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The Role of Various Coagulant in Water Treatment

Mansi Patil[1*], Rutuja Kakade[2], Chanchal Penshanwar[3], Madhuri Sansare[4], Sushant Shelar[5], P. D. Shinde[6]

[1,2,3,4,5]*Student, Department of Civil Engineering, Marathwada Mitra Mandal Institute of Technology, Pune, India*
[6]*Assistant Professor, Department of Civil Engineering, Marathwada Mitra Mandal Institute of Technology, Pune, India*

***Abstract*: Coagulation is the natural and chemical water treatment process is used to remove small suspended solid particles from all types of water. At present time the disposal of the sludge is becoming a major problem. One of the major environmental challenges facing municipalities around the world is the disposal of waste. Therefore, it is necessary to utilize the waste effectively with technical department. This study aims to treat the water by using natural and chemical coagulants. Natural coagulants are watermelon seeds, mooring seeds, and other seeds. Chemical coagulants are alum, sodium aluminate and ferric sulphate. Untreated sample and treated water sample will go through physical, chemical, and biological examination like PH, color, turbidity, TDS, TSS, MPN, etc. This project gives an idea about use of suitable coagulants i.e., natural, and chemical.**

***Keywords*: coagulants, sludge, suspended solids, types of examination on sample.**

1. Introduction

A. Types of Coagulants

There are two types of coagulants that are most used in water and wastewater treatment:

1) Chemical coagulant
   - Alum coagulant
   - Ferric sulphate
2) Natural coagulants
   - Moringa seed
   - Okra seed

1) Chemical coagulants

Chemical Coagulation is the process used to eliminate solids from water, by manipulating electrostatic charges of atoms suspended in water.

- *Alum coagulant:*

Alum is the maximum used as alum coagulant. It is obtainable in several solid forms such as block, kibbled or ground and is also available as a solution. In waterworks practice aluminum sulphate is frequently but imperfectly referred to as 'alum'. [3]

- *Ferric sulphate:*

Ferric Sulphates are effective primary coagulants that are used by the water industry for consumption water production, wastewater treatment requests such as phosphorus removal, struvite control and sludge digestion. [4] Ferric Sulphate as Coagulant and the Chemical Reactions like alum, ferric sulphate also needs alkalinity in the water in instruction to form the flock particles ferric hydroxide [$Fe(OH)_3$]. When natural alkalinity is not enough, alkaline chemicals (such as soluble salts containing, CO^{-2} and OH^{-} ion) should be additional.

2) Natural coagulants

Natural coagulant is a naturally occurred; plants-based coagulant that can be used in coagulation-flocculation procedure of wastewater treatment for plummeting turbidity.

- *Moringa seeds:*

Numerous studies have been conducted and presented that moringa seeds are real as bio coagulant to improve physio-chemical properties of dirty water. The seed extract can separate unwelcome particulates from water sediment impurities. [3] They also have potential as anti-microbial treatment – the unprocessed seed powder may sediment over 90% of the microorganisms from raw water.

- *Okra seeds:*

Okra is previously an important vegetable crop grown in tropical and subtropics parts of the biosphere. The okra seeds are used for the conduct of water sample. For the water treatment, the oil contained in the okra seeds was first extracted, before the okra seeds used. In the range of studied, it is experiential that whatever the volume of gumbo mucilage, the turbidity reductions when the pH rises. [4]

Fig. 1. Moringa seed powder

*Corresponding author: mansipatil7020@gmail.com

Fig. 2. Okra seeds

Types of tests carried out:

1. Ph
2. Alkalinity
3. Hardness
4. TDS
5. TSS

Fig. 3. Alkalinity test

2. Objectives

- To determine the alkalinity, pH, and hardness test on the surface water.
- To determine the TDS, TSS and MPN test on the surface water.
- Comparison between natural and chemical coagulants in terms of effectiveness and cost.

3. Results

Table 1
Comparison between natural and chemical in terms of effectiveness

1. Alum			
Sr. no.	**Amount of coagulant added**	**Type of test**	**Result**
1.	1 gm	pH	7.8
2.		Alkalinity	92.3
3.		Hardness	29.8
4.		TDS	363
5.		TSS	3.92
6.		MPN	35
2. Moringa			
1.	1 gm	pH	8.9
2.		Alkalinity	203
3.		Hardness	60
4.		TDS	511
5.		TSS	19
6.		MPN	90
7.	3 gm	pH	8.8
8.		Alkalinity	200
9.		Hardness	50
10.		TDS	506
11.		TSS	16.92
12.		MPN	80
13.	5 gm	pH	7.3
14.		Alkalinity	104
15.		Hardness	34
16.		TDS	403
17.		TSS	15.86
18.		MPN	76
3. Okra			
1.	1 gm	pH	8.9
2.		Alkalinity	298
3.		Hardness	254
4.		TDS	430
5.		TSS	36.9
6.		MPN	80
7.	3 gm	pH	8.7
8.		Alkalinity	260
9.		Hardness	263
10.		TDS	430
11.		TSS	42
12.		MPN	65
13.	5 gm	pH	7.5
14.		Alkalinity	97
15.		Hardness	25.98
16.		TDS	560
17.		TSS	20.89
18.		MPN	57
4. Ferric sulphate			
1.	1 gm	pH	8.6
2.		Alkalinity	127
3.		Hardness	60
4.		TDS	560
5.		TSS	16
6.		MPN	53
7.	3gm	pH	8.9
8.		Alkalinity	200
9.		Hardness	90
10.		TDS	600
11.		TSS	20
12.		MPN	46
13.	0.1gm	pH	7.2
14.		Alkalinity	93.5
15.		Hardness	26.1
16.		TDS	540
17.		TSS	3.53
18.		MPN	39

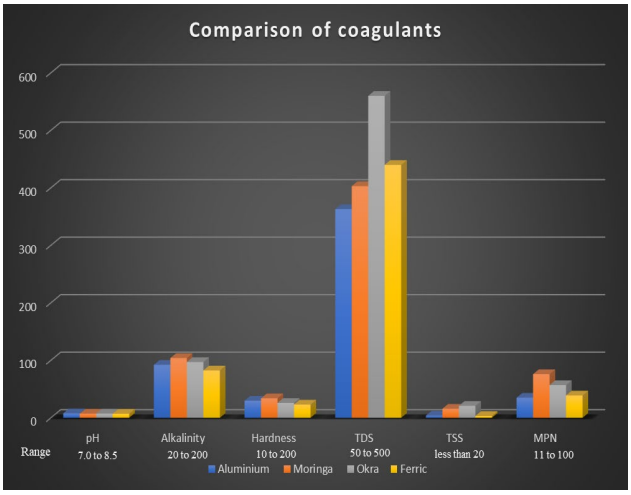

Fig. 4. Comparison of coagulants

Table 2
Comparison between natural and chemical in terms of cost

S.No	Coagulant	Gram	Cost
1	***Natural coagulants***		
a	Moringa	100	50 Rs.
b	Okra	100	71 Rs.
2	***Chemical coagulants***		
a	Alum	100	46 Rs.
b	Ferric sulphate	100	150 Rs.

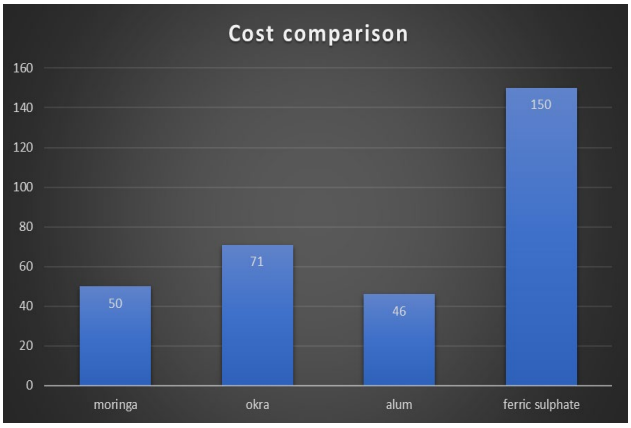

Fig. 5. Cost comparison

Fig. 6.

4. Conclusion

Various tests are carried out on the surface water to know its chemical physical a biological parameters like alkalinity, pH, hardness, TDS, TSS and MPN with different coagulants added in it.

With the help of results and cost we compare the natural and chemical coagulants; we conclude that the aluminum and moringa powder is suitable for the treatment of the water.

Whereas the okra coagulant and ferric sulphate is totally not suitable for converting the surface water into the drinking water.

Percentage of effectiveness and cost:

1) Alum: 43%
2) Moringa: 29%
3) Okra: 15%
4) Ferric sulphate: 13%

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