustainable depletion of groundwater has been documented on both regional and global scales[1]. The quality of groundwater is equally important to its quantity owing to the suitability of water for various purposes[2]. In recent years, intensive agricultural activities, domestic and industrial discharge, over-exploitation, uneven rainfall and mismanagement of groundwater have raised serious concern regarding groundwater contamination[3]. The World Health Organization reports that every year more than 3.4 million people die as a result of water-related diseases and a leading cause of death around the world[4].

The serious side of water pollution is caused by human action, urbanization and industrialization. The cause of pollution being[5]:

a) Sewage, which comprises decomposable organic problem& pathogenic agents,

b) Industrial & trade waste, which comprise toxic agents,

c) Agricultural pollutants, which comprise fertilizers & pesticides,

d) Physical pollutants viz. heat (thermal pollution) and radioactive substance (WHO Tech. Report, 1968)

Agriculture is demographically the broadcast economic sector and plays a significant role in the overall socioeconomic growth of India. The improvements in irrigation, infrastructure, quality seeds, innovative mechanization, chemical fertilizers and pesticides have helped India to make it seventh largest agricultural exporter worldwide[6]. But, on the other side, massive use of chemical fertilizers and pesticides deteriorated both groundwater quality and soil health[7].

The District Firozabad is situated between 27º 27 º 24' north latitude and 77 º 60' and 70º 04' east longitude in the south west corner of Uttar Pradesh. It is situated at about 40 Km east of Agra Distt. The district Comprise of an area of about 263.86Sq Km[8]. The total population of the district is 2081752 of which 1411513 reside in rural areas while 670239 in urban areas[9].….

Firozabad well known as '*Suhag Nagari' is* famous for its glass industry throughout the world. Today Firozabad is a modern town with all of the amenities. But this urbanization & modernization leads the city to a drastic situation of water scarcity.

The assessment of water quality changes during A decade is based on physic - chemical & biological analysis & the change in physic - chemical constituents of water can be reflected directly on the Biotic community of the Canal And Ground water. 'Jeda Jhaal' (60 km away canal from Ganga River) is a main water body being one in all the previous system and supply of potable water for the city. Earlier ground water was the

main source of supply to all over the city[10].. With increasing population load & explosion of town quality of ground water deteriorated to an extent that even when the standard treatment. Water system faces drawback in maintaining potable water quality standard[11].

1.2 METHODOLOGY

Batch Reactor: Evacuated tubular glass collectors consisting of two insulated glasslayers with vacuum to prevent heat loss and a metallic coating of copper is provided in the inner tube to conduct heat to the medium[12]. The specification of the batch reactor is 30 cm in length and 3.4 cm in diameter. Evacuated tubes are kept on slanted mounting frame made of iron. Experiments have been performed to test the increment in the efficiency of SODIS reaction with the use of batch reactor. Batch reactor used for the experiment is shown in Fig.1.

Figure1: Batch Reactor

PET Bottles: The plastic bottles need verified to be an adequate and safe vessel for water treatment with SODIS. Three numbers of ordinary plastic drinking transparent bottles was used in this experiment[13]. The first bottle contains normal ground water, second contains jeda jhaal Water and the third one is of Yamuna river. These PET (Polyethylene) transparent plastic bottles are exposed to the daylight for some hours as shown in Fig.2

Figure 2: PET Bottles:

Natural bio-coagulant preparation: Seeds were collected from nearby market. Dissections of the seed pods were executed by hand.[14] The seeds were removed from the pods and were dried out in the hot sun for 2 days. Fine powder was made by using mortar and pestle.

Figure 3: Moring Seeds and Powder

Photo catalysts: Photo catalysts are the regents that absorb sunlight and then produce the higher temperature and due to this property they are used in various kinds of solar applications. There are various examples of these kind of photo catalysts like Activated Carbon (AC), TiO2 Titanium Oxide, ZnO2 Zinc Oxide. In pictures below photo catalysts are clearly shown.

Figure 4: Activated Carbon

Weather Parameters: The batch reactor and PET bottles exposed to natural sunlight, specific to weather patterns in Firozabad, U.P, India . The ambient temperature was measured using digital thermometer (Fig.5(a))[15].The incident solar radiation was measured using a solar power meter(Fig.5(b)).The experiment was conducted on a sunny day between 11.30 and 16.00 h.

Figure: 5 (a) Digital Thermometer, 5(b) Solar Power meter

Analysis: The physiochemical parameters of water sample from 'jeda jhaal' were measured using TDS meter, Turbidity meter and pH Meter (Fig.6). The specifications of the instruments used for testing water samples are listed in Table 1.

Figure: 6 TDS meter, Turbidity Meter, pH Meter

1.3 RESULT & SIMULATION

Comparative Study of Pet Bottles and Batch Reactor under SODIS

The various physical and chemical parameters of water sample like pH, Turbidity and TDS were observed before and after treatment with SODIS.

Microorganisms are highly sensitive to heat. The temperature and revelation time plays a very vital role in exclusion of microorganisms. The experiment was carried with PET bottles/Batch reactor for around six hours with average solar intensity of 824 w/m2from 11.30 AM to 16:00 PM .In case of PET bottles, water temperature reached above 50ºC in six hours of constant exposure to the sunlight.

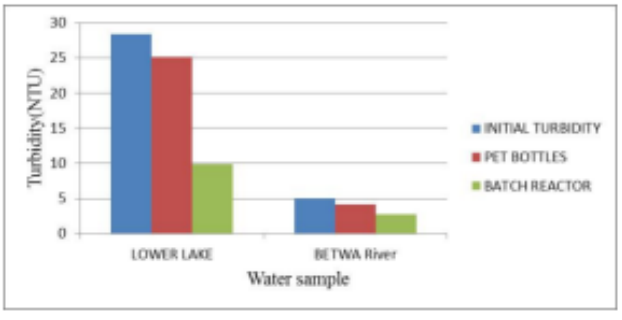

Fig. 7: Comparison of Turbidity of Water samples

Study of Turbidity Removers like Biocogulants

The various parameters were measured and the initial parameters are as follows:

Table 1: Initial parameters

Turbidity	42.5NTU
pH	8.66
Electrical Conductivity	751 µS
TDS	328 ppm
Temp.	29.5 °C
% NACL	1.5
ORP	-92.5mV

Turbidity-In case of sample 1 (0.6g/l) and sample 2 (0.8g/l) turbidity got reduced up to 4 hrs of experiment and after that a little bit increment has been seen in turbidity. But in case of sample 3 (0.7g/l) and sample 4 (0.1g/l) turbidity got reduced continuously up to 6 hrs but at a very slow rate. The minimum turbidity measured was found in sample 1 (0.4g/l) in the 4th hr of experiment and it was 6.03NTU as shown in fig 8

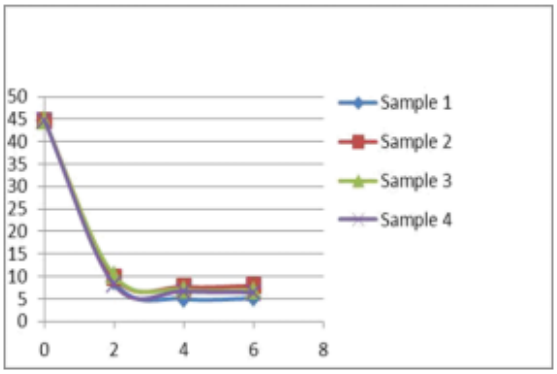

Fig.8: variation in turbidity

TDS- In all the samples, TDS increased up to 2hrs and after that in sample1 (0.6g/l) and sample 2 (0.8g/l).TDS got reduced up to 4 hrs of experiment and after that a high increment has been seen in TDS as shown in fig.9. But in case of sample 3 (0.98g/l) and sample4 (1.15 g/l) TDS got increased continuously up to 6hrs but at a very slow rate as.

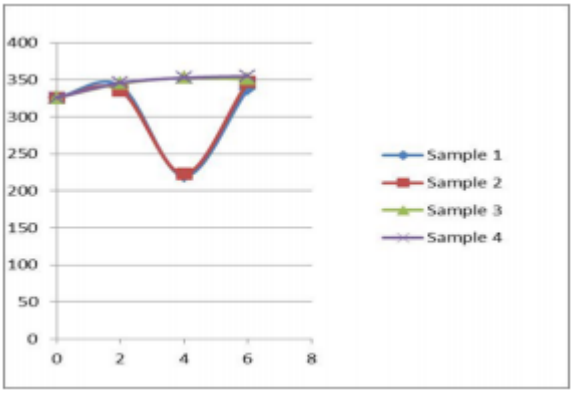

Fig.9: variation in TDS

pH- In all the samples, pH is decreasing upto 2hrs and after that in case sample1(0.5g/l) pH got decreased continuously up to 6hrs. In case of sample2 (0.7g/l) and sample3(0.9g/l) pH got reduced up to 4hrs and then it got increased by certain value. In case of sample4 (1.1g/l) pH got reduced up to 2hrs, then increased up to 4hrs and then again decreased up to 6 hrs as shown in fig 10.

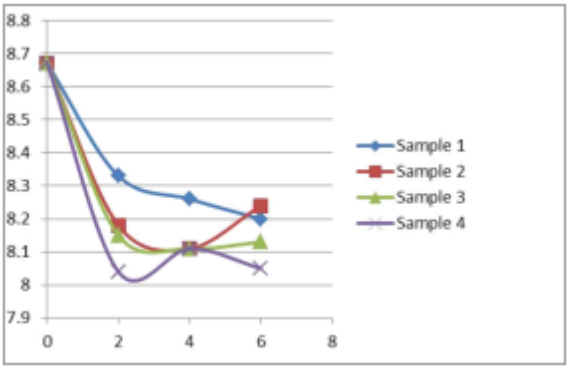

Fig.10: variation in pH

CONCLUSION

In this study, an attempt has been made to investigate groundwater quality status by the combined use of the Water Quality Index. The conclusion of that study is that - SODIS time reduced from 8h to 1h which is more than 90 % efficient with batch reactor. - Bio-coagulants reduce the turbidity around 85% and with moringa it reduces from 60 NTU to 9 NTU. Overall design is portable as well eco-friendly.

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Corresponding Author

Dr. Kumar Kinjalk Bhardwaj*

Assistant Professor, Department of Chemistry, Govt. PG College Fatehabad, Agra, UP, 283111