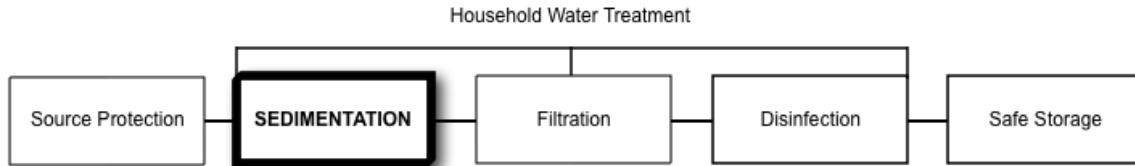


Household Water Treatment and Safe Storage Factsheet: Natural Coagulants

The Treatment Process



Potential Treatment Capacity

Very Effective For:	Somewhat Effective For:	Not Effective For:
<ul style="list-style-type: none"> • Turbidity 	<ul style="list-style-type: none"> • Bacteria • Viruses • Protozoa • Helminths • Taste, odour, colour 	<ul style="list-style-type: none"> • Dissolved chemicals

What are Natural Coagulants?

The sedimentation process can be quickened by adding coagulants to the water.

Coagulation with extracts from natural and renewable vegetation has been widely practiced since recorded time. There is a variety of natural coagulants used around the world, depending on the availability.

Extracts from the seeds of *Moringa oleifera* can be used, the trees of which are widely present in Africa, the Middle East and the Indian subcontinent. *Strychnos potatorum*, also known as clearing nuts or the nirmali tree, is found in India to treat water. Prickly pear cactus is prevalent and traditionally used in Latin America. There are also reports of other natural coagulants being used, such as fava beans.

How Does it Remove Contamination?

Coagulants contain significant quantities of water-soluble proteins which carry an overall positive charge when in solution. The proteins bind to the predominantly negatively charged particles that cause turbidity (e.g. sand, silt, clay).

Coagulation happens when the positively and negatively charged particles are chemically attracted together. They can then accumulate (flocculation) to form larger and heavier particles (flocs). The flocs can be settled out or removed by filtration.

Bacteria and viruses can attach themselves to the suspended particles in water that cause turbidity. Therefore, reducing turbidity levels through coagulation may also improve the microbiological quality of water.



A. de Saint-Sauveur

Moringa seed pods (Credit: www.moringanews.org)

Household Water Treatment and Safe Storage Fact Sheet: Natural Coagulants

Operation

Little research has been done to optimize and standardize the use of natural coagulants. Their use is usually passed through traditional knowledge in the community.

Generally, natural coagulants are not available in a usable form and need to be prepared. This is usually done just beforehand to keep the coagulant fresh. For example, prickly pear cactus needs to be peeled and cut and moringa seeds need to be dried and crushed into a powder.

Users add the prepared dose of coagulant to the water. The water is then stirred for a few minutes to help create flocs. The flocs can be settled out and the clear water is decanted, or removed by filtration.



Moringa seeds in a pod (Credit: www.hear.org)



Dried clearing nuts (Credit: www.farmwealthgroup.com)



Prickly pear cactus (Credit: Tennant, R., www.freelargephotos.com)

Household Water Treatment and Safe Storage Fact Sheet: Natural Coagulants

Key Data

Inlet Water Quality

- No specific limits

Treatment Efficiency

	Bacteria	Viruses	Protozoa	Helminths	Turbidity
Laboratory	90-99.99% ¹ >96.0% ³	Not available	Not available	Not available	80-99.5% ¹ 83.2-99.8% ³
Field	50% ²	Not available	Not available	Not available	95% ²

¹ Madsen et al. (1987). Tests based on *Moringa oleifera*.

² Tripathi et al. (1976); Able et al. (1984) cited in Sobsey. M. (2002). Tests based on *Strychnos potatorum*.

³ Nkurunziza et al. (2009). Tests based on *Moringa oleifera*.

- Little research has been done to evaluate the efficacy of natural coagulants
- Effectiveness of natural coagulants varies from one to another

Operating Criteria

Flow Rate	Batch Volume	Daily Water Supply
Not applicable	Unlimited	Unlimited

- Little research has been done to optimize and standardize the use of natural coagulants
- Generally, natural coagulants need to undergo some processing before use
- Preparation, use and dose varies according to the natural coagulant and water source

Robustness

- Availability depends on local conditions

Estimated Lifespan

- Dried beans and seeds can be stored for a long time
- Prickly pear cactus needs to be used before the sap dries

Manufacturing Requirements

Worldwide Producers:

- Not applicable

Local Production:

- Harvested and prepared locally

Materials:

- Natural coagulants (e.g. moringa seeds, prickly pear cactus)
- Miscellaneous tools (e.g. knife)

Fabrication Facilities:

- Prepared in households

Labour:

- Traditional practice, anyone can be taught to prepare and use natural coagulants

Household Water Treatment and Safe Storage Fact Sheet: Natural Coagulants

Key Data

Maintenance

- Dried beans and seeds should be stored in a dry location

Direct Cost

Capital Cost	Operating Cost	Replacement Cost
US\$0	US\$0	US\$0

Note: Program, transportation and education costs are not included. Costs will vary depending on location.

Other

- Jar testing can be undertaken to optimize effectiveness of particular coagulants with water sources
- Natural coagulants leave organic matter in the water, which may make subsequent chlorine treatment less effective
- Some users complain about the taste that natural coagulants may cause in water

References

Madsen, M., Schlundt, J. and E.F. Omer (1987). Effect of water coagulation by seeds of *Moringa oleifera* on bacterial concentrations. *Journal of Tropical Medicine and Hygiene*; 90(3): 101-109

Sobsey, M. (2002). *Managing Water in the Home: Accelerated Health Gains from Improved Water Supply*, Water, Sanitation and Health, Department of Protection of the Human Environment, World Health Organization, Geneva, Switzerland.

Nkurunziza, T., Nduwayezu, J. B., Banadda E. N. and I. Nhapi (2009). The effect of turbidity levels and *Moringa oleifera* concentration on the effectiveness of coagulation in water treatment. *Water Science & Technology*, Vol 59, No 8, pp 1551–1558.

CAWST (Centre for Affordable Water and Sanitation Technology)

Calgary, Alberta, Canada

Website: www.cawst.org Email: cawst@cawst.org

Wellness through Water.... Empowering People Globally

Last Update: June 2011