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Textile And Mat Decolorized Water Quality Evaluation Against Both Indian And International Standards Of Potable Water

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Abstract: ***The textile and mat effluent colored waste water were treated with biologically synthesized iron oxide nanoparticles. The obtained textile and mat decolorized water were tested for the purpose of eco restoration and normal utility such as irrigation domestic use aquatic animal living water quality. Physico-chemical parameter such as pH , EC, TDS, Total alkalinity, Total hardness, TSS, Nitrate, Chloride, Calcium, Magnesium, Sulfate, DO and BOD were analyzed. The present study aimed to calculate the water quality index (WQI) in order to assess the water for consumption.***

Keywords: Textile decolorized water; Mat decolorized water; Physico chemical analysis; Water Quality Index.

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I. INTRODUCTION

Today, the demand for potable water supply has been increasing with the exhaustion of lentic and lotic environments. Man has been exploiting ground water constantly, mainly due to the pollution of surface water with sewage, industrial waste and synthetic chemicals. The waste water change the physical parameters like color, smell, taste, and water can create some health problems and diseases in consuming populations [1, 2, 3, and 4]. Thus physical, chemical and biological sciences have developed methods to measure water quality and relate its effects on human health and well-being [5, 6, 7, and 8]. Therefore, the objective of the present attempt is to investigate the decolorized dye water (textile and mat industries) for human and animal consumption.

II. MATERIALS AND METHODS

A. PHYSICO CHEMICAL PARAMETER ANALYSIS

Textile and mat decolorized water collected in sterilized bottles using following procedure. The analysis of various physic-chemical parameters like pH ,EC, Total hardness, Alkalinity, Calcium, Magnesium, Chloride, Sulfate, Nitrate, DO, and BOD were analyzed the methods described [9].

B. QUALITY RATING (Q_n)

$$\mathbf{Qn = 100\ [V_n - V_{i0}] \ /\ [S_n - V_{io}]}$$

(Let there be n Water quality parameters and quality rating or Sub index ($\mathbf{Q_n}$) corresponding to n^{th} parameter is a number reflecting the relative value of this parameter in the polluted water with respect to its standard permissible value).

Where

$\mathbf{Q_n}$ = quality rating for the $\mathbf{n^{th}}$ water quality parameter.

$\mathbf{V_n}$ = estimate value of the $\mathbf{n^{th}}$ parameter a given sampling station.

$\mathbf{S_n}$ = standard permissible value of $\mathbf{n^{th}}$ parameter

$\mathbf{V_{io}}$ = ideal value of $\mathbf{n^{th}}$ parameter in pure water.

All the ideal values ($\mathbf{V_{io}}$) are taken as zero for the drinking water except for pH = 7.0 and dissolved oxygen = 14.6 mg/L.

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C. UNIT WEIGHT (W_n)

The unit weight (W_n) for various water quality parameters are inversely proportional to the recommended standards for the corresponding parameters.

Wn = K/ Sn

Where

W_n = unit weight for **n**th parameters
S_n = standard value for **n** th parameters
K = constant for proportionality

D. CALCULATION OF WQI

The overall water quality index was calculated by aggregating the quality rating with the weight linearly.WQI is calculated from the following equation

$$WQI = \sum Q_n Wn / \sum Wn$$

Status of water quality based on WQI value recorded in 0-25 mentioned that the value is excellent, 26-50 recorded that the value is good, 51-75 value is poor, 76-100 value is very poor and 100 and above value is unsuitable for drink.

III. RESULT AND DISCUSSION

The pH values of textile and mat decolorized water are slightly alkaline ranging from 7.6 to 7.6 [10]. pH between 6.7 and 8.4 is suitable, while pH below 5.0 and above 8 is detrimental. In the present investigation pH values were within the WHO & BIS standards.

Conductivity is a measure of current carrying capacity. Thus, as concentration of dissolved salts increases conductivity also increases. Many dissolved substances may produce aesthetically displeasing color, taste and odour. In the present study textile and mat decolorized water values obtained are in the range 580 and 280 micro mho/cm). Therefore these waters have a corrosive property and require treatment before use (Table 1& 2).

The mineral constituents dissolved in water include many constitute dissolved solids. Textile and mat decolorized water TDS values ranged within 980 and 750 mg/L. It is as per standards suitable for drinking purposes. In the present investigation the total hardness of the textile and mat decolorized water is found in the range 200 to 185 mg/L (Table 1 & 2).

According to [10] water with hardness values more than 180 mg/L is considered excessive. Hardness below 300 mg/L is considered potable. Total suspended solids in textile and mat effluent decolorized water were observed 590 and 429 mg/L. Nitrate is the most important nutrients in an ecosystem. In the present study textile and mat decolorized water showed low concentrations of nitrate (1 and 0 mg/L) well below permissible levels as per the standards.

Chloride values obtained in the study are found in the range between 48.6 and 374 mg/L (Table 1& 2). Sulfate ion does not affect the taste of water, if present in low concentrations. The sulfate ion concentration in the textile and mat decolorized water of this present investigation oscillate from 0.5 and 0.4 mg/L. Sulfate values recorded in the (textile and mat) water effluent were in low concentration permissible limits of WHO & BIS. Textile and mat decolorized water of calcium were recorded 11.8 and 242 mg/L. Mat water had high concentration of calcium and textile water has reported that less calcium concentration within permissible limit of WHO & BIS (Table 1& 2).

In the present study textile and mat decolorized water recorded 14.8 and 154 mg/L. Mat water had high concentration of magnesium; textile water was reported that less magnesium concentration is under permissible limit of WHO & BIS. It is an important parameter which is essential to the metabolism of all aquatic organisms that posses aerobic respiration [11] presence of DO in water may be due to direct diffusion from air and photosynthetic activity of auto trophs [12]. Oxygen can be rapidly removed from the waters by discharge of oxygen demanding wastes. The DO values obtained in the present study are textile and mat decolorized water values range 1.72 and 7.5 mg/L.

Biological Oxygen Demand (BOD) is the parameter used to assess the pollution of surface water and ground water. The BOD value obtained in the present study is within permissible level in textile decolorized water and mat decolorized water has high BOD concentration but within the permissible limit of WHO & BIS. Water Quality Index

The rating of water quality index (WQI) was calculated for thirteen physicochemical parameters in textile and mat decolorized water. Decolorized effluent water quality index calculations are depicted in the Table (1 and 2). The water quality index obtained for the water system in industrial effluent decolorized water i.e. textile decolorized water and mat decolorized water were 92.24 and 108.80 respectively, which indicate the poor quality [13].

IV. CONCLUSION

This water quality rating study clearly showed that, the status of the water system (textile industrial decolorized water & mat industrial decolorized water) is eutrophic and it is unsuitable for the human uses. It is also observed that the pollution load is relatively high in mat decolorized water when compared to the textile decolorized water. Low dissolved oxygen and, high bio-chemical oxygen demand indicate the atrophic status of the water system. A relatively higher concentration of chlorides indicates the unsuitable of water for domestic use. However the WQI values of the textile and mat water indicate that the water is unfit for human consumption. It can unsafely be considered that the values of WQI in the present investigation were reported to be in textile water. The WQI values indicate that the textile water is of poor Water Quality and consumption is not totally safe for human and animal and mat water was observed greater than 100 indicating that the water is unsuitable for human [14 and 15]. On overall consideration textile water was less polluted compare to mat water.

Sr. No	Parameters	Observed value	Standard values (S_n)	Recommended agency	Unit weight (W_n)	Quality rating (Q_n)	$W_n Q_n$
1	pH	7.6	6.5-8.5	ICMR/ BIS	0.2190	40	8.76
2	Electric Conductivity as (EC) Micro mho/	580	300	ICMR	0.371	193.33	71.71

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	cm						
3	Total Dissolved Solids as (TDS) mg/L	980	500	ICMR/ BIS	0.0037	196.00	0.7252
4	Total alkalinity (as $CaCO_3$) mg/L	140	120	ICMR	0.0155	116.66	1.808
5	Total hardness (as $CaCO_3$) mg/L	200	300	ICMR/ BIS	0.0062	66.66	0.4133
6	Total Suspended Solids (as TSS) mg/L	590	500	WHO	0.0037	118	0.4366
7	Nitrate (as NO_3) mg/L	1.0	45	ICMR/ BIS	0.0412	2.222	0.0915
8	Chloride (as Cl) mg/L	48.6	250	ICMR	0.0074	19.44	0.143
9	Calcium (as Ca) mg/L	11.8	75	ICMR/BIS	0.025	15.73	0.393
10	Magnesium (as Mg) mg/L	14.8	30	ICMR/BIS	0.061	49.33	3.00
11	Sulphate (as SO_4) mg/L	0.5	150	ICMR/BIS	0.01236	0.333	0.00412
12	Dissolved Oxygan (as DO) mg/L	1.72	5	ICMR/BIS	0.3723	134.16	49.95
13	Biological Oxygen Demand (as BOD) mg/L	6.9	138	ICMR	0.3723	5	1.86
					∑Wn = 1.51	∑Qn = 956.865	∑WnQn = 139.29
Water Quality Index = ∑Wn Qn / $\sum W_n$ = 92.245							

Table 1: The textile effluent decolorized water physico chemical and Water Quality Index Analysis

Sr. No	Parameters	Observed value	Standard values (S_n)	Recommended agency	Unit weight (W_n)	Quality rating (Q_n)	$W_n Q_n$
1	pH	7.6	6.5-8.5	ICMR/ BIS	0.2190	40	8.76
2	Electric Conductivity as (EC) Micro mho/ cm	280	300	ICMR	0.371	93.33	0.371
3	Total Dissolved Solids as (TDS) mg/L	750	500	ICMR/ BIS	0.0037	150	0.555
4	Total alkalinity (as $CaCO_3$) mg/L	125	120	ICMR	0.0155	104.1	1.614
5	Total hardness (as $CaCO_3$) mg/L	185	300	ICMR/ BIS	0.0062	61.66	0.382
6	Total Suspended Solids (as TSS) mg/L	420	500	WHO	0.0037	84	0.310
7	Nitrate (as NO_3) mg/L	0	45	ICMR/ BIS	0.0412	-	-
8	Chloride (as Cl) mg/L	374	250	ICMR/ BIS	0.0074	149.6	1.107
9	Calcium (as Ca) mg/L	242	75	ICMR	0.025	322.6	8.06
10	Magnesium (as Mg mg/L	154	30	ICMR/ BIS	0.061	513.3	31.31
11	Sulfate (as SO_4) mg/L	0.4	150	ICMR/ BIS	0.01236	0.0026	0.00003
12	Dissolved Oxygen (as DO) mg/L	7.5	5	ICMR/ BIS	0.3723	73.95	27.53
13	Biological Oxygen Demand (as BOD) mg/L	312.5	138	ICMR	0.3723	226.44	84.30
					∑Wn = 1.51	∑Qn =1818.98	∑WnQn = 164.299
Water Quality Index = ∑Wn Qn / $\sum W_n$ = 108.80							

Table 2: The mat effluent decolorized water physic chemical and Water Quality Index Analysis

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