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Experimental Investigation on Treatment of Municipal Waste Using Natural Coagulant

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Abstract: ***Water is undoubtedly the most vital parameter among the natural resources. Turbidity imparts a enormous problem in waste water treatment. In this present study, an attempt has been made to evaluate the effectiveness of locally available Azadirachta indica and Dolichos lablab as natural coagulant for reduction of impurities in the hostel wastewater. The tests were carried out using the conventional jar test apparatus. The quality of the treated waste water was analyzed and compared with each other. The experiment were conducted at various dosages of the crude water extract by dry seeds of Azadirachta indica and Dolichos lablab using jar test experiment***

The optimum dosage of the coagulant dosage was identified. Parameters of quality of the waste waters were measured before and after the treatment to evaluate the removal efficiency on the major pollutants of concern in waste water treatment, such as Suspended Solids, COD, BOD, pH, TDS, Sulphates and Chlorides. Result showed the Azadirachta indica seeds were efficient as a primary coagulant in waste water treatment and maintains pH, and reduce other parameters of waste water. From the observed result Azadirachta indica was suitable natural coagulant for hostel waste water treatment .Utilisation of locally available natural coagulant was found to be suitable, easier, cost effective and environment friendly for water treatment .

Keywords: Municipal waste , treatment , alum , Natural Coagulant , Azadirachta indica, Dolichos lablab

I. INTRODUCTION

Growing population, increased economic activity and industrialization has not only created an increased demand for fresh water but also resulted in severe misuse of this natural resource. Water resources all over the world are threatened not only by over exploitation and poor management but also by ecological degradation. Indiscriminate dumping of untreated wastewater and chemical wastes directly into rivers, lakes and drains have made these water bodies unable to cope up with the pollutant load. The steady increase in the amount of water used and wastewater produced by urban communities and industries throughout the world also poses potential health and environmental problems.

The quality standards usually depend upon whether water will be reused or discharged into a receiving stream. Wastewaters contain particles with a wide variety of shapes, sizes, density, etc, which influence their behavior in water and, therefore, their capacity to be removed. The extent and type of treatment required, however, depends upon the character and quality of both sewage and source of disposal.

Small community at the seaside might discharge its unaltered sewage directly into the ocean without any ill effects, but if this city were located inland on a small stream, a high degree of treatment might be needed. Turbidity in wastewater is caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, and plankton and other microscopic organisms. Turbid water has muddy or cloudy appearance and it is aesthetically unattractive. The turbidity increases as sewage becomes stronger.

The most commonly faced problem in disposal of waste water is the color and turbidity. Finely dispersed suspended and colloidal particles are responsible for the color and turbidity of the waste waters. Color in water results from the presence of natural metallic ions, humus and peat material, plankton, weeds, and industrial waste. Suspended and colloidal matter such as clay, slit, finely divided organic and inorganic matter, and plankton and other microscopic organisms are responsible for turbid waters. finally the treated water supplied to the gardening purposes.

A. Objective of the Study

1) To quantify the amount of waste water generated from different sources as domestic sewage and rain water
2) To determine the efficiency of varies treatment units in the removal of different pollutants
3) To determine the overall efficiency of the treatment plant .
4) To reduce the level of turbidity and other impurities from waste water using locally available natural Coagulant.

5) The intended action of the coagulant is to neutralize that charge, allowing particles to come together to form larger particles that can be more easily removed from the raw water.

II. MATERIAL AND TESTING

A. Natural Coagulant

1) *Preparation of Natural Coagulant:* Seed solution may be prepared from either seed kernel or the solid residue obtained following extraction of seed oil.to prepare the seed for use as a coagulant aid.

B. Procedure

Seed pods are allowed to mature and dry naturally to a brown color on the tree.
The seeds are removed from the harvesting pods and shelled.
seed kernel are crushed and sieved (0.8mm mesh or similar) traditional technique used to produce maize flour have been found to be satisfactory.
The finely crushed seed powder in mixed with clean water to form a paste and it is then diluted to the required strength.dosing solution can be prepared from 0.5 to 5 % concentration(for eg 0.5 to 5g/l)
Insoluble materials is filtered out using either a fine mesh screen or muslin cloth6.finally the coagulant solution was ready for use.

FIGURE 2.1 – Dolichos lablab

FIGURE 2.1 Azadirachta indica seed

C. Seed Requirement

The area under cultivation to produce the annual seed requirement depends on the size of the treatment works and raw water quality (as noted in table1.0)Assuming the average seed kernel yield for a mature tree is 3kg ,then at an average seed dose of 100mg/lit the harvest from a single tree will treat 30000 litres of water. using the same assumption and recommended tree
Spacing of 3m,the harvest from 1 hectare mature trees would treat 30000 m^3 of water .this equates to a small treatment works producing 10m^3 per hour if operated 8 hour a day for a full year

D. Coagulant Dose Requirement

As for all coagulants , the amount of seed required will vary depending on the raw water source and on the raw water quality. One advantages of seed use is that in general, there is wide dose range over which effective treatment may be achieved and also maintained. dosage are given as equivalent weight of seed powder required to make up the dosing solution

Raw water turbidity (NTU)	Dosage range (mg/lit)
50 ≤	10-50
50-100	30-100
≥150	50-200

III.RESULT ANAND DISCUSSIONS

Experiments were carried out for the different effluents like Hostel waste with the help of different natural coagulations like Azadirachta indica and Dolichoa lablab. Normally in the industries, colloidal particles were removed from the wastewater with the help of chemical coagulants but the present study discuss about the treatment of wastewater with the help of natural coagulants.
Coagulation is the process of destabilizing colloidal particles so that particles growth can occur as a result of particle collisions. Coagulation is a safe and effective method of treating water, which improves its quality by reducing levels of organic compounds, dissolved phosphorus, color, iron and suspended particles.

S.NO	Parameters	Hostel waste
1	pH	7.6
2	TSS(mg/lit)	1300
3	TDS(mg/lit)	4235
4	BOD(mg/lit)	520
5	COD(mg/lit)	1700
6	Sulphates(mg/lit)	830
7	Chlorides (mg/lit)	145.34

Table 3.1 . Characteristics of Hostel Waste Before Treatment

S.NO	Coagulant dosage(ml)	Floc formation (ml)
1	10	53
2	20	68
3	30	71
4	40	51
5	50	36

Table 3.2 . Optimum coagulant dosage using Azadirachta Indica in Hostel waste.

S.NO	Coagulant dosage(ml)	Floc formation (ml)
1	10	35
2	20	43
3	30	49
4	40	58
5	50	27

Table 3.3 . Optimum coagulant dosage using Dolichos lablab in Hostel waste

OPTIMUM COAGULANT DOSAGE	Parameters	Untreated (mg/lit)	Trated(mg/lit)	% of Reduction
30	pH	7.6	7.1	6.57
	TSS(mg/lit)	1300	450	65.57
	TDS(mg/lit)	4235	2035	51.94
	BOD(mg/lit)	520	350	32.69
	COD(mg/lit)	1700	1250	26.47
	Sulphates(mg/lit)	830	420	45.78
	Chlrides(mg/lit)	145.34	120	17.49

Table 3.4 . Percentage reduction of various parameters of Hostel waste using Azadirachta Indica coagulant

OPTIMUM COAGULANT DOSAGE	Parameters	Untreated (mg/lit)	Trated(mg/lit)	% of Reduction
30	pH	7.6	7.3	3.95
	TSS(mg/lit)	1300	1100	15.38
	TDS(mg/lit)	4235	3200	24.49
	BOD(mg/lit)	520	370	28.80
	COD(mg/lit)	1700	760	55.29
	Sulphates(mg/lit)	830	580	30.12
	Chlrides(mg/lit)	145.34	110.25	24.15

Table 3.5 . Percentage reduction of various parameters of Hostel waste using Dolichos lablab coagulant

The maximum removal efficiency of BOD with the treatment of different coagulant like Azadirachta indica and Dolichos lablab was obtained as 32.69% and 28.80% respectively. effect of Dolichos lablab coagulant dosage is not effective on BOD removal when compared to Azadirachta indica.

From the above results, because of having greater efficiency in removing impurities and the economic point of view , it is recommended that Azadirachta indica is the best natural coagulant for treating the hostel waste water.

At various proportions ,the Dolichos lablab coagulant were placed by Azadirachta indica and some other natural coagulant and the efficiency were analysed.from the result the best combination of Azadirachta indica and Dolichos lablab is achieved by replacing Dolichos lablab by 75% and its efficiency is 82.34 in removing COD. From the above results ,it is recommended to replace Dolichos lablab by Azadirachta indica in removing impurities

By using Azadirachta indica and Dolichos lablab the maximum ror the removal of suspended solids from the hostel waste was measured as 65.38% and 15.56%. when compared to the Dolichos lablab, Azadirachta indica is better in removing TSS. from the observed results, Azadirachta indica gives the maximum TDS removal efficiency as 51.94.the maximum removal efficiency of COD with the treatment of different coagulant like Azadirachta indica and Dolichos lablab were 55.29%&26.47.the effect of Azadirachta indica coagulant dosage on the COD removal was not effective.from the observed , Dolichos lablab gives the maximum removal efficiency of 55.29%

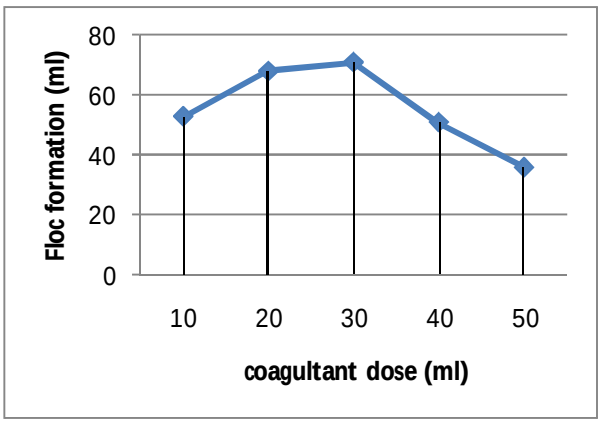


FIG. 3.1. Optimum Dosage of Azadirachta indica

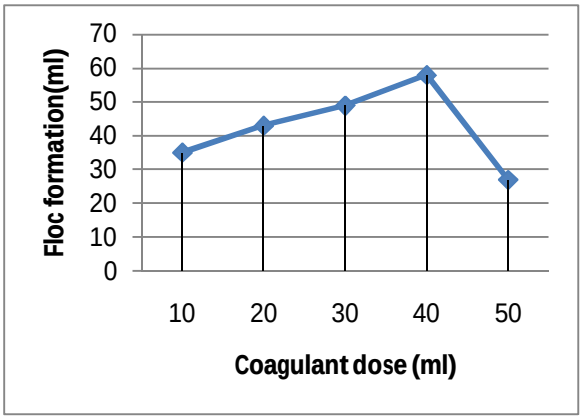


FIG.3.2. Optimum Dosage of Dolichos lablab

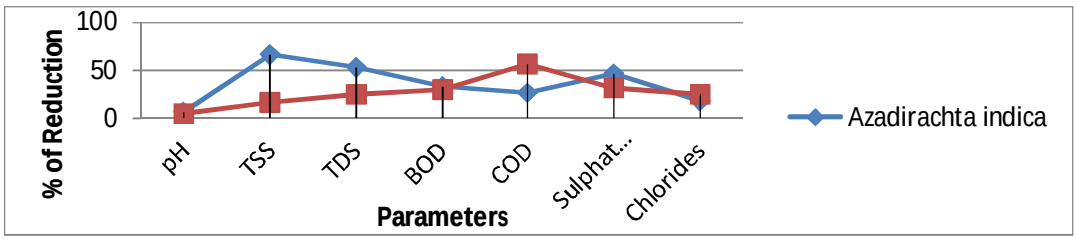


FIG. 3.3. Comparison of Azadirachta indica Vs Dolichos lablab

IV. CONCLUSIONS

A. In this project the characteristic of hostel waste effluent were analyzed and they are not within the permissible limits

B. The optimum dosage of natural coagulant and Azadirachta indica Dolichos lablab are to be studied

C. By using Azadirachta indica and Dolichos lablab the maximum efficiency for the removal of suspended solids from the hostel waste as 65.57% and 15.38%.

D. The maximum efficiency of COD is achieved by Dolichos lablab as 55.29%.

E. Where compare to Dolichos lablab , Azadirachta indica the gives the best result

F. Because of having greater efficiency in removing impurities and from the economic point of view, Azadirachta indica is recommended as a natural coagulant for the treatment of hostel waste water

G. From the above result natural coagulant can be gainfully as an alternate of common chemical coagulant .also the natural coagulant can be used with an advantage of replacing the alum and chemical coagulant

H. So that we suggested that the Azadirachta indica is to be used as a natural Coagulant and it will Gives the greater efficiency in removing Impurities.

REFERENCES

[1] Diaz A., Rincon N., Escorihuela A., Fernandez N., Chacin E. and Forster C. F., “A preliminary evaluation of turbidity Removal by Natural Coagulants Indigenous to Venezuela”, Process Biochemistry, Vol 35(3), 1999, pp 391-395

[2] Achmad Subagio, “Characterization of hyacinth bean (Lablab purpureus (L.) sweet) seeds from Indonesia and their protein isolate”, Food Chemistry, Vol 95, 2006, pp 65-70.

[3] Nilanjana Rao, “Use of Plant Material as Natural Coagulants for Treatment of Waste Water”, 2005.

[4] Babu R, Chaudhuri M. Home water treatment by direct filtration with natural coagulant.

[5] Beltran-Heredia J, Sanchez-Martın J, Solera-Hernandez C. Anionic surfactants removal by natural coagulant/flocculant products. Ind Eng Chem Res 2009; 48:5085–92

[6] Chun-Yang Yin, Emerging usage of plant-based coagulants for water and wastewater treatment, Process Biochemistry 45 (2010) 1437–1444

[7] Sen AK, Bulusu KR. Effectiveness of nirmali seed as coagulant and coagulant aid. Indian J Environ Health 1962; 4:233–44

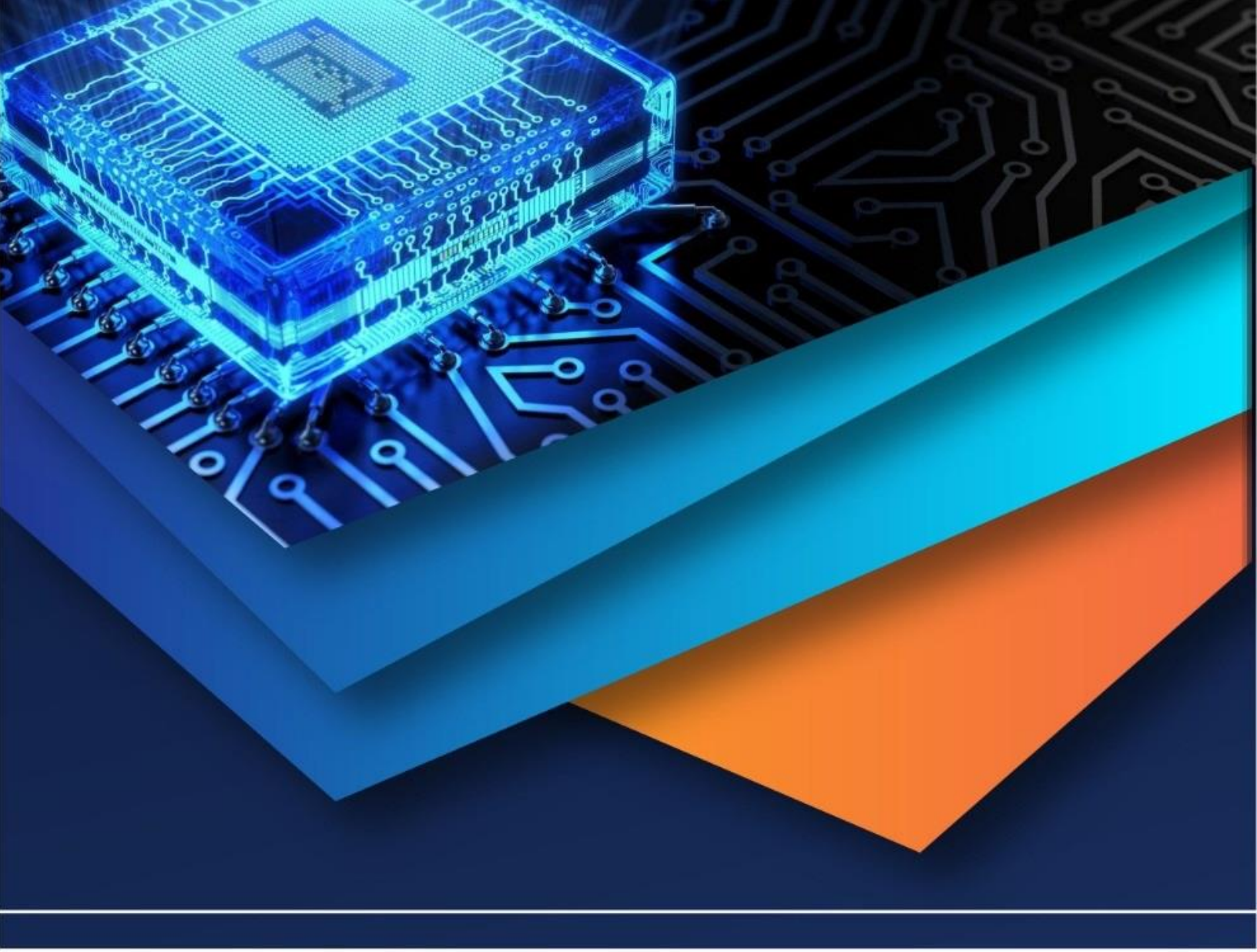
[8] Folkard , G.K., Sutherland , J.P. & Grant, W.D. 1993, Natural coagulants at pilot scale ; In: Pickford , J. ed. Water, Environment and Management; Proc. 18th WEDC Conference, Kathmandu, Nepal, 30 Aug-3 Sept 1992. Loughborough University Press.

[9] S. A. Unnisa, P. Deepthi, and K. Mukkanti, “Efficiency studies with Dolichos lablab and solar disinfection for treating turbid waters,” Journal of Environmental Protection Science, vol. 4, pp. 8–12, 2010

[10] M. H. Mehdinejad, B. Bina, M. Nikaeen, and H. M. Attar, “Effectiveness of chitosan as natural coagulant aid in removal of turbidity and bacteria from turbid waters,” Journal of Food,Agriculture and Environment, vol. 7, no. 3-4, pp. 845–850, 2009

[11] Menkiti, M.C. and Onukwuli, O.D. (2011). Impact of pH ariation on Coag-flocculation Behaviour of Chitin Derived Coag flocculant in Coal Washery Effluent Medium. Journal of Minerals & Materials Characterization & Engineering. 10 (15):1391-1407

[12] WHO (2004). Guidelines for drinking water quality. Third Edition, Vol.1 Recommendations. Printed in China by Sun Fung. 540.



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