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Application of plant based natural coagulants for sewage water treatment

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ABSTRACT:

Access to clean drinking water remains a pressing issue in numerous corridors of the country, directly impacting public health and quality of life. Several water sanctification styles live, but numerous are complex, expensive, or environmentally dangerous. In response, this study investigates the use of locally available factory- grounded natural coagulants — papaya seed greasepaint and neem splint greasepaint — for water treatment. Grounded on former exploration, natural accoutrements have shown implicit in removing turbidity and microbial pollutants from water. In this study, colorful tablets of natural coagulants were applied to sewage water samples, and crucial parameters similar as pH, turbidity, and Total Suspended Solids (TSS) were anatomized. Following a series of controlled jar tests, the optimum lozenge for each coagulant was linked. The results demonstrated that both coagulants effectively reduced turbidity and suspended solids, while maintaining respectable pH situations. This study indicates that using natural coagulants offers a cost-effective, Eco-friendly, and ménage-friendly result for small- scale water treatment in pastoral and civic communities likewise.

Keywords: Coagulation, Papaya seed powder, Neem leaf Powder, pH, Turbidity, Total Suspended Solids.

Introduction:

Water is precious and essential natural resource, inversely distributed on our earth. In the field of water our country is faced with two mains and major problems which are volume and quality of the drinking water. Turbidity imparts enormous problem in water treatment. While some suspended material will be large enough and heavy enough to settle fleetly to the bottom of vessel if a liquid sample is left to stand (settable solids). truly small patches will settle only truly sluggishly(or) not at each if the sample is regularly agitated or the patches are colloidal. These small solid patches beget the liquid to appear cloudy. Turbidity in waste water is caused by suspended matter, similar as complexion, ground, finely divided organic and inorganic matter, answerable colored organic composites, and other bitsy organisms. A cloudy water has muddy or cloudy appearance and it is aesthetically monstrous. They may be manufactured from factory seeds, leaves, and roots. Natural coagulants have bright future and are concerned by numerous inquiries because of their abundant source, low price, terrain friendly, multifunction in water sanctification.

Coagulants are used to increase the size of submarine substances, making them large enough to settle or to be removed by beach, binary subcaste filtration, or the membrane. In this study we used Alum, Papaya seed greasepaint and Neem splint greasepaint as the coagulants in treating the sewage water.

Methodology:

The experimental study was conducted using the Jar Test method, a standard procedure for evaluating coagulation efficiency in water treatment. Sewage water samples collected from the PMC 32 MLD Sewage treatment plant, Pune, were treated with varying dosages of three coagulants—alum, papaya seed powder, and neem leaf powder. Each sample was placed in separate jars and subjected to rapid mixing , followed by slow mixing to promote floc formation. The samples were then left undisturbed to allow settling. Water from above the sediment was collected and tested for turbidity, pH, and total suspended solids. This process helped determine the optimum dosage for each coagulant and assess its effectiveness in improving water quality.

Research Methodology:

- Step 1: Collection of water sample.
- Step 2: Preparation of natural coagulants, Papaya Seed Powder, Neem Leaf Powder.
- Step 3: Jar test procedure.
- Step 4: Testing parameters, Turbidity, pH, Total Suspended Solids.
- Step 5: Optimum dosage determination.
- Step 6: Comparison.

- Step 7: Conclusion.

Materials Used:

Neem Leaf Powder as a Natural Coagulant: - Neem leaves are considerably available and cost-effective, making them a sustainable volition to chemical coagulants. When added to water, neem flake cream releases positively charged proteins that bind to negatively charged impurities like ground and bacteria. This commerce forms flocs that settle at the bottom, helping to reduce turbidity, maintain pH, and lower Total Suspended Solids(TSS). Overall, it offers an eco-friendly and effective system for perfecting water quality.

Papaya Seed Powder as a Natural Coagulant: - Papaya seeds, rich in proteins and medicinal parcels, act as a natural coagulant in water treatment. They contain positively charged proteins, analogous as papain, which bind with negatively charged impurities like ground, complexion, and bacteria. This leads to floc conformation through adsorption and charge neutralization, causing the impurities to settle at the bottom. Besides perfecting water clarity, papaya seeds also offer health benefits due to therians- seditious, digestive, and immunity- boosting parcels.

Objective:

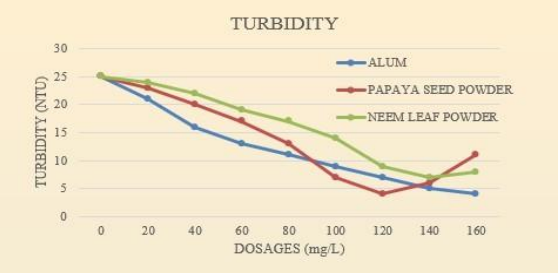
- To reduce the Turbidity, TSS and pH of water.
- To determine the effectiveness of Papaya seed greasepaint and Neem splint greasepaint.
- To find out the optimum dose of coagulants needed to treat the sewage water

Results

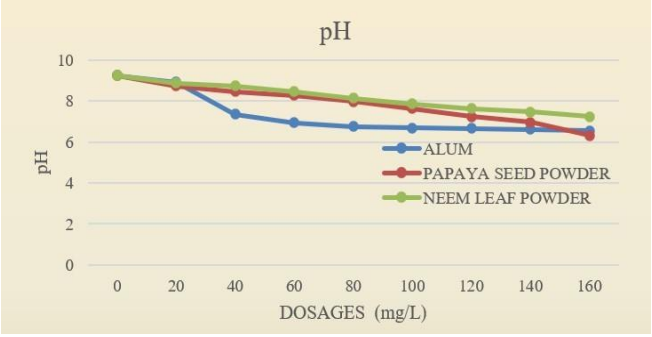
In this study, alum was used as a coagulant with dosages ranging from 20 mg/L to 160 mg/L. As the dosage increased, turbidity decreased gradually, with the lowest turbidity of 4 NTU observed at 160 mg/L. The turbidity values at each dosage were: 21, 16, 13, 11, 9, 7, 5, and 4 NTU. Throughout the experiment, pH remained between 6.5 and 8.5, and TSS was below 250 mg/L. The optimum alum dosage was found to be 160 mg/L, where all water quality parameters were within acceptable limits.

In this study, papaya seed powder was used as a coagulant with dosages from 20 mg/L to 120 mg/L. Turbidity decreased steadily with increasing dosage, reaching a minimum of 4 NTU at 120 mg/L. The turbidity values recorded were 23, 20, 17, 13, 7, and 4 NTU for 20 to 120 mg/L dosages, respectively. pH remained between 6.4 and 8.4, and TSS was below 249 mg/L. Thus, the optimal alum dosage was found to be 120 mg/L, where all water quality standards were met.

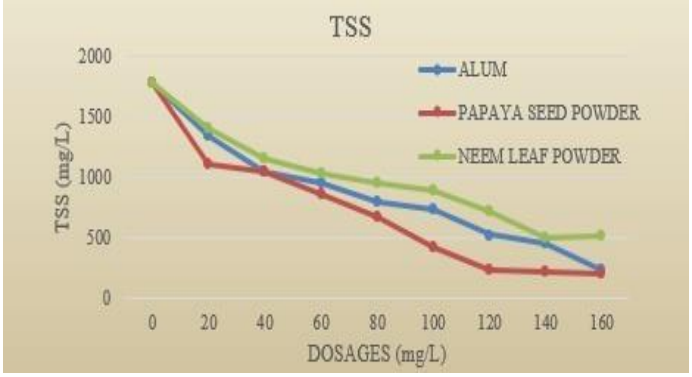
In this study, neem leaf powder was used as a natural coagulant with dosages from 20 mg/L to 140 mg/L. Turbidity decreased gradually, reaching a minimum of 6 NTU at 140 mg/L. The turbidity values observed were 24, 22, 19, 17, 14, 9, and 6 NTU at respective dosages. The pH remained between 6.4 and 8.4, and TSS was below 249 mg/L. The optimal dosage of neem leaf powder was 140 mg/L, where all key water quality parameters were within permissible limits.



Graph 1 :Coagulant doasages (mg/L) vs Turbidity



Graph 2: Coagulant doasages (mg/L) and vs pH.



Graph 3: Coagulant doasages (mg/L) vs TSS

Conclusion :

- In this study the factory grounded natural coagulants are used. Different tablets of papaya seed greasepaint and neem splint greasepaint along with chemical coagulant(alum).
- The factory grounded coagulants uprooted from papaya seeds and neem splint greasepaint has shown to be a new promising natural coagulant to treat sewage water when combined with alum@ 40 mg/ L.
- The quantum of alum needed for the treatment of water is veritably high. The optimum lozenge of alum is achieved@ 160 mg/ L which causes the conditions like Alzheimer.
- rather of high quantum of chemical coagulant(alum) in treating water the factory grounded natural coagulants can be effectively used in treating sewage water which can be used for drinking, gardening, aseptic workshop and construction.
- By observing the graphs, we can conclude that the papaya seed greasepaint and neem splint greasepaint worked efficiently in treating the sewage water whereas the papaya seed greasepaint is the stylish among the chosen coagulants.
- It was set up that papaya seed, neem splint greasepaint as natural coagulants carried high reduction probabilities of the test comparison with alum. Employing seeds greasepaint to purify cloudy water created some positive Amenities similar as being eco-friendly and cheap products to use.

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