Result Paper on Use of Natural and Chemical Coagulant For Water Treatment

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Abstract- *Drinking water treatment entails a number of processes based on the quality of the water source, such as turbidity and the quantity of microbial load present in the water, as well as cost and chemical availability, to achieve the required level of treatment. The purpose of this research is to look at how natural and manmade coagulants affect surface water. To determine the pH of the water used in the treatment. To assess the efficiency of natural and chemical coagulants in terms of pH sensitivity to chemical dosage. By using the Jar Test, determine the appropriate alum dosage for the desired result. Objectives of paper are To determine the optimal content of a blend of natural and chemical coagulants for surface water treatment. To compare the efficacy of natural and pharmaceutical remedies. To compare the quality of water before and after coagulant treatment.*

Keywords- PH, GRAM, ALUM , MO

I. INTRODUCTION

Alum is only effective at a specific pH range, which can be increased by combining natural and artificial coagulants. Alum is expensive because it is required in huge quantities for water treatment, and it is linked to human health and the environment. Natural coagulant preparation is difficult and time-consuming. As a result, by combining artificial and natural coagulants, it can be reduced significantly. Natural macromolecular coagulants have a promising future, but many researchers are concerned about their abundant supply, low price, injustice, multifunctionality, and biodegradability. In the future, the most effective mix proportion for low turbid and medium turbid water in various seasons will be determined. Technically and economically, waste water treatment is a difficult task. It invests a significant quantity of money, as well as land. Some treatment plants are facing issues as a result of rising costs, rising electricity costs, or poor plant maintenance. This necessitates some low-cost treatment that will assist them in overcoming their difficulties. The outcome of the Jar Test is explained in this document.

JAR TEST

The jar test is intended to simulate the coagulation/flocculation process in a water treatment plant. The results that it produces are used to help optimize the performance of the treatment plant. The procedure for a jar test is as follows:

1. Using a 1,000 mL graduated cylinder, add 1,000 mL of raw water to be coagulated to each of the jar test beakers.
2. Using a prepared coagulant stock solution (Alum), dose each beaker with increasing amounts of solution. Here's an example for dosing the beakers.

Jar Test Alum Dosage

Jar #	mL Alum Stock Added	mg\L Alum Dosage
1	0.5	5.0
2	1.0	10.0
3	1.5	15.0
4	2.0	20.0
5	2.5	25.0
6	3.0	30.0

III. RESULTS OF GRAM, ALUM AND MO POWDER

A. Jar test results of alum dosage for collected water sample for normal pH.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding alum in collected sample.

Table 3.1: Jar test results of alum dosage for collected water sample for normal pH.

Sample No.	Dosage (mg/lit.)	Initial Turbidity (NTU)	Final Turbidity (NTU)	Initial pH	Final pH
1	5	11.1	1.85	6.81	5.56
2	10	11.1	1.26	6.81	5.60
3	15	11.1	1.08	6.81	5.58
4	**20**	**11.1**	**0.45**	**6.81**	**4.68**
5	25	11.1	1.13	6.81	5.47
6	30	11.1	1.95	6.81	5.09

20 mg/lit. is the optimum dose of alum obtained by jar test which gives the minimum turbidity of 0.45 NTU for collected water sample.

B. Jar test results of alum dosage for collected water sample for for acidic pH.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding alum in collected sample for acidic pH range.

Table 3.2: Jar test results of alum dosage for collected water sample for acidic pH.

Dosage	Initial pH	Final pH	Initial Turbidity	Final Turbidity
5	2.95	1.64	11.1	1.9
10	2.95	1.68	11.1	2.3
15	**2.95**	**1.80**	**11.1**	**1.1**
20	2.95	1.79	11.1	2.7
25	2.95	1.75	11.1	3.1
30	2.95	1.77	11.1	4.3

15 mg/lit. is the optimum dose of alum obtained by jar test which gives the minimum turbidity of 1.1 NTU for collected water sample.

C. Jar test results of alum dosage for collected water sample for for basic pH.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding alum in collected sample for basic pH.

Table 3.3: Jar test results of alum dosage for collected water sample for basic pH.

Dosage	Initial pH	Final pH	Initial Turbidity	Final Turbidity
5	9.26	5.42	11.1	7.7
10	9.26	4.97	11.1	6.6
15	**9.26**	**4.84**	**11.1**	**5.2**
20	9.26	4.21	11.1	5.4
25	9.26	4.20	11.1	5.9
30	9.26	3.89	11.1	6.1

15 mg/lit. is the optimum dose of alum obtained by jar test which gives the minimum turbidity of 5.2 NTU for collected water sample.

D. Jar test results of MO seed powder dosage for collected water sample for normal pH range.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding MO seed powder in collected sample for normal pH.

Table 3.4: Jar test results of MO seed powder dosage for collected water sample for normal pH range.

Sample No.	Moringa olifera (mg/lit.)	Initial Turbidity (NTU)	Final Turbidity (NTU)	Initial pH	Final pH
1	25	11.1	2.9	6.81	7.32
2	50	11.1	2.7	6.81	7.14
3	75	**11.1**	**1.7**	**6.81**	**7.54**
4	100	11.1	2.8	6.81	7.61
5	125	11.1	3.6	6.81	7.29
6	150	11.1	4.2	6.81	7.95

75 mg/lit. is the optimum dose of MO obtained by jar test which gives the minimum turbidity of 1.7 NTU for collected water sample.

E. Jar test results of MO seed powder dosage for collected water sample for acidic pH range.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding MO in collected sample for acidic pH.

Table 3.5: Jar test results of MO seed powder dosage for collected water sample for acidic pH range.

Dosage	Initial pH	Final pH	Initial Turbidity	Final Turbidity
25	2.95	5.83	11.1	2.7
50	2.95	6.12	11.1	2.4
75	2.95	6.24	11.1	2.2
100	**2.95**	**6.89**	**11.1**	**2.1**
125	2.95	7.62	11.1	2.9
150	2.95	8.1	11.1	3.1

100 mg/lit. is the optimum dose of MO obtained by jar test which gives the minimum turbidity of 2.1 NTU for collected water sample.

F. Jar test results of MO seed powder dosage for collected water sample for basic pH range.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding MO seed powder in collected sample for basic pH.

Table 3.6: Jar test results of MO seed powder dosage for collected water sample for basic pH range.

Dosage	Initial pH	Final pH	Initial Turbidity	Final Turbidity
25	10.10	9.8	11.1	5.3
50	10.10	8.4	11.1	4.2
75	**10.10**	**7.2**	**11.1**	**2.8**
100	10.10	6.8	11.1	3.7
125	10.10	6.5	11.1	4.3
150	10.10	6.1	11.1	4.8

75 mg/lit. is the optimum dose of MO obtained by jar test which gives the minimum turbidity of 2.8 NTU for collected water sample.

G. Jar test results of Gram seed powder dosage for collected water sample for normal pH range.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding gram seed powder in collected sample for normal pH.

Table 3.7: Jar test results of Gram seed powder dosage for collected water sample for normal pH range.

Sample No.	Gram Powder (mg/lit.)	Initial Turbidity (NTU)	Final Turbidity (NTU)	Initial pH	Final pH
1	**25**	**11.1**	**5.3**	**6.81**	**6.46**
2	50	11.1	6.6	6.81	6.89
3	75	11.1	6.9	6.81	6.94
4	100	11.1	7.5	6.81	6.97
5	125	11.1	8.1	6.81	6.89
6	150	11.1	8.8	6.81	6.91

25 mg/lit. is the optimum dose of gram seed powder obtained by jar test which gives the minimum turbidity of 5.3 NTU for collected water sample.

H. Jar test results of Gram seed powder dosage for collected water sample for acidic pH range.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding gram seed powder in collected sample for acidic pH.

Table 3.8: Jar test results of Gram seed powder dosage for collected water sample for acidic pH range.

Sample No.	Gram Powder (mg/lit.)	Initial Turbidity (NTU)	Final Turbidity (NTU)	Initial pH	Final pH
1	25	11.1	6.5	2.87	3.12
2	**50**	**11.1**	**6.1**	**2.87**	**3.27**
3	75	11.1	6.7	2.87	3.48
4	100	11.1	6.9	2.87	3.96
5	125	11.1	7.1	2.87	4.10
6	150	11.1	7.4	2.87	4.21

50 mg/lit. is the optimum dose of gram seed powder obtained by jar test which gives the minimum turbidity of 6.1 NTU for collected water sample.

I. Jar test results of Gram seed dosage for collected water sample for basic pH range.

Following are the results obtained by jar test of collected water sample which gives the difference between initial turbidity and final turbidity and initial pH and pH obtained after adding gram seed powder in collected sample for basic pH.

Table 3.9: Jar test results of Gram seed dosage for collected water sample for basic pH range.

Sample No.	Gram Powder (mg/lit.)	Initial Turbidity (NTU)	Final Turbidity (NTU)	Initial pH	Final pH
1	25	11.1	7.20	9.84	8.74
2	50	11.1	6.86	9.84	8.44
3	**75**	**11.1**	**6.21**	**9.84**	**8.32**
4	100	11.1	6.75	9.84	7.89
5	125	11.1	6.63	9.84	7.69
6	150	11.1	6.91	9.84	7.54

75 mg/lit. is the optimum dose of gram seed powder obtained by jar test which gives the minimum turbidity of 6.21 NTU for collected water sample.

IV. RESULT OF JAR TEST ON HIGH TURBID WATER

A sample of sewage water is collected from a Nallah near Rajaram bridge. This water sample is very turbid having turbidity of 84.7 NTU. Then this collected sample is allowed to settle down for 12 hours. pH occurred of collected sample is 7.4 which is Normal pH range. Then Jar test is performed on this collected sample by adding most efficient proportion of natural coagulants and chemical coagulant, i.e. alum, gram and MO. In the following results the proportion is decided on the basis of maximum optimum amount of dosage of Mo, i.e. **75 mg/lit.**

Table 4.1: Turbidity – 2.1 NTU

ALUM	GRAM	M.O.
0.5	0.5	1
18.75	18.75	37.5

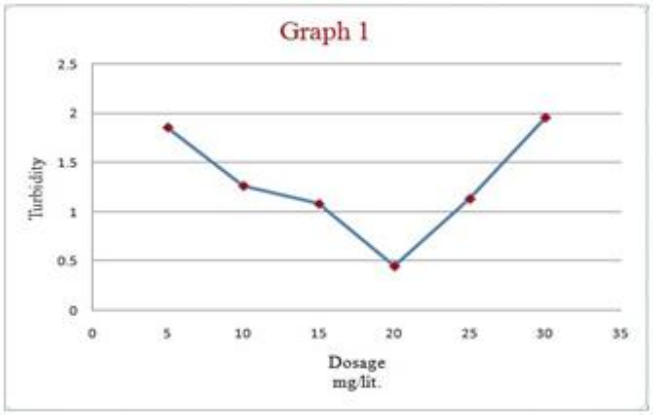
In the following results the proportion is decided on the basis of maximum optimum amount of dosage of Mo, i.e. 50 mg/lit.

Table 4.2: Turbidity – 4.7 NTU

ALUM	GRAM	M.O.
0.5	0.5	1
18.75	18.75	37.5

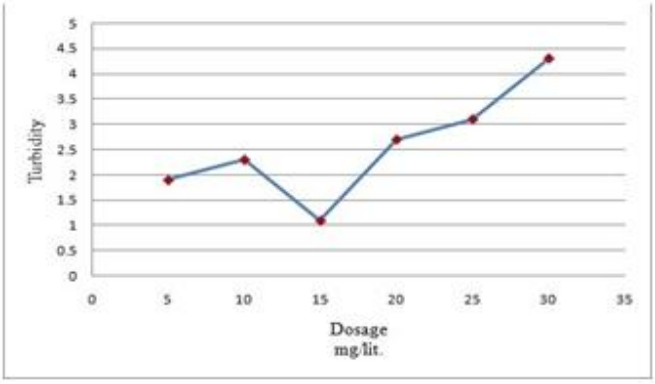
V. GRAPHICAL ANALYSIS OF JAR TEST RESULTS

1]Jar test results of alum dosage for collected water sample for normal pH.



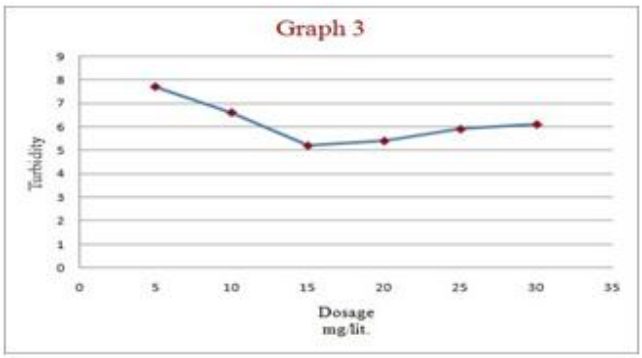
Graph 5.1: Jar test results of alum dosage for collected water sample for normal pH.

2] Jar test results of alum dosage for collected water sample for acidic pH.



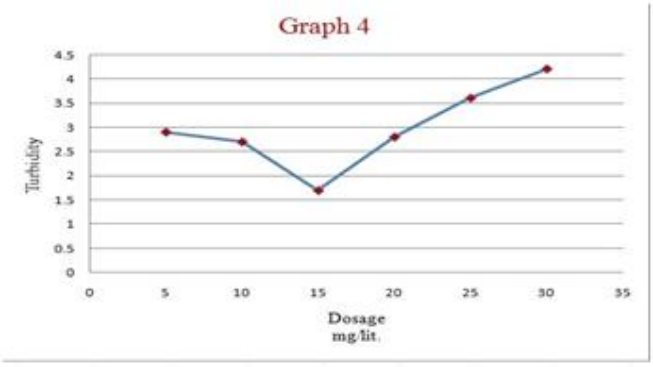
Graph 5.2- Jar test results of alum dosage for collected water sample for acidic pH.

3]Jar test results of alum dosage for collected water sample for basic pH.



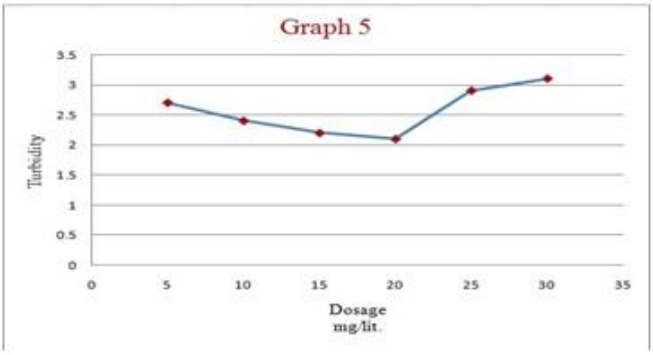
Graph 5.3- Jar test results of alum dosage for collected water sample for basic pH.

4]Jar test results of MO seed powder dosage for collected water sample for normal pH.



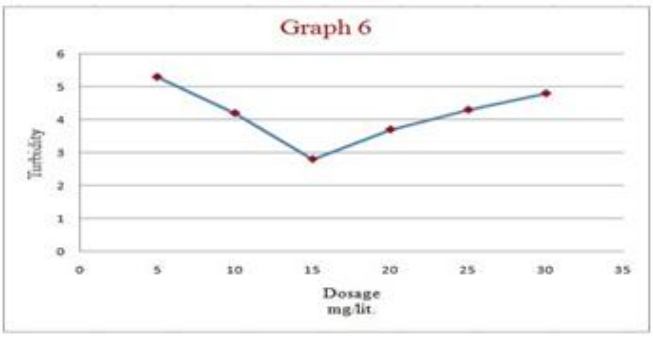
Graph 5.4- Jar test results of MO seed powder dosage for collected water sample for normal pH.

5] Jar test results of MO seed powder dosage for collected water sample for acidic pH.



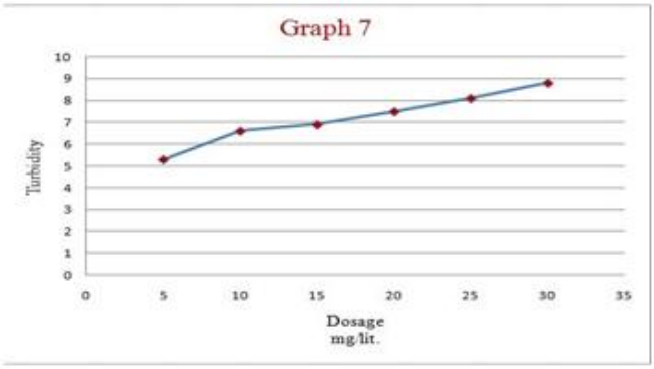
Graph 5.5- Jar test results of MO seed powder dosage for collected water sample for acidic pH.

6]Jar test results of MO seed powder dosage for collected water sample for basic pH.



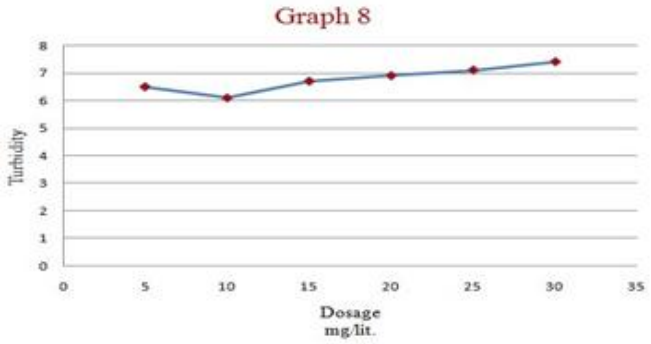
Graph 5.6- Jar test results of MO seed powder dosage for collected water sample for basic pH.

7]Jar test results of Gram seed powder dosage for collected water sample for normal pH.



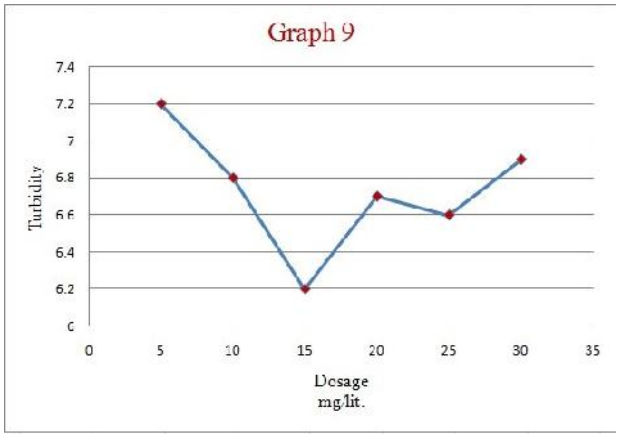
Graph 5.7- Jar test results of Gram seed powder dosage for collected water sample for normal pH.

8] Jar test results of Gram seed powder dosage for collected water sample for acidic pH.



Graph 5.8- Jar test results of Gram seed powder dosage for collected water sample for acidic pH.

9]Jar test results of Gram seed dosage for collected water sample for basic pH.



Graph 5.9- Jar test results of Gram seed dosage for collected water sample for basic pH.

VI. CONCLUSION

- From the analysis of results obtained it is observed that the mixture of natural coagulants, i.e. powder of MO seed and gram seed powder with the chemical coagulant, i.e. alum is very productive.
- Cost of treatment of water can be reduced by using mixture of natural and chemical coagulant. Use of alum can be reduced in large extent by adding MO and gram seed powder.
- The diseases caused by use of alum are prevented simultaneously. 0.5: 0.5: 1 is the most effective proportion of Alum, Gram seed powder and MO for the low turbid, medium turbid and high turbid water.
- Mixture of MO powder and gram seed powder also affects on pH of water and turns it to the range of potable water, i.e. 6 to 7.5. It is also observed that these natural coagulants attracts flocks and helps in reducing flocks setting time of turbid water.
- For the small water treatment plant the use of mixture of natural and chemical coagulant is most efficient than the use chemical coagulants only.
- This is the most suitable method to treat water in regions where MO is available in large extent such as South Asian region.

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