Assessment Of Irrigation Water Quality In Orathupalayam Dam, Tamil Nadu, India

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Abstract: Water is individual of the highest precious natural resources on earth. In the present day industrialization, abandon of water sources collective with constantly growing population have been in charge for water pollution. It was increasingly polluted with sewege, agricultural, chemicals, heavy metals and other synthetic products. Orathupalayam dam is situated on the river Noyyal in Kangeyam Taluk. The river passes through Tiruppur, where the water quality gets affected. All the industries in Tiruppur were equipped with Treatment plants yet the pollution in the river continues. The water samples in and around the dam have been collected and tested for irrigational suitability. The results showed that the water doesn't satisfy certain irrigational quality parameters. The water stored in the dam moreover affects the quality of water in surrounding regions of the dam. At the same time Prosopis juliflora has become a threatening weed which reduces the ground water level to a greater extent. The pulverized wood of Prosopis juliflora is used as a treatment medium to remove some of the ions and dyes, thus making the water more or less suitable for irrigation.

Index Terms: Groundwater chemistry, Irrigation water quality, Prosopis juliflora, Orathupalayam dam

1 INTRODUCTION

The essential role that water the stage for our planet and its populace have often been summed up by the look 'Without water we cannot survival'. Because of its salient feature it is often called "Universal Solvent". There is plenty of water now on Earth. Over 75% of the planet's outside is roofed with water. The normal annual worldwide consumption of this existing resource is 12%, the fraction was rising that contain high growth of each population or economy. Though articulated two and a half millennium ago, the importance of this statement is evident even now as we stepped into 21st century. Surface and subsurface water is solitary of the important enablers of life on earth. Water serves various purposes, as a part of production in power, agriculture, and preservation of ecosystems, and could act as a descend to dissolve the Biochemical substances (John Joyce 2012). From the demand side, a number of factors are set to escalate global water demand.

2. STUDY AREA DESCRIPTION

The present study was aimed to assess surface water quality in Orathupalayam Dam and of ground water in the localities of nearby region. The study area Orathupalayam Dam (11.1077º N and 77.5419º E) is located on Noyyal River between Chennimalai (11.1627º N and 77.5963º E) and Kangeyam (11.0053º N and 77.5610º E), Tamil Nadu, South India. The Dam is situated 16km north of kangeyam and 26km east of Tiruppur. The Location map of the orathupalayam dam is shown in Figure 1.

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Fig. 1 *Sampling location Map*

3. MATERIALS AND METHODS

3.1 MATERIALS USED

Prosopis juliflora have become an insidious weed in several countries where it was introduced. Prosopis juliflora timber is one of such commercially feasible and environmentally suitable biological materials. Prosopisjulifora grows massively and spreads mostly due to its natural mechanism to overcome difficult conditions of like drought and salt. It is facilitate by its high 'proline' content below stress conditions and the plant to flourish where other species die. in the midst of deep penetrating roots, it can draw water from deeper layers.

3.2 PREPARATION OF MATERIAL

In order to remove impurities, the collected wood (dry wood) from Prosopis juliflora (mesquite) was pulverized and washed

profusely with distilled water . This was followed by complete drying at 120ºC and cooled down to room temperature. Further the powdered material was sieved using 0.2mm size meshed sieve. Neither chemical nor physical treatments were done beforehand for adsorbent preparation (Nashua et al., 2011). The dry wood and pulverized wood of Prosopis juliflora are shown in the Figure 2.

Fig. 2 *Pulverized Prosopis juliflora wood*

3.3 SAMPLE LOCATION

Orathupalayam Dam was surveyed with a motive to identify sampling stations to collect water samples. Local inhabitants were interviewed to identify their issues related to Dam. Based on preliminary survey four sites were identified for surface water sampling from Orathupalayam Dam and six nearby sites were selected for ground water samples. The sample locations are shown in the Figure 3.

Fig. 3 *Sample locations*

3.4 SAMPLE COLLECTION

Collection of water samples was done as per the standard methods of water & waste water (IS 10500: 2012). Surface water samples were collected in triplicates & sub surface water samples in 6 wells around orathupalayam Dam. Water samples were taken in 1000 ml pre-washed plastic bottles. Bottles were filled to brink with water samples, tightly closed and labelled. During the present investigation samples collected are symbolized S-1, S-2…etc. and source of water 4.

Fig. 4 *GPS device*

Table 1 *Source and location of collected sample*

S.No	*Sample code*	*Source type*	*Latitude*	*Longitude*	*Elevation (from msl)*
1	*S-1*	*S.W*	*N 11°06'29.7"*	*E 077°32'20.3"*	*231 m*
2	*S-2*	*S.W*	*N 11°06'23.0"*	*E 077°32'12.9"*	*235 m*
3	*S-3*	*S.W*	*N 11°06'30.5"*	*E 077°32'28.4"*	*234 m*
4	*S-4*	*S.W*	*N 11°06'31.9"*	*E 077°32'40.7"*	*237 m*
5	*S-5*	*G.W*	*N 11°06'27.0"*	*E 077°32'29.8"*	*241 m*
6	*S-6*	*G.W*	*N 11°06'03.3"*	*E 077°32'32.3"*	*246 m*
7	*S-7*	*G.W*	*N 11°06'02.8"*	*E 077°32'38.7"*	*250 m*
8	*S-8*	*G.W*	*N 11°06'39.1"*	*E 077°32'20.4"*	*246 m*
9	*S-9*	*G.W*	*N 11°06'45.2"*	*E 077°32'18.4"*	*254 m*
10	*S-10*	*G.W*	*N 11°06'05.7"*	*E 077°32'25.9"*	*264 m*

4. RESULTS AND DISCUSSION

The present study on treatment of ground water using treatment systems indicates that some of the irrigation quality parameters like soluble sodium percentage, electrical conductivity, USSL classification and salinity hazard are within the desirable limits. The other parameters like sodium adsorption ratio, Kelley's Ratio, magnesium hazard are within the permissible limits. The quality of water before and after treatment mentioned in Table 1. (S.W. for surface water and G.W. for ground water) are indicated. The locations of the samples were noted by GPS device which is shown in the figure 3.3. Samples were given codes, source type and location as enumerated in Table 2

Table 2 : *Quality of water before and after treatment.*

PARAMETER (mg/l)	*BEFORE TREATMENT*	*AFTER TREATM NT*
TURBIDITY (NTU)	*2*	*0*
EC (µS/cm)	*2260*	*2240*
TDS	*1589*	*1500*
pH	*6.97*	*6.9*
TOTAL HARDNESS	*396*	*390*
SODIUM	*280*	*234*
POTASSIUM	*40*	*35*
CALCIUM	*94*	*92*
MAGNESIUM	*38*	*38*
CHLORIDE	*420*	*410*
SAR	*6.16*	*6.05*
SSP	*62.81*	*59.45*
KELLEY'S RATIO	*1.56*	*1.03*
MAGNESIUM HAZARD RATIO	*40*	*40*

4.1 TURBIDITY

The turbidity of the water has reduced drastically after passing through the filter medium. The figure 5 shows the turbidity of water before and after treatment.

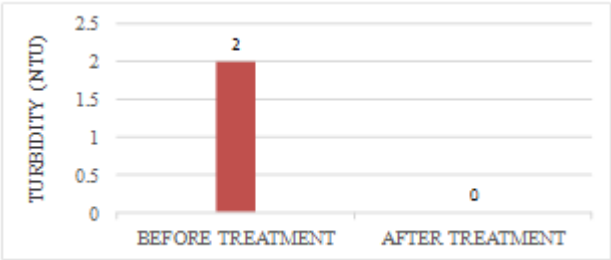

Fig. 5 *Turbidity of water before and after treatment*

4.2 SODIUM ADSORPTION RATIO (SAR)

The SAR ratios have slightly reduced after the treatment. The figure 6 shows the sodium adsorption ratio of water before and after treatment. The values are within the desirable limits.

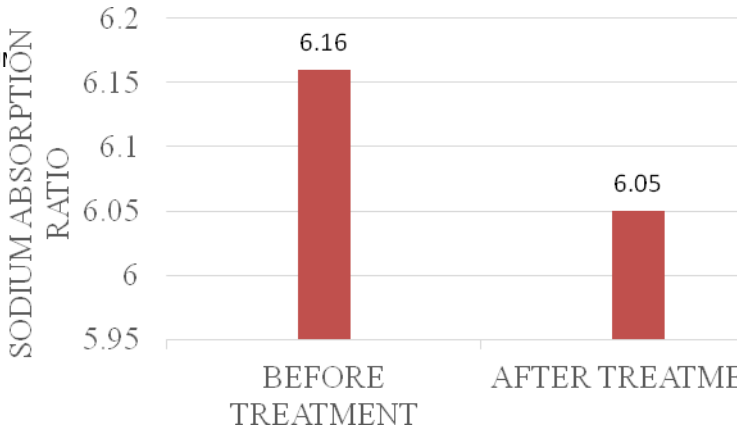

Fig. 6 *: Sodium adsorption ratio of water before and after treatment*

4.3 ELECTRICAL CONDUCTIVITY (EC)

EC is mainly due to the presence of ions. The Electrical conductivity is reduced to desirable limits after treatment. The figure 7 shows the electrical conductivity of water before and after treatment.

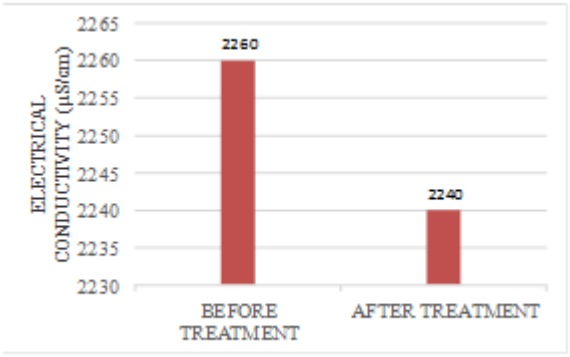

Fig. 7 *Electrical conductivity of water before and after treatment*

4.4 SODIUM PERCENTAGE

The sodium percentages are reduced near desirable limits after treatment. The figure 8 shows the sodium percentage in water before and after treatment.

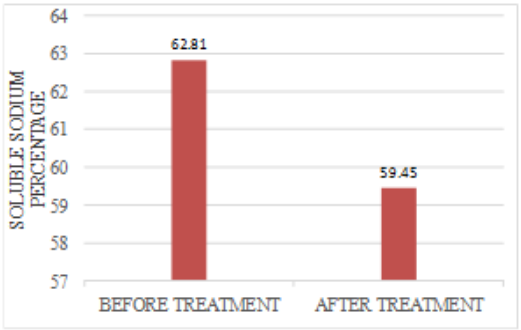

Figure 8 *Soluble sodium percentage of water before and after treatment*

4.5 TOTAL HARDNESS

The hardness of water has slightly reduced yet the water is very hard after the treatment. The figure 9 shows the total hardness of water before and after treatment.

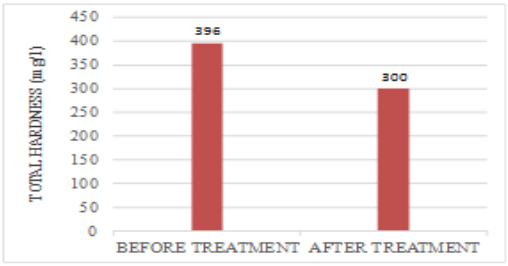

Fig. 9 *Total Hardness of water before and after treatment*

4.6 MAGNESIUM HAZARD

The Magnesium hazard has remained the same before and after treatment yet they are within the permissible limits. The figure 10 shows the Magnesium hazard of water before and after treatment.

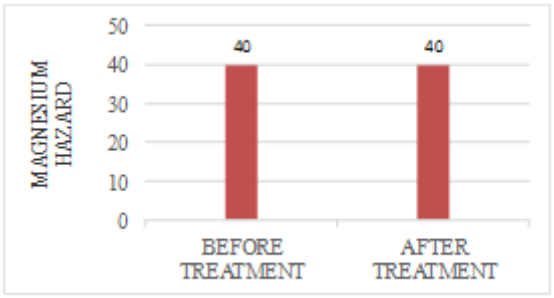

Fig. 10 *Magnesium hazard of water before and after treatment*

4.7 TOTAL DISSOLVED SOLIDS (TDS)

The TDS have not reduced drastically. Hence the water quality is brackish before and after treatment. The figure 11 shows the Total dissolved solids of water before and after treatment.

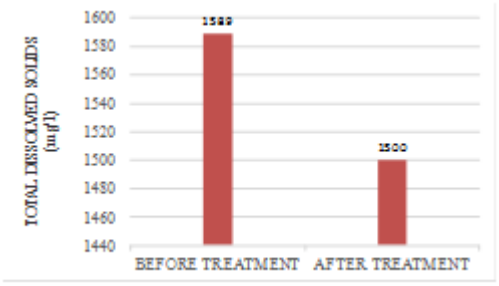

Fig. 11 *Total dissolved solids of water before and after treatment*

4.8 KELLY'S RATIO

The Kelley's ratio is within the permissible limits before and after treatment. The figure 12 shows the Kelley's Ratio of water before and after treatment.

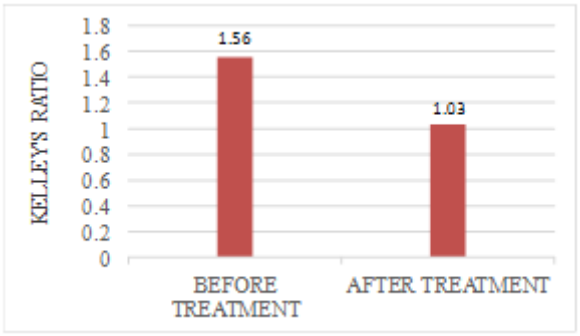

Figure 12 *Kelley's ratio of water before and after treatment*

4.9 USSL CLASSIFICATION

The untreated and treated water are classified as good according to USSL classification.

4.10 SALINITY HAZARD

The untreated water is not suitable for irrigation under regular situations. But the treated water can be used on soils with high drainage with respect to salinity hazard.

4.11 STUYFZAND'S CLASSIFICATION

Since the chloride ions have not reduced drastically the water quality based on Stuyfzand's classification is brackish before and after treatment.

5. CONCLUSION

The comparison of the test results after treatment shows that the quality of the water has increased thus satisfying many of the irrigation quality parameters like soluble sodium percentage, sodium adsorption ratio, electrical conductivity, magnesium hazard, USSL Classification, Kelley's Ratio, salinity hazard and turbidity. The turbidity of the water is completely removed after treatment. Further treatment may be needed to satisfy other irrigation quality parameters like total hardness, total dissolved solids and Stuyfzand's classification. The sludge deposited in the dam has to be removed to prevent further contamination of water. The aggressive weed Prosopis juliflora is used effectively for the treatment making it development for agriculture.

6. REFERENCES

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