



## Comparison of Removal of Turbidity by Alum Sulfate and Nelumbo Nucifera

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### ABSTRACT

Turbidity is caused by particles suspended or dissolved in water. High turbidity can significantly reduce the aesthetic quality of lakes and streams, having a harmful impact on our lives. Many aluminium salts are used to treat turbidity problem. The use of aluminium based coagulants has raised great concern about the release of aluminium into the effluent. Aluminium is linked with Alzheimer's disease as well as carcinogenic properties. This study focuses on the use of more ecofriendly and better option in the form of flower of Nelumbo nucifera. Highly turbid water was treated with Alum sulfate and the flower powder of Nelumbo nucifera and observed. The flower powder of Nelumbo nucifera was found to be more effective at higher concentrations.

**Keyword:** water, turbidity, alum, Nelumbo, turbid meter,

### INTRODUCTION

Turbidity is caused by particles suspended or dissolved in water that scatter light making the water appear cloudy or murky. Particulate matter can include sediment - especially clay and silt, fine organic and inorganic matter, soluble colored organic compounds, algae, and other microscopic organisms. Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is an expression of the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity. Material that causes water to be turbid include clay, silt, finely divided inorganic and organic matter, algae, soluble colored organic compounds, and plankton and other microscopic organisms. Turbidity makes water cloudy or opaque.

Turbidity in open water may be caused by growth of phytoplankton. Human activities that disturb land, such as construction, mining and agriculture, can lead to high sediment levels entering water bodies during rain storms due to storm water runoff. Areas prone to high bank erosion rates as well as urbanized areas also contribute large amounts of turbidity to nearby waters, through storm water pollution from paved surfaces such as roads, bridges and parking lots. Some industries such as quarrying, mining and coal recovery can generate very high levels of turbidity from colloidal rock particles.

In drinking water, the higher the turbidity level, the higher the risk that people may develop gastrointestinal diseases.<sup>[3]</sup> This is especially problematic for immune compromised people, because contaminants like viruses or bacteria can become attached to the suspended solids. The suspended solids interfere with water disinfection with chlorine because the particles act as shields for the virus and bacteria. Similarly, suspended solids can protect bacteria from ultraviolet (UV) sterilization of water.

Turbidity readings can be used as an indicator of potential pollution in a water body. Although turbidity is not a direct indicator of health risk, numerous studies show a strong relationship between removal of turbidity and removal of protozoa. The particles of turbidity provide "shelter" for microbes by reducing their exposure to attack by disinfectants. Microbial attachment to particulate material has been considered to aid in microbe survival. Fortunately, traditional water treatment processes have the ability to effectively remove turbidity when operated properly.

Aluminium sulfate, shortly known as alum, when added to raw water reacts with the bicarbonate alkalinities present in water and forms a gelatinous precipitate. This floc attracts other fine particles and suspended material in raw water, and settles down at the bottom of the container. There may be negative health consequences from continued exposure to the aluminum ions in the alum. Because some of the product is absorbed into the skin, one way to cut your exposure to the product is to apply it every other day, rather than every day. There are a variety of primary coagulants which can be used in a water treatment plant. One of the earliest, and still the most extensively used, is aluminum sulfate, also known as alum. Alum can be bought in liquid form with a concentration of 8.3%, or in dry form with a concentration of 17%. When alum is added to water, it reacts with the water and results in positively charged ions. In a developing country like India, Alum is used by majority of people who cannot afford a water filter. Use of alum is a traditional method used even now to remove turbidity from overhead tanks and large water sumps. Recent studies of various scientists have suggested that the use of alum is linked to neurological disorders like Alzheimer's disease. The present study focuses of the use of other natural coagulants like *Nelumbo nucifera* instead of alum.

The instrument used for measuring it is called nephelometer or turbid meter, which measures the intensity of light scattered at 90 degrees as a beam of light passes through a water sample.

Turbidity meters are devices that have a light source, lens, and detector located 90° from the light source that work together to measure the turbidity of a sample. When a sample of is placed into the path between the light source and detector, some of the particles in the sample scatter the light in such a way that it reaches the detector at 90°. The detector determines the amount of light scattering and compares the reading against standards on a calibration curve.

### Turbidity Removal by Natural Coagulants

Natural coagulants (lotus flower powder) and alum sulfate crystals were grinded and sieved through the sieve; the powder of *Nelumbo nucifera* was washed thoroughly to remove the colour. It was kept under the sun for drying and then it was dried in a microwave oven for few minutes. This dried powder of *Nelumbo* as well as that of alum was added to the turbid waters

of Osman Sagar in different concentrations. Coagulation experiments were carried out. The effect of concentration of coagulant on turbidity removal was checked using a turbidity meter.



Coagulant	Dose used mg/lit	% of turbidity reduction
Flowers of <i>Nelumbo nucifera</i>	30	27.7
	40	35.0
	50	48.2
	60	54.0
	70	72.8
	80	81.2
	90	84.6
	100	86.4

Coagulant	Dose used mg/lit	% of turbidity reduction
Alum	30	54
	40	62.1
	50	69.8
	60	72.3
	70	73.2
	80	74.6
	90	76.9
	100	81.6

The experiment focused on turbidity reduction efficiency using different doses of coagulant i.e. flower powder of *Nelumbo nucifera* and alum sulfate. The percentage of turbidity was found to reduce more with alum when the concentrations are low and less with *Nelumbo nucifera*. As the concentrations of both the coagulants were increased the result was vice versa. The higher concentrations of *Nelumbo nucifera* gave a much better result than alum.

### Conclusion:

Therefore the use of locally available coagulant like flower powder of *Nelumbo nucifera* (lotus) provides a better option for clean and safe water than alum.