International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

The use of Moringa Seed Oil Cake as a Natural Remedy for Waste Water Treatment

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Article Info
Volume 8, Issue 6
Page Number : 76-83

Publication Issue :
November-December-2021

Article History
Accepted : 20 Nov 2021
Published: 30 Nov 2021

ABSTRACT

Moringa oleifera is a miracle tree with potential and its cultivation is actively promoted by Indian Government. Moringa Seeds powder is used to clarify turbid, dirty water. Research shows that the seed not only settles the mud, but can carry with it over 90% of Microorganisms. Seeds of this tree used for wastewater treatment. Based on this, water quality of Jabalpur (Madhya Pradesh) Pond Water was examined before and after the treatment using Moringa Seed oil cake. Moringa oleifera seed oil cake reduced the, Turbidity, pH, Total Solid, Total Dissolve Solid, Total Suspended Solids, Colour, Odour, and microbial growth (CFU) for the pond water samples. It was found that the moringa seed oil cake combination with different adjutants shows treatments was effectively reduce physicochemical (Turbidity, pH, Total Solid, Total Dissolve Solid, Total Suspended Solids, Colour, Odour) and biological parameters (microbial growth (CFU)). This primary result confirms the great potential of Moringa oleifera seed oil cake in wastewater treatment applications.

Keywords : Moringa Seed Oil Cake, Bioremediation, Waste Water, Treatment.

I. INTRODUCTION

Moringa also called Drumstick tree is a versatile tree useful not only for human beings and also in various industrial applications. It has been used in the ayurvedic for thousands of years. People in India have been using it as an item of their daily food for nearly 5000 years. Moringa used as a vegetable.

Water purification is the process of removing chemicals, biological contaminants, suspended solids from contaminated water. Bioremediation is the process of using biomaterials to remove contamination from water. Plant products are low cost plant products and presumed to be safe for human health. (Bhatia *et al.* 2006, Beltran *et al.* 2008, Vieira *et al.* 2010 and Tan *et al.* 2008.) Many researches show the plant materials have been used

for purification of turbid water. (Zonoozi *et al.* 2009 and Gupta *et al.* 2009)

Moringa Seeds powder are used to clarify turbid, dirty water. Research shows that the seed not only settles the mud, but can carry with it over 90% of Microorganisms. Some plants such as Garlic, Neem, and drumstick are reported to have bioremediation properties. Many researchers are focused in the use of Moringa seeds in water purification and improvement of water quality making it portable for drinking. The seeds of various species were found to contain cationic polyelectrolytes that are proved to be very effective in the treatment of water.

II. MATERIAL & METHODS

2.1 Collection of Plant Sample and Water Samples

Fresh, Brown & fully mature seeds of *Moringa oleifera* were collected from different locations which included 3 specific locations from Jabalpur City. Sampling of fully mature seeds of *Moringa oleifera* was done in the peak flowering season during the period of Late February & March.

Heavy polluted 6 different ponds were identified and collected water sample from in Jabalpur City (Madhya Pradesh). All water samples were collected in separate sterile plastic containers. (Olszowy H A, 1998, APHA 2005, Rajani and Ramachandra 2000)

2.2 Seed oil Extraction by Soxhlet Assembly

Before the extraction of oil from brown & mature seeds of *Moringa oleifera*, firstly, they have to be air dried by spreading on an open smooth surface to evaporate all the moisture. Secondly, after they have completely air dried, thirdly, the seed coats are removed to obtain the White Colored Seed Kernels or the part commonly known as Cotyledons. Finally these seed kernels are weighed & crushed uniformly using a mortar & pestle to convert the solid round seeds into a fine powder. The powder is tightly packed in a sachet made out of Whatman's Filter Paper. This sachet is then put into the middle chamber of the Soxhlet assembly which is then closed from the upside. 300 ml of 99% Ethanol was carefully poured into the upper chamber using a funnel which passes through the upper chamber, completely wets the sachet placed in the middle chamber & finally collects in the round bottom flask or the lower chamber.

2.3 Bioremediation capacity of modified biosorbents

Other bioremediation properties such as reduction in coli-forms, reduction in pH, Total Solid, Total Dissolve solid, Total Suspended solid, Colour, Odour and reduction in turbidity of water samples was estimated by various tests according to American Public Health Association norms (APHA 2005).

2.4 Clarification of Turbid Surface water using Seed Extract form *Moringa oleifera* with different adjutants

This standard method for the clarification of water is performed with locally available materials & may be modified according to specific local conditions. Materials required for Integrated Management of polluted water through different adjutants like Calcium Carbonate, Charcoal Powder, Potash Alum and Sand.

III. Results and Discussion

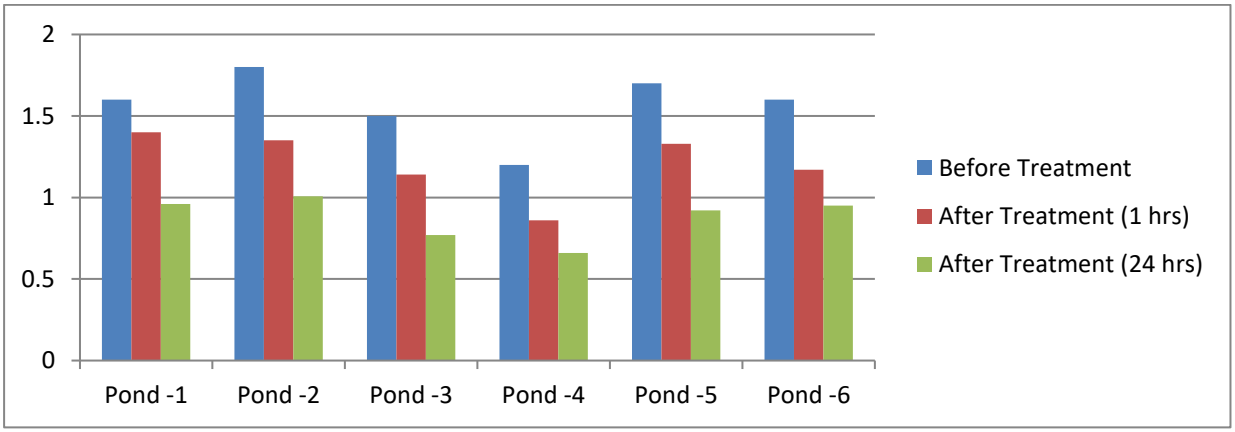
3.1 Oil extraction

Moringa seed oil was extracted using ethanol to obtain moringa seed oil cake without oil. However, the oil has not been fully extracted from the Moringa seed; only 15% of oil was extracted from the Moringa seed. In general, Moringa seed contains 36–45% oil (Garcia-Fayos *et al.* 2010). The remaining seed cake residue could be used in the wastewater treatment.

3.2 Analysis of Turbidity of Water Samples

Effect of primary and secondary treatment with *Moringa oleifera*. From the above results show Maximum reading of Turbidity was observed in the sample collected from Pond-1. Minimum reading of Turbidity was observed in the sample collected from Pond-4. Maximum reduction in Turbidity (60%) was also observed in the sample collected from Pond-1.

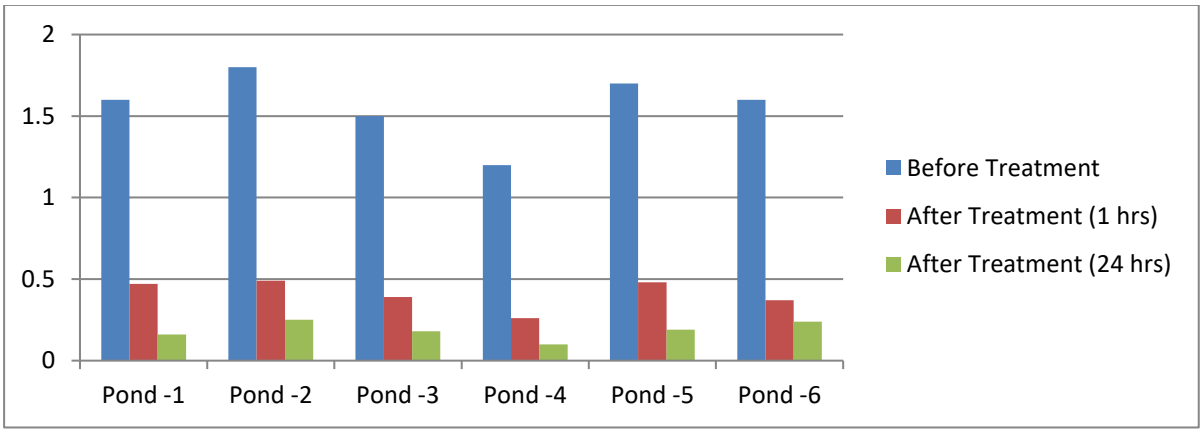
Graph No. 1- The effect of only dry seed oil cake of Moringa on the turbidity of different water samples at intervals of 1 hour and 24 hours.



3.3 The effect of adjutants with moringa seed oil cake on the turbidity of different water samples

The effect of formulated management of Moringa oil cake on the turbidity on waste water samples is shown in graph. Reduction in turbidity was obtained within the range of 70-90%. As the time interval after treatment with the coagulant increased, so did the degree of the clarification until the maximum limit, above which there was no further decrease in turbidity. The maximum time taken the coagulant to treat the samples was 24 hours. Readings were recorded after 1 hour and 24 hours of adding the dry seed cake. Maximum reading of Turbidity was observed in the sample collected from Pond-1. Minimum reading of Turbidity was observed in the sample collected from Pond - 4 Maximum reduction in Turbidity (90%) was also observed in the sample collected from Pond-1.

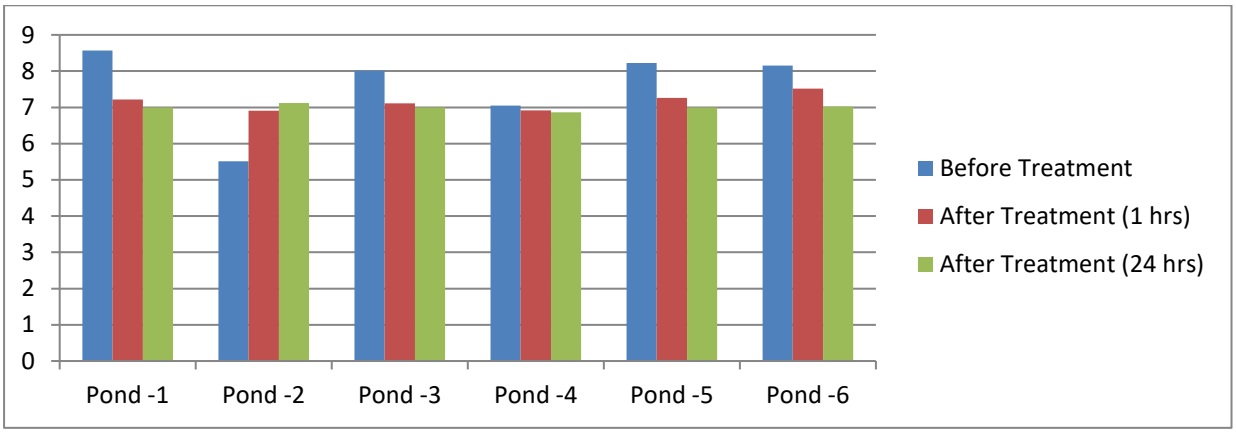
Graph No. 2- The effect of formulation with Moringa oil cake on the turbidity of different water samples



3.4 Analysis of pH of Water Samples.

From the above results show maximum reading of pH was observed in the sample collected from Pond-1. Minimum reading of pH was observed in the sample collected from Pond-2. Maximum reduction in pH (29.22%) was also observed in the sample collected from Pond-2.these results were similar with the study obtained by kalaicelvi *et.al.,* 2019. and Amagloh and Benang (2009) and Arnoldsson *et al.* (2008).

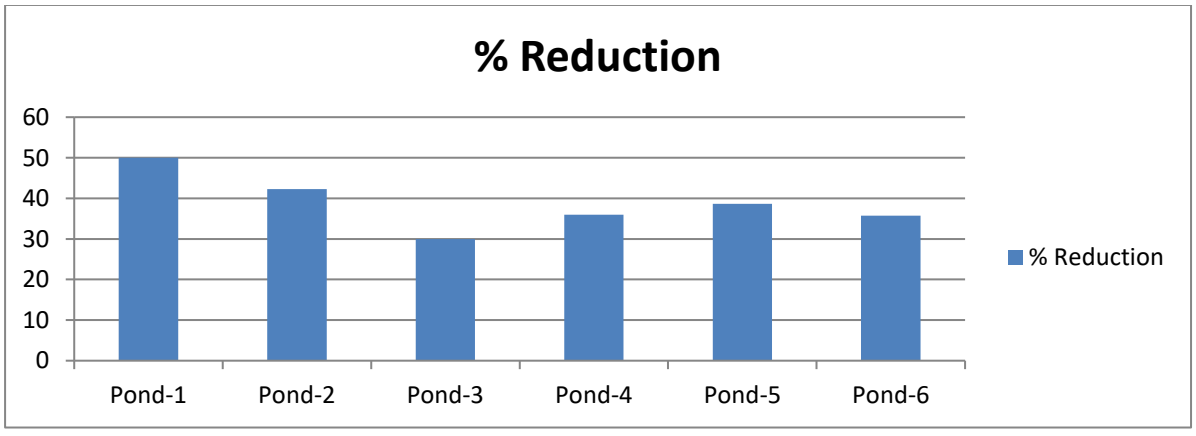
Graph No 3- The effect of adjutants with Moringa Seed oil cake on the pH of different water samples at intervals of 1 hour and 24 hours.



3.5 Analysis of Total Solid in Water Samples

From the above results it can show Maximum value for Total Solids was observed in the sample collected from Pond-1. Minimum value for Total Solids was observed in the sample collected from Pond-4. Maximum reduction in the value for Total Solids (50%) was also observed in the sample collected from Pond-1. These results were similar with the results obtained by (Shah *et al.*, 2013 and Dehghani *et al.* 2016)

Graph No. 4- Analysis of total solids in different water samples.

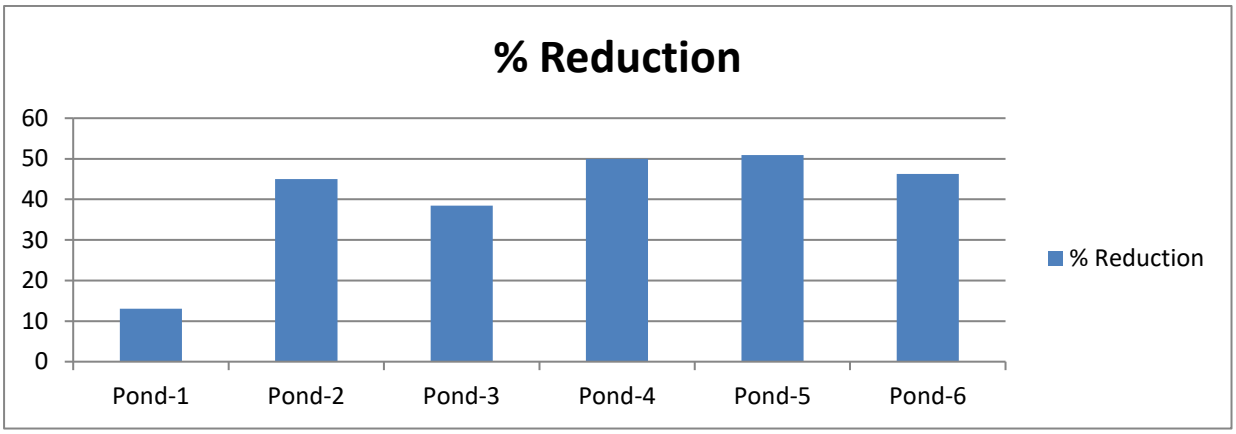


3.6 Analysis of Total Dissolved Solids of different water samples.

From the above results Maximum value for Total Dissolved Solids was observed in the sample collected from Pond-5. Minimum value for Total Dissolved Solids was observed in the sample collected from Pond-6.

Maximum reduction in the value for Total Dissolved Solids (50.90%) was also observed in the sample collected from Pond-5. These results were similar with the results obtained by (Shah *et al.* 2013 and Dehghani *et al.* 2016)

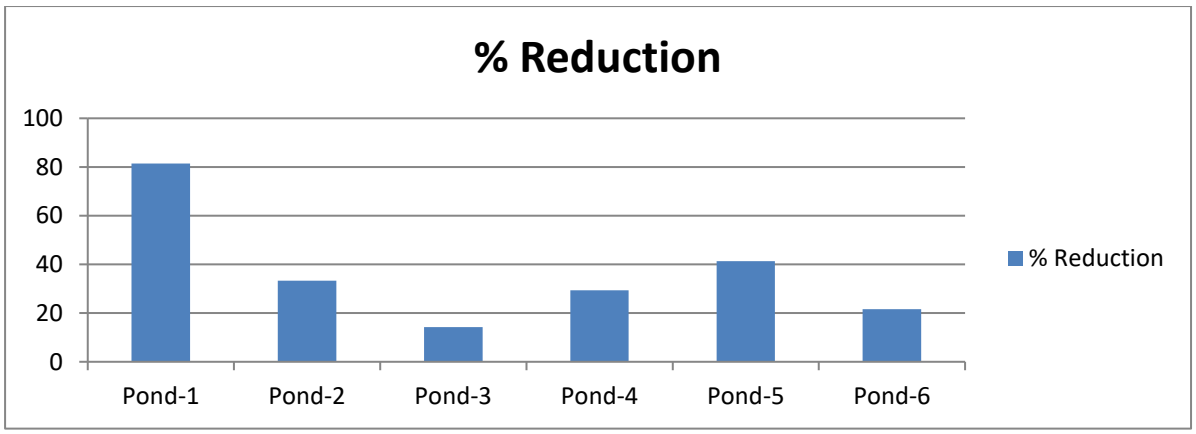
Graph No. 5- Analysis of Total Dissolved Solids of different water samples



3.7 Analysis of Total Suspended Solids of different water samples.

From the above results it can how Maximum value for Total Suspended Solids was observed in the sample collected from Pond-1. Minimum value for Total Suspended Solids was observed in the sample collected from Pond-2. Maximum reduction in the value for Total Suspended Solids (81.48%) was also observed in the sample collected from Pond-1. These results were similar with the results obtained by (Shah *et al.* 2013 and Dehghani *et.al.*2016)

Graph No.6- Analysis of Total Suspended Solids of different water samples



3.8 Comparative analysis of Colour and Odour of Treated and Untreated Water Samples

Visual analysis was done for identifying the colours of the different water samples and mostly, the obtained colours straight away indicated pollution. Regarding odour, mostly all the ponds strong and pungent odours. Due to the presence of a lot of underwater flora and fauna such as algae and fish, the odours were highly unsuitable. A more specific description is given in the table below. Further on after treatment, the respective

colours of the samples had vanished and all the samples turned transparent, whereas, all the odour was completely removed and the samples turned completely odourless. Similarly Sridhar *et al.* 2011 and Gupta *et al.* 2009 reported maximum removal of color.

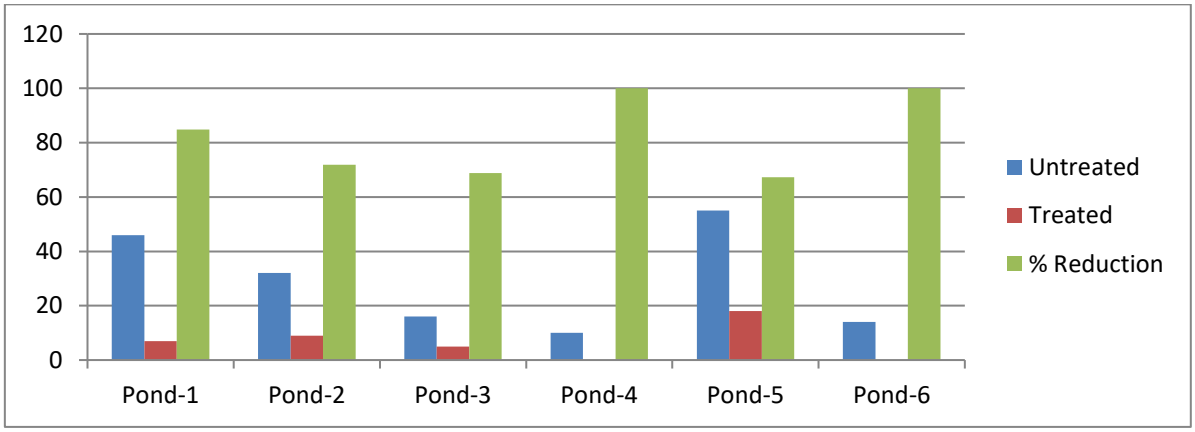
Table No. 1- Comparative analysis of Colour and Odour of Treated and Untreated Water Samples

Sample	Colour (Before treatment)	Colour (After Treatment)	Odour (Before treatment)	Odour (Before treatment)
Pond -1	Bright Green	Transparent	Fishy Smell	Odourless
Pond -2	Light Green	Transparent	Fishy Smell	Odourless
Pond -3	Lemon Yellow	Transparent	Mild Algal Odour	Odourless
Pond -4	Translucent	Transparent	Odourless	Odourless
Pond -5	Brown	Transparent	Fishy Smell	Odourless
Pond -6	Pale Yellow	Transparent	Weed Like Odour	Odourless

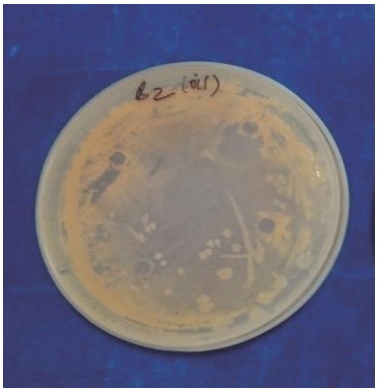
3.9 Counting of Colony Forming Units from different water sources.

From the above results show Maximum numbers of colonies were obtained in the sample collected from Pond-1. Minimum numbers of colonies were obtained in the sample collected from Pond -2. Maximum reduction in the number of colonies obtained (81.48%) was also observed in the sample collected from Pond-1. These results agreed with what was concluded by Alo *et al.* (2012) and Arafat and Mohamed (2013).

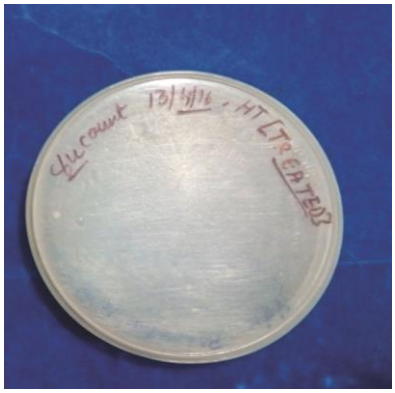
Graph No. 7- Counting of Colony Forming Units from different water sources.



Figures:



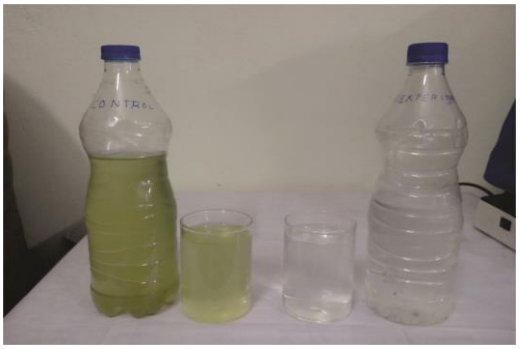
CFU Count Before Treatment



CFU Count After Treatment

Formulated Sachet for Water Purification

Water Sample
+
Water Sample with formulated Product.



Water Sample Before Treatment
+
Water Sample After Treatment

IV.CONCLUSION

During human and other activates in the pond water was highly polluted *M. oleifera* as a natural resource offers many advantages to many countries of the developing world. The effective enhancement of unused water treatment processes can decrease reliance on the importation treatment chemicals, develop a new crop for farmers and employment opportunities for rural development. *M. oleifera* seed oil cake reduced the, Turbidity, pH, Total Solid, Total Dissolve Solid, Total Suspended Solids, Colour, Odour, and Counting of colony forming unit for the pond water samples. It was found that the moringa seed oil cake combination with different adjutants shows treatments was effectively removed colour, odour and reduce physicochemical and biological parameters .

Funding: None

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Cite this article as :

Jaya Singh, Sushma Dubey, Saurabh Gupta, "The use of Moringa Seed Oil Cake as a Natural Remedy for Waste Water Treatment", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 8 Issue 6, pp. 76-83, November-December 2021.

Journal URL : https://ijsrset.com/IJSRSET218613