

Coagulation activity of *Strychnos potatorum* L. Seed powder

Sumita V. Kalekar* and Nanda W. Shinde

Department of Botany, DSPM'S K. V. Pendharkar College of Arts, Commerce & Science, Dombivli (E) 421203, Thane Dist., Mumbai, India.

Corresponding author: *Sumita V. Kalekar, Department of Botany, DSPM'S K. V. Pendharkar College of Arts, Commerce & Science, Dombivli (E) 421203, Thane Dist., Mumbai, India.

Abstract

Tribal people in India in extreme poverty use unimproved drinking water sources such as surface water and unprotected wells. These water sources become highly turbid during late summer and rainy season. Because of drinking turbid and untreated water, epidemics of water born diseases are of common occurrence in these populations. People drink polluted water because they lack knowledge of proper drinking water treatments and also they cannot afford costly chemical coagulants. Therefore, usage of safe, traditional water treatment agents from natural sources has become essential. . Sanskrit writings dating from several centuries BC make reference to seeds of tree *Strychnos potatorum* L. as clarifying. Hence in present paper the water clearing efficacy of this plant is reported. Results of turbid untreated water samples treated with seed powder of this plant are given.

Keywords: Natural coagulants, *Strychnos potatorum* seed powder, rural populations, turbidity clearing efficacy, unsafe drinking water sources

Introduction

Water is used for several purposes by humans but the level of purity of water being consumed is very crucial since it has direct effect on health. Conventional treatments of water often include sedimentation, filtration and disinfection. In rural and undeveloped countries people living in extreme poverty are presently drinking highly turbid and microbiologically contaminated water, because they lack knowledge of proper drinking water treatment and they cannot afford costly chemical coagulants. It is well known fact that most of the chemical disinfectants used for antibacterial activity generate various unwanted chemicals which are associated

with harmful effects on human health such as hemolytic anemia, cancer risk, nervous system effect and liver effects.

Sanskrit writings from India reported that the seeds of *Strychnos potatorum* L. were used to clarify turbid surface water over 4000 years ago due to which the species was logically named as clearing nut tree or nirmali. The ripe seeds are used as clearing nut. This also indicates that they were the first reported plant-based coagulant used for water treatment. Nirmali seed extracts are anionic polyelectrolytes that destabilize particles in water by means of interparticle bridging. It was reported that the seed extracts contain lipids, carbohydrates and alkaloids which contain – COOH and free –

OH surface groups which enhance the extracts' coagulation capability (Kajithoju *et. al.*, 2012). Due to the presence of natural coagulant and antimicrobial activity, seed powder was used to coagulate-flocculate or precipitate microbes and turbidity in water (Kajithoju *et. al.*, 2012).

Materials and methods

Strychnos potatorum L. seeds were collected from the Tarewadi, Kolhapur. These seeds due to their hard structure, could not be powdered in a grinder. In such a case the seeds were kept immersed in 50 ml water containing 2ml. conc. HCl. After a week, the mixture was mashed to a soup-like solution and was washed through a nylon cloth. The material retained on the cloth was oven dried for 24 hours at 103°C to 105°C and weighed. By calculating the weight of the seeds dissolved, the strength of the stock solution was determined (Babu and Chaudhuri, 2005). Water samples for study purpose were collected from ground open well water from Umberli village near Dombivli, Maharashtra. Treatment to water was given by directly using seed powder.

Turbid open well water sample was treated with *Strychnos potatorum* seed powder at concentrations 50mg/l, 100mg/l, 150mg/l separately in three conical flasks and kept on shaker for 45min at 110-120rpm for proper mixing. After removing from shaker the contents of the flask were allowed to settle. Once the treated water samples were kept for sediment settling, they were observed after every one hour to determine exact time duration required for complete sedimentation.

Observation

It was observed that maximum reduction in turbidity was achieved with concentration of 150mg/l (Fig.4). The time required for complete clearing of water with this concentration was 39 hrs.



Figure 1: Untreated ground open well water sample.



Figure 2: Flask with 50mg/l conc^{on}.



Figure 3: Flask with 100mg/l conc^{on}.

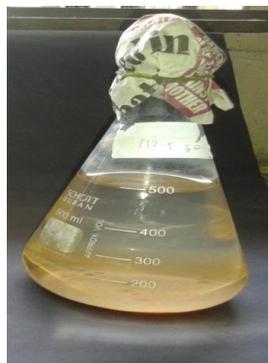


Figure 4: Flask 150mg/l conc^{on}.

Strychnos potatorum seed powder treatment showing flasks after 39 hrs.

Results and discussion

In present study, the analysis showed that the seed powder of *Strychnos potatorum* L. at 150mg/l concentration used is natural and powerful coagulant because at this concentration it has reduced the amount of turbidity. There was an improvement in the flock size and flock settled rapidly i.e. 39 hrs.

The initial brown colour of ground open well water was completely removed after treatment of *Strychnos potatorum* L. seed powder. *Strychnos potatorum* L. seed powder showed absorbent properties and obtained good clarification.

Conclusion

Strychnos potatorum L. seed powder acts as a natural coagulant, flocculant, absorbent for the treatment of ground open well water. Thus we conclude that seed powder of *Strychnos potatorum* L. is natural coagulant. It is most clear at the dose of 150mg/l. It is ecofriendly and proves to be cheaper method of water treatment. *Strychnos potatorum* seeds can be used in the rural areas to treat turbid drinking water where no other facilities are available for the drinking water treatment.

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