# Waste Water Treatment Using Natural Coagulants

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**Abstract**

Natural coagulant gains the advantage over chemical coagulant due to various reasons. One of the reasons are natural coagulant are safer than chemical coagulant. When using coagulant for water treatment, there will be possibilities of residue coagulant present in the water after the treatment. Chemical coagulant residue such as alum is harmful because it can cause Alzheimer disease if consumed. On the other hand, if natural coagulant was used, the residual coagulant would not be harmful. Likewise, natural coagulant is much cheaper compared to chemical coagulant. Chemical coagulant such as alum, need coagulant aid to effectively treat high turbidity water, thus making it more expensive and difficult to be used in poor countries. Whereas natural coagulants are much cheaper and can be extracted from various plant wastes which greatly reduce the treatment cost. Nevertheless, an abundance and locally available resource must be met to use natural coagulant commercially.

**Keywords**: - Artificial Coagulant, Natural Coagulant, Turbidity

## I. INTRODUCTION

The production of drinking water from most raw water sources involves coagulant use at a coagulation/flocculation stage to remove turbidity in the form of suspended and colloidal material. Many coagulants and flocculants are widely used in conventional water treatment processes. These materials can be classified into inorganic coagulants (e.g. aluminium and ferric salts) and synthetic organic polymers. Aluminium salts are cheap and are the most widely used coagulants in water and wastewater treatment all over the world. Regarding the application of synthetic polymers, the presence of residual monomers is undesirable because of their neurotoxicity and strong carcinogenic properties. In recent years there has been considerable interest in the development of usage of natural coagulants which can be produced or extracted plant. These coagulants should be biodegradable and are presumed to be safe for human health. In addition, natural coagulants produce readily biodegradable and less voluminous sludge. The use of natural materials of plant origin to clarify turbid raw waters is not a new idea. Natural coagulants have been used for domestic household for centuries in traditional water treatment in tropical rural areas. Low cost wastewater treatment technologies will continue to be viable and economical option in the recovery, recycle and reuse of water.

There are often seven steps in large-scale water treatment like Screening, Aeration, Coagulation and Flocculation, Sedimentation, Filtration, Chlorination, and Supplementary

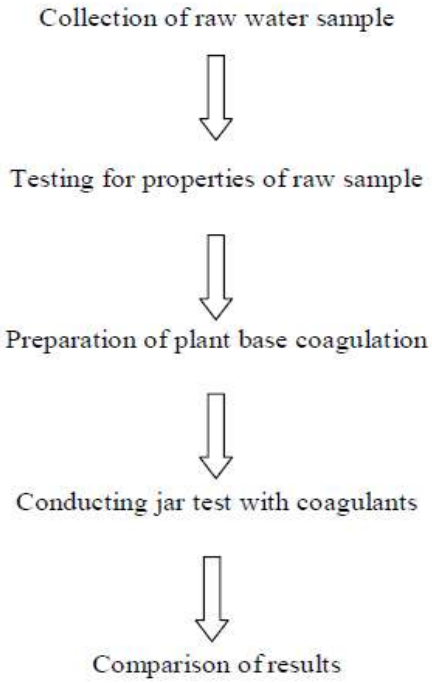
Treatment. After aeration, coagulation takes place, to remove the fine particles (less than 1 μm in size) that are suspended in the water. In this process, a chemical called a coagulant (with a positive electrical charge) is added to the water, and this neutralizes the negative electrical charge of the fine particles. The addition of the coagulant takes place in a rapid mix tank where the coagulant is rapidly dispersed by a high-speed impeller. Since their charges are now neutralized, the fine particles come together, forming soft, fluffy particles called 'flocs'(Before the coagulation stage, the particles all have a similar electrical charge and repel each other).

Generally coagulants are of two types: Artificial coagulants and Natural coagulants. Artificial coagulants are metal based coagulants. The aluminium coagulants include aluminium sulphate, aluminium chloride and sodium aluminate. The iron coagulants include ferric sulphate, ferrous sulphate, ferric chloride and ferric chloride sulphate. Drawbacks of most frequently used coagulants are Alzheimer's disease and similar health related problems associated with residual aluminium in treated water, it produces large sludge volumes, it requires pH alkalinity adjustment, low efficiency in coagulation of cold water, adds dissolved solids or salts to water and usually needs to add alkalinity.

## II. OBJECTIVE OF THEPROJECT

The objective of the study is to assess the possibility of using natural coagulants as an alternative to the current commercial synthetic coagulants such as Alum and to optimize the coagulation process. This study investigates the potential of environmental friendly and natural coagulant for the treatment of waste water.

## III. METHODOLOGY



Water sample is collected from a lake located in Naknampur. The following tests were conducted on raw water sample to know its properties: pH, Turbidity, Conductivity, Alkalinity, Hardness, and Jar test. Tamarind seeds, Neem leaves, Chick peas, Drumstick seed powder were the materials used in the experiment. The process of preparation of coagulant is explained below.

Tamarind seeds: Tamarind seeds were roasted to remove the moisture and after roasting the seed covering was removed and blended them into fine powder, sieved through 90micron sieve. 5gm of powder was added to 500ml distilled water.

Fig 1: Tamarind seed and Powder

Neem leaves: Kept fresh neem leaves in oven at 80° C for 24hrs to remove moisture and blended it into fine powder and sieved it through 90micron sieve.

Fig 2: Neem leaves and powder

Chick peas: Oven dried chick peas to remove any moisture and grinded them into fine powder in flour mill. Sieved it through 90micron sieve. Added 2gm of powder to 500 ml distilled water to make standard solution.

Fig 3: Chick peas and powder

Drumstick seed powder: Collected fully grown drumstick seeds and removed outer cover of the seeds. Oven dried them at 80°C degree centigrade for 24 hours and ground them into fine powder and sieved in 90 micron sieve.

Fig 4: Drumstick seeds and powder

## IV. RESULTS

| | |
|---|---|
| Temperature | 27.3$^{o}$C |
| pH | 7.3 |
| Alkalinity | 250ppm |
| Conductivity | 3.35 µS/cm |
| Turbidity | 39.8 NTU |
| Total dissolved solids | 1273 mg/l |

Table 1: Properties of Raw Water Sample

| Dosage | Turbidity | Efficiency (%) |
|---|---|---|
| 0 ml | 38 NTU | - |
| 4 ml | 8 NTU | 80.95 |
| 8 ml | 6 NTU | 85.71 |
| 16 ml | 5 NTU | 88.09 |
| 32 ml | 9 NTU | 78.57 |
| 64 ml | 13 NTU | 69.45 |

Table 2: Optimum coagulant dosage of Alum

| Coagulant used | Dosage | Turbidity | Efficiency (%) |
|---|---|---|---|
| Tamarind Seeds | 12 ml | 9 NTU | 78.57 |
| Neem leaf | 2g | 21 NTU | 50.00 |
| Chick peas | 8ml | 8 NTU | 80.95 |
| Drumstick seeds | 4gm | 11 NTU | 73.80 |

Table 3: Efficiencies of Natural coagulants used

## V. CONCLUTION

The low cost effective water treatment is very much necessary in today's scenario and is very much necessary especially in developing countries because of large scales of poverty. The study reveals a methodology in low cost and effective water treatment in terms physical characteristics. The world is under the doom of climate change and global warming extreme weather conditions are altering the cycles of drought and floods which are impacting the water quality due to high erosion and large scale of point and non-point pollution, in accordance this study involves of using organic coagulants to treat the water thus reducing the proliferation of carcinogenic diseases. In recent years the importance of organic coagulants which are highly efficient in reducing the carcinogenic diseases, the paper has used locally available organic materials to treat the water.

Though Alum is more efficient but the side effects are highly alarming, it was found that chick peas performed almost equivalent to Alum. The Indian standard code recommends that

the turbidity should be less than 10NTU and accordingly all the organic or natural coagulants reduced the turbidity less than 10NTU. The study also reveals that the Alum, Tamarind seeds decreased the pH value of the water sample. Thus this study concludes that though Alum is more efficient in reducing the turbidity but the side effects are more alarming and hence it is necessary to make use of Natural Coagulants to treat the water.

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