Use of Aloe Vera Juice for the Treatment of Water

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***Abstract*— Alum is the mostly used coagulant in the treatment of water. But it has some carcinogenic effects. Therefore many scientists suggested that to use natural coagulants. Natural coagulants are the coagulants which obtained from natural plants and animals. In this paper Aloe Vera juice has been used to treat the water by the process of coagulation ad flocculation. Sample collected for the treatment from Mutha River at the station of Vitthalwadi.**

***Keywords*— Turbidity, polluted water, Natural Coagulant, Aloe Vera juicer.**

I. INTRODUCTION

In developing countries like India, most of the population lived in rural areas. Most of the rural areas even do not get safe drinking water. About 780 million people still do not get safe drinking water. There is a need to construct small scale water treatment plant in these areas to treat the water from nearer river.

Alum is the most promising coagulant used to treat the water in developing countries. As searched by various scientists Alum has various carcinogenic effects. Alum is responsible for many neurological diseases. Alzheimer's disease can also cause due to repetitive use of Alum in the treatment of drinking water. Alum produced a large amount of sludge after the treatment. Cost of chemical coagulant also increasing day by day in the developing countries. [I]

Therefore it has been proved that use of natural coagulants which can be extracted from natural plants and animals are the only solution to get the safe drinking water.

II. PREAPARATION OF COAGULANT

Fully grown Aloe Vera plant was selected for the making of Aloe Vera juice. Very First leave was cut from the bottom and kept it vertically inclined for some minutes so that yellow liquid can be drained out. After this procedure edges of the leave were cut by using sharp knife and front and back of the leave were separate out with scooping out gel part of it. Gel part of Aloe leave then grinded with regular mixer grinder and juice was prepared.

By adding 95ml of water in 5ml of pure Aloe Vera juice 5% solution was prepared.

By adding 98ml of water in 2ml of pure Aloe Vera juice 2% solution was prepared.

By adding 99ml of water in 1ml of pure Aloe Vera juice 1% solution was prepared.

By adding 10gm of Alum powder in 1000ml of water Alum coagulant was made. 1ml of this stock solution is equal to 10mg/l..

A. Sampling

Water samples collected for the experiment were from Mutha River in Pune, Maharashtra, India. Samples collected by the standard method included in Indian standards.

III.METHODOLOGY

Group I: - Alum as a primary coagulant

In this group of experiment Alum was used as a primary coagulant. Applied doses were 5mg/l, 10mg/l, 15mg/l and 20mg/l.

Group II: - Aloe Vera as a primary coagulant

In this group of experiments primary coagulant used was pure Aloe Vera juice prepared by above process.

Group III: - Partially replacing optimum dose of Alum with Aloe Vera juice

In this group of experiments Aloe Vera juice was used to replace Alum partially. Replacements were done by 20% to 90% with every 10% difference.

Group IV: - Partially replacing optimum dose of Alum with 5% Aloe Vera solution

Combinations for this experiment were as per the above. Preparation of coagulant was done as per explained above.

Group V: - Partially replacing optimum dose of Alum with 2% Aloe Vera solution

2% Aloe solution was prepared as described in the above. Percentage replacements were 20% to 90%.

Group VI: - Partially replacing optimum dose of Alum with 1% Aloe Vera solution

1% Aloe solution was also used as per the above procedures.

Turbidity was measured with Nephelometric turbidity meter. Colour of the sample water was observed with the naked eye and pH of the water was measured with pH meter.

TABLE I
SHOWING THE ANALYSIS OF WATER

Date	Turbidity	Ph	Colour
9 Feb 2016	19.6	7.33	Yellowish
13 Feb 2016	19.2	7.44	Blackish
17 Feb 2016	20	7.08	Muddy
29 Feb2016	24.4	7.34	Yellowish
01Mar 2016	24.4	7.42	Yellowish
02 Mar 2016	25.8	7.22	Yellowish
9 Mar 2016	24.7	7.25	Yellowish
26Mar 2016	21.6	7.5	Yellowish

IV. Result and Discussion

Group I: - Alum as a primary coagulant

Seven to Eight samples were tested by this method. It has been observed that as we increased dose of Alum beyond the optimum dose no any significant change was found in decrease in the turbidity.

pH of the water decrease with the increase in the dose of Alum.

Group II: - Aloe Vera as a primary coagulant

From Table No. 2 We can see that as we increase the dose of Aloe Vera juice percentage turbidity removed was also increased but efficiency to treat the water is not good as compared to Alum. There is increase in the pH value with increase in Aloe Juice.

Table No. 2 Showing the results of Aloe Vera as a primary coagulant for turbidity 19.6 NTU

Jar no.	Aloe Vera dose (ml/0.5 l)	pH	Turbidity (NTU)	% Turbidity removed	Colour
1	2.5	6.91	12.2	37.76	Greenish clear
2	5	6.92	14.4	26.53	Greenish clear
3	7.5	7.00	13	33.67	Greenish clear
4	10	7.00	11.9	39.29	Greenish clear

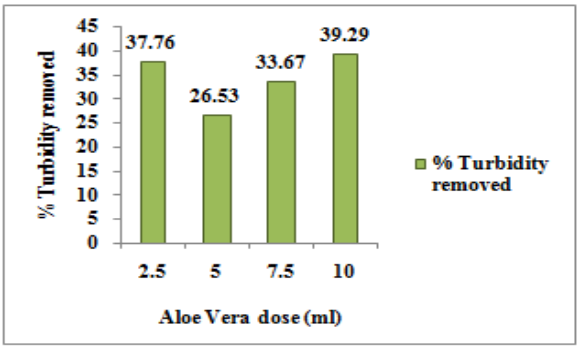

Fig. 1 Showing the results of Aloe Vera as a primary coagulant

Group III: - Partially replacing optimum dose of Alum with Aloe Vera juice

Here we can see that as we increse the quantity Aole Vera for the treatment of water percentage turbidity removed were increased. About 40-80% of Alum replaced with Aloe Vera gave good results. pH of water maintained because of Aloe Vera juice.

Table No. 3 Showing the results of Alum partially replaced with Aloe Vera

% Aloe Vera replaced	Alum (mg/0.5l)	Aloe Vera dose (ml/0.5l)	pH	Turbidity (NTU)	% Turbidity removed	Colour
20	4	1	5.3	6.62	78.28	Crystal clear
40	3	2	2.9	6.69	88.11	Crystal clear
60	2	3	4.8	6.82	80.33	Crystal clear
80	1	4	5.2	7.02	78.69	Crystal clear
30	3.5	1.5	10.7	6.25	56.15	Crystal clear
50	2.5	2.5	4.2	6.48	82.7	Crystal clear
70	1.5	3.5	3.4	6.58	86.07	Crystal clear
90	0.5	4.5	5.3	7	78.28	Crystal clear

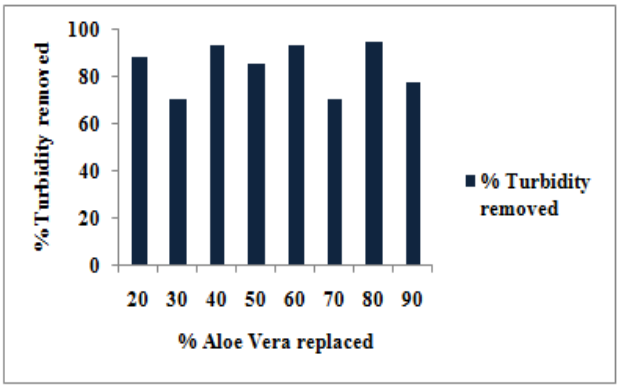

Fig 2 showing the results of Alum replaced with pure Aloe Vera juice

Group IV: - Partially replacing optimum dose of Alum with 5% Aloe Vera solution

About 40-80% replacemnt of Alum with Aloe Vera gave more than 80% of turbidity removal shown in the Table No. 4. Among them 40% replacement could be the best combination of coagulant as it gave about 88% removal of turbidity. As we can see here also as we increased the Aloe content pH of the water increased up to desirable level.

TABLE NO. 4

SHOWING THE RESULTS OF ALUM PARTIALLY REPLACED WITH 5% ALOE SOLUTION

% Aloe Vera replaced	Alum (mg/0.5l)	Aloe Vera dose (ml/0.5l)	pH	Turbidity (NTU)	% Turbidity removed	Colour
20	4	1	5.3	6.62	78.28	Crystal clear
40	3	2	2.9	6.69	88.11	Crystal clear
60	2	3	4.8	6.82	80.33	Crystal clear
80	1	4	5.2	7.02	78.69	Crystal clear
30	3.5	1.5	10.7	6.25	56.15	Crystal clear
50	2.5	2.5	4.2	6.48	82.7	Crystal clear
70	1.5	3.5	3.4	6.58	86.07	Crystal clear
90	0.5	4.5	5.3	7	78.28	Crystal clear

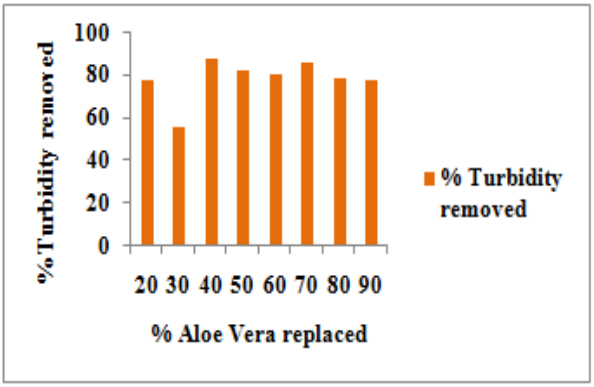

Fig 3 showing the results of Alum replaced with 5% Aloe solution

Group V: - Partially replacing optimum dose of Alum with 2% Aloe Vera solution

About 20-40% replacement of Alum gave more than 80% removal of turbidity. 40% replacement of Alum is the best combination of coagulants for removal more turbidity of water sample. 2% Aloe Solution also helpedto increase the pH of water sample which decreased due to addition of Alum.

TABLE NO. 5

SHOWING THE RESULTS OF ALUM PARTIALLY REPLACED WITH 2% ALOE SOLUTION

% Aloe Vera replaced	Alum (mg/0.5l)	Aloe Vera dose (ml/0.5l)	pH	Turbidity (NTU)	% Turbidity removed	Colour
20	4	1	3.9	6.39	84.88	Crystal clear
40	3	2	3.1	6.68	87.98	Crystal clear
60	2	3	6.01	6.83	76.71	Crystal clear
80	1	4	6.20	7.03	75.97	Crystal clear
30	3.5	1.5	5.4	6.15	79.07	Crystal clear
50	2.5	2.5	4.2	6.55	83.72	Crystal clear
70	1.5	3.5	6.12	6.56	76.28	Crystal clear
90	0.5	4.5	6.3	6.98	75.58	Crystal clear

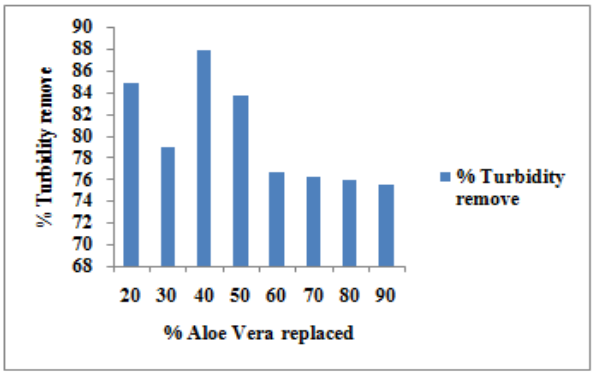

Fig 4 showing the results of Alum replaced with 2% Aloe solution

Group VI: - Partially replacing optimum dose of Alum with 1% Aloe Vera solution

In this experimentation work we can see from the Table No. 6 that about 20% - 40% replacement of Alum with Aloe solution removed more than 80% of turbidity and pH of the water has also maintained between the desirable limit given by Indian standard 10500.

% Aloe Vera replaced	Alum (mg/0.5l)	Aloe Vera dose (ml/0.5l)	pH	Turbidity (NTU)	% Turbidity removed	Colour
20	4	1	4.2	6.50	83.00	Crystal clear
40	3	2	4.1	6.85	83.40	Crystal clear
60	2	3	6.8	7.1	72.47	Crystal clear
80	1	4	7.3	7.10	70.45	Crystal clear
30	3.5	1.5	3.2	6.50	87.04	Crystal clear
50	2.5	2.5	4.4	6.62	82.19	Crystal clear
70	1.5	3.5	6.8	6.70	72.47	Crystal clear
90	0.5	4.5	7.32	6.78	70.36	Crystal clear

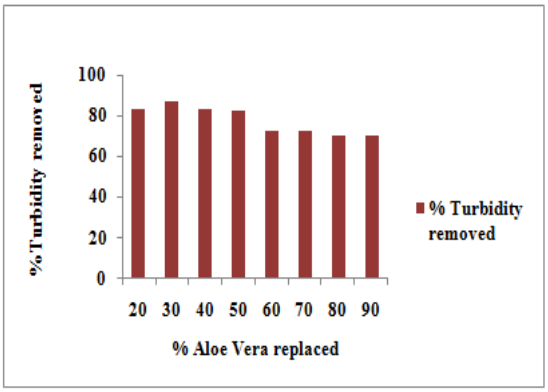

Fig 5 showing the results of Alum replaced with 1% Aloe solution

Fig 6 showing the image of sample station

TABLE NO. 6 PARTIALLY REPLACING OPTIMUM DOSE OF ALUM WITH 1% ALOE VERA SOLUTION

Fig 7 showing the image of sample station

Fig 8 showing the image of Aloe Vera leaves

Fig 9 showing the images of jars used for the experiment

V Conclusions

From the above experimentation work we can conclude that use of natural coagulant like Aloe Vera can prove to be a better coagulant when added with Alum. But Aloe Vera as a primary coagulant is not as good as compared to Alum. Pure Aloe Vera juice added with Alum with 70% replaced can be efficiently used to treat the water. But use of pure Aloe will not be technically sound as there should be various difficulties to be considered while using it like availability of plant at so much large quantity, extraction of Aloe juice at larger quantity etc. To fix this problem various Aloe solutions were made of 5%, 2%, and 1% which used in the treatment. It has been prove that all the solutions made as per above are eligible to treat the water when combined with Alum. Thinking technically 1% aloe solution with 20% replacement of Alum is the best combination to treat the water by eliminating bad effects of Alum up to some extends as it can remove more than 85% of turbidity which fall under the value given by Indian Standard 10500 that is less than 5NTU. This combination also maintained pH of the water required for potable water as given by Indian Standard i.e. between 6.5and 8.5. hence 1% Aloe solution is the best coagulant to treat the water when added with Alum.

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