JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

REMOVAL OF COLOUR FROM TEXTILE WASTE WATER USING *MORINGA OLEIFERA* AS NATURAL COAGULANT

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Abstract: The wastewater generated by the textile industry is rated as the most polluting among all industrial sectors considering both volumes discharged and effluent composition.*Moringa oleifera* seeds were reported as a natural coagulant (primary coagulant) in household water treatment as well as in the community water treatment systems.In present study the textile effluent was subjected for the colour removal by using natural coagulant *Moringa oleifera*. Also, the pH on colour removal was also studied. pH and concentration of coagulant and time for treatment were found to be important factors in dye colour removal of textile effluent 2gm dose of *M. oleifera* at 9 pH for two-hour agitation time was found to be very effective for colour removal of textile effluent.

***Key words: Moringa oleifera* seeds, waste water treatments, colour removal, textile waste water.**

1. Introduction:

In view of growing awareness of pollution problems, dispersal of organic contamination in the environment is becoming a matter of concern. Ever increasing use of chemical and related compounds in each and every field of industry and ever agriculture summons an urgent need of method for their effective removal from water and wastewater. Synthetic dyes are an important source of water pollutants that are recalcitrant in nature and difficult to degrade. Water pollution causes serious impacts on socio-economic prominence of the people. *Moringa oleifera* seeds treat water on two levels, acting both as a coagulant and an antimicrobial agent. It is generally accepted that Moringa works as a coagulant due to positively charged water – soluble proteins, which bind with negatively charged particles (silt, clay, bacteria, toxins etc) allowing the resulting "flocs" to settle to the bottom or be removed by Filtration. The antimicrobial aspects of *Moringa* continue to be researcher. Findings support recombinant proteins both removing microorganisms by coagulation as well as acting directly as growth inhibiters of the microorganisms.

The major advantages of natural coagulants over chemical ones are their cost-effectiveness and biodegradability (Yin et al. 2007). These advantages offer a healthier way of treatment, especially when the natural coagulant is indigenous to a rural community. Different natural coagulants reported for water treatment are Strychnospotatorum seeds (Adinolfi et al. 1994), seed gum of Cassia javahikai, Ipomoea dasysperma (Sanghi et al. 2002), Cassia angustifolia (Jayaram et al. 2009, Mangale S. 2012), *Moringa oleifera* (Pollard et al. 1994; Muyibi and Evison 1995), etc. Among them, *M. oleifera* (family Moringaceae) is possibly the most widely studied natural coagulant, which is a nontoxic tropical plant found throughout India, Asia, subSaharan Africa, and Latin America (Jahn 1981). *M. oleifera* is the most widespread species which grows quickly, even on medium soils having relatively low humidity (Jahn 1988). There are very few reports on textile dye coagulation using *M. oleifera* as a coagulant (Beltran-Heredia and Martin 2008; Beltran-Heredia et al. 2009)

The powder of Moringa oleifera seeds is also used as coagulant/flocculent agent for drinking water clarification due to its high content of a water soluble cationic protein which able to reduce turbidity (Gong R, 2005, Mangale S. 2012). Moringaoleifera oil extraction can be used for water treatment, for drinking water clarification, and it is also for textile waste water treatment (Nigam, P., 2000, Chen, C. 2007, Mangale S. 2012). The use of natural coagulant is used in developing countries, as substitution of external chemical coagulants as aluminumsulfate, ferric chloride. (Fang, A. 2009, Khataee, A. 2009). The water -soluble extract of the dry seeds of Moringa oleifera is one of the natural coagulants, which is a tropical plant from the family of Moringa ceae.Moringaoleifera is used for water treatment in two different methods,

one as a primary source of activated carbon (Khataee, A. 2009) and the second method through seed extraction, and produce a product working as a coagulant/flocculant agent (Nagaveni, G., 2004).

2. Methodology:

2.1 Collection of textiles:

Water samples were collected from textile industry from Kolhapur, Maharashtra, India.The samples were collected in clean polythene cans of 10 liters capacity. Proper care was taken during sampling with due consideration to the material of the container, gaseous exchange, sample analysis time, preservation required etc. The sample was collected from equalization tank of the treatment. The physic- chemical characteristics of collected waste water was analyzed in laboratory.

2.2 Preparation of natural coagulant:

Maringaoleifera seeds were collected from Kolhapur region. matured seeds are removed from the pods and shelled.Shelled seeds were used to prepare coagulant. Seed kernels are crushed and sieved (0.02 – 0.8 mm mesh or similar). The fine powder was prepared using mixer and it was used as natural coagulant.

2.3 Study of the Effect of p^H on colour removal.

The P^H is an important variable in decolonization studies. The 100 ml samples were taken in each conical flask and adjust the P^H such as 10.3, 9, 8, 7, 6, 5 respectively.The initial P^H of this solution was tested. Then sample was treated with 2 gm quantity of doses in each conical flask. This sample was kept in shaker for 2 hr. and agitation allowed at 130 rpm.

2.4 Analysis of Physico chemical Charcateristics of wastewater:

1. The collected textile waste water was analyzed for the physic chemical characteristics before and after treatment with natural coagulants and also studied for different pH conditions. The tested parameters includeColor, pH, Chemical Oxygen Demand (COD), Total Dissolved Solid (TDS), Total Suspended Solid (TSS), Total solids (TS), Hardness, Chloride etc.

3. Results:

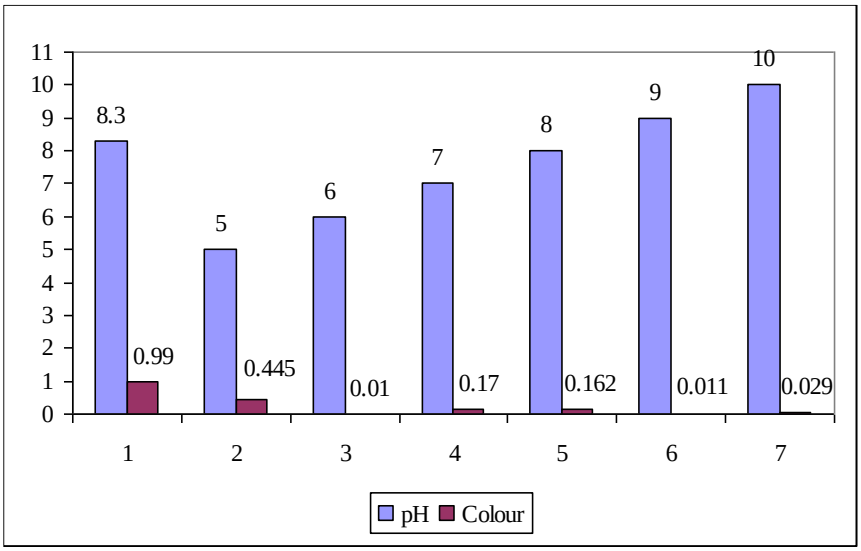
The collected waste water was treated with the *M. oleifera* seeds as natural coagulant and the following observations were recorded.

Characterizations of textile effluent before treatment:

Parameters	**Values mg/lit**
pH	**8.3**
TSS	**4100**
TDS	**4200**
COD	**2440**
HARDNESS	**250**
COLOUR	**0.99**
CHLORIDE	**887.5**

Table no. 1 effect of pH on color removal by using natural coagulant drumstick seeds

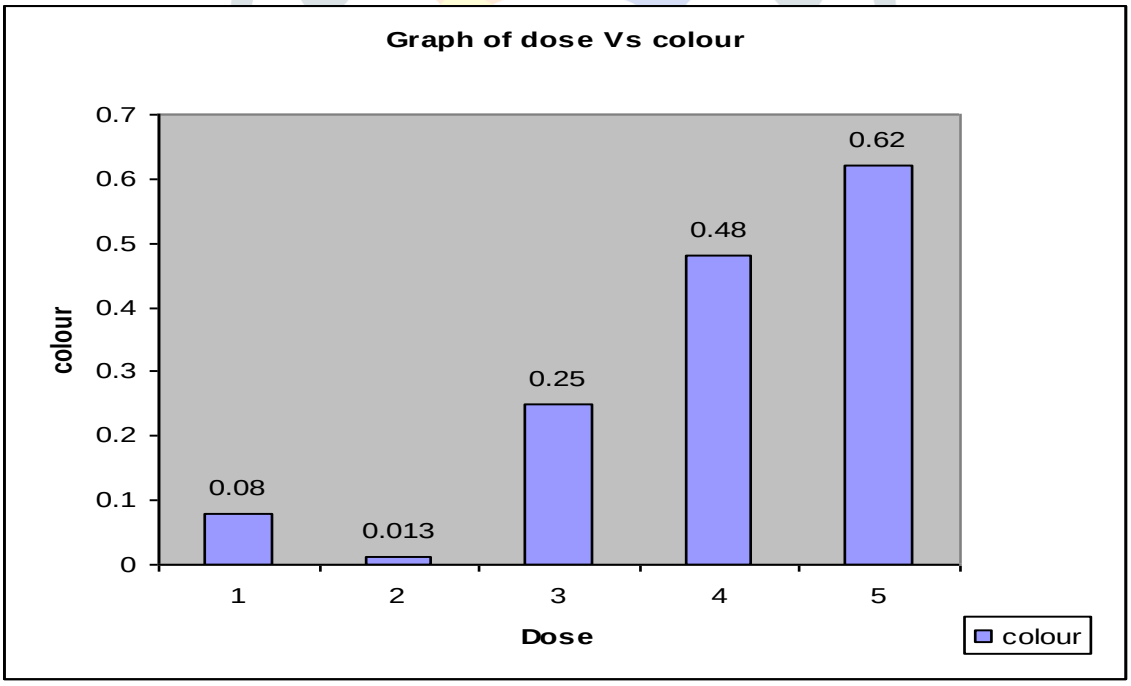
pH	**Dose gm**	**pH after treatment**	**TSS mg/lit**	**TDS Mg/lit**	**COD Mg/lit**	**Hardness Mg/lit**	**Colour (O.D.)**	**Chloride Mg/lit**
5	2	6.5	1000	3000	700	500	0.445	313
6	2	6.5	1500	8000	2580	590	0.01	355
7	2	7	200	4000	1480	610	0.17	234.3
8	2	6.5	100	7500	1040	490	0.162	383.4
9	2	7	1300	3300	900	330	0.011	213
10	2	7	700	8600	700	660	0.029	255.6



Graph No.1 effect of pH on colour removal by using natural coagulant drumstick seeds

Table no. 2effect of agitation time and dose concentration on colour removal after 1st hr.

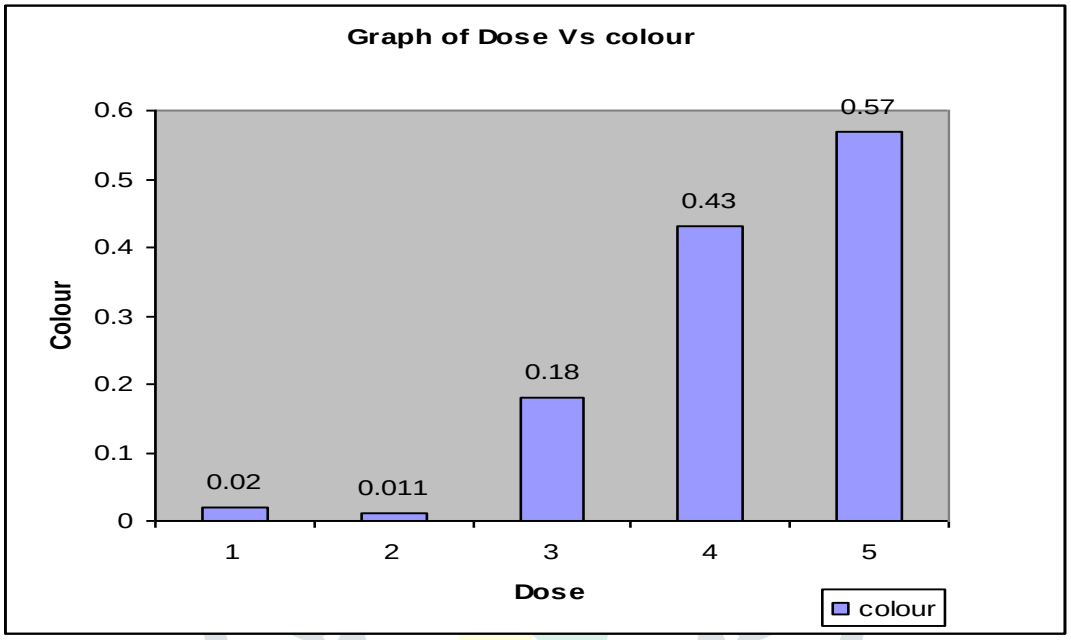
pH	Dose gm	pH after treatment	TSS mg/lit	TDS mg/lit	COD mg/lit	Hardness mg/lit	Colour	Chloride mg/lit
9	1	6.2	1928	1002	480	280	0.08	400
9	2	6	2500	2840	550	310	0.013	375
9	3	6.3	4536	3980	660	740	0.25	318
9	4	6.3	6220	6540	920	1235	0.48	250
9	5	6.3	9002	8490	1280	1320	0.62	213



Graph No. 2 effect of agitation time and dose concentration on color after 1 hour.

Table no. 3effect of agitation time and dose concentration on color removal after 2 hr.

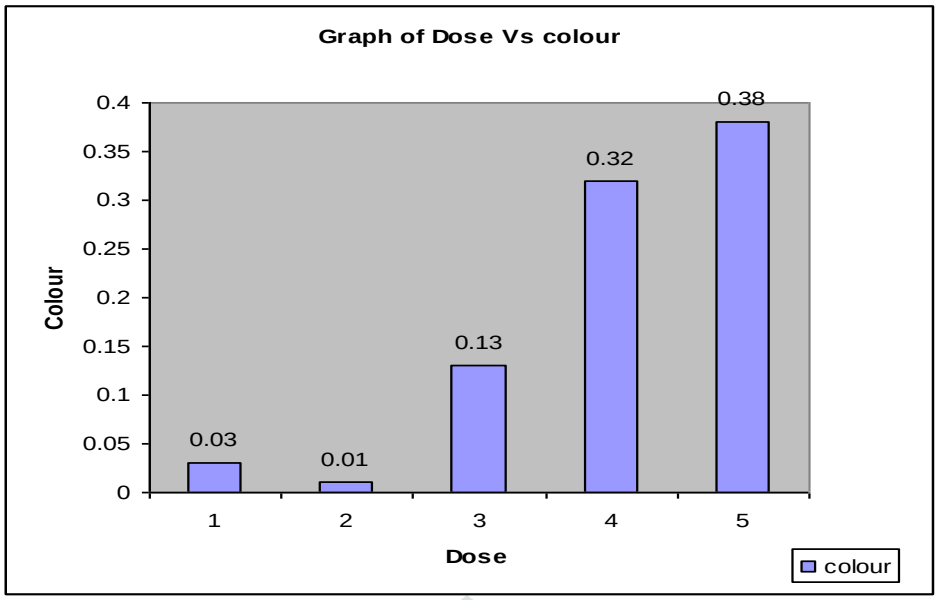
pH	Dose gm	pH after treatment	TSS mg/lit	TDS mg/lit	COD mg/lit	Hardness mg/lit	Colour	Chloride mg/lit
9	1	6	1720	9200	680	300	0.02	369.2
9	2	7	1300	3300	900	330	0.011	355
9	3	7	2600	6800	970	460	0.18	312.4
9	4	7.2	5140	10800	1040	600	0.43	213
9	5	7.2	8620	16200	1640	1580	0.57	152



Graph No. 3 effect of agitation time and dose concentration on colour after 2 hours.

Table no. 4 Effect of agitation time and dose concentration on colour removal after 3hr

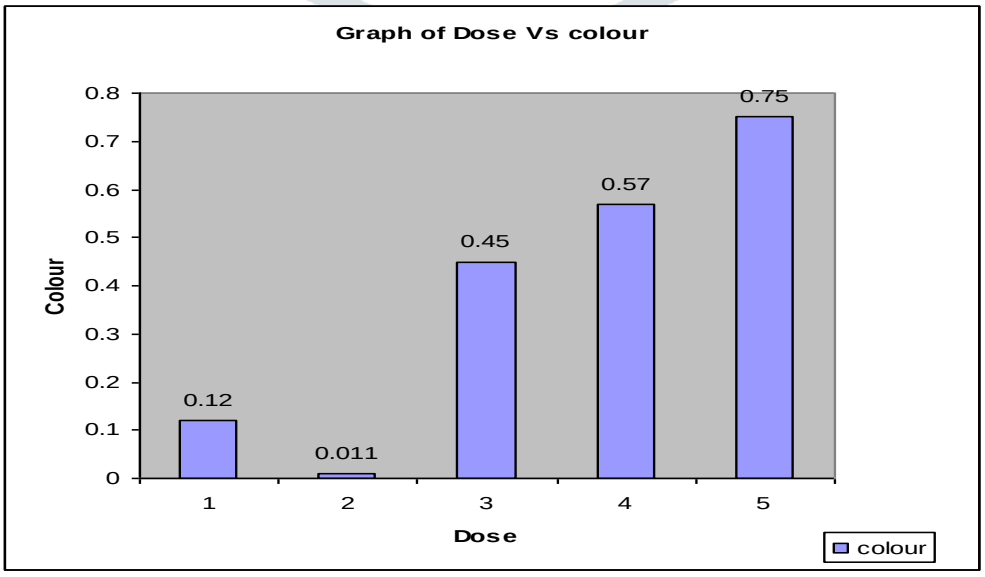
pH	Dose gm	pH after treatment	TSS mg/lit	TDS mg/lit	COD mg/lit	Hardness mg/lit	Colour	Chloride mg/lit
9	1	6	1320	4860	740	420	0.03	355.3
9	2	7	476	9540	980	560	0.01	336.5
9	3	7	2320	13800	1270	740	0.13	241.2
9	4	7	2300	13000	2800	980	0.32	211
9	5	7	5323	16900	1910	1920	0.38	135.2



Graph No. 4 effect of agitation time and dose concentration on colour after 3 hours.

Table no.5effect of agitation time and dose concentration on color removal after 4 hr

pH	Dose gm	pH after treatment	TSS mg/lit	TDS mg/lit	COD mg/lit	Hardness mg/lit	Colour	Chloride mg/lit
9	1	6.5	400	6000	980	580	0.12	341.4
9	2	6.5	824	10800	1180	740	0.011	318
9	3	6.5	1800	12200	1420	810	0.45	255.4
9	4	6.5	2000	12400	1280	900	0.57	209
9	5	6.5	4224	18600	2000	1140	0.75	105



Graph No.5 effect of agitation time and dose concentration on color after 4 hours.

4. Conclusion:

The physio-chemical parameters of textile waste water before and after the treatment with *M. oleifera* as natural coagulant wasanalyzed during the study.

From the study result it is concluded that the*M. oleifera* was found to be the best natural coagulant and found to be very effective for the color removal from waste water. pH and concentration of dose and time were found to be important factors in colour removal of effluent. 2gm dose of the *M. olefera* seed powder at 9 pH for two-hour agitation time is very good for colour removal. TSS and TDS and COD were found to be increase for some duration as addition of *M. oleifera* seeds in waste water but the color was removed from the effluent.

5. Conflict of interest

There is no any conflict of interest between the authors. Each author has a contribution in this research and publication work.

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