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Coagulation Acivity of *Moringa oleifera* Lam. Seeds

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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. Women in rural areas of India treat their water with Moringa oleifera seed powder prior to drinking purpose. Hence in present paper, study on 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, *Moringa oleifera* seed powder, rural populations, water clearing efficacy

1. 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 generated various unwanted chemicals which are associated with harmful effects on human health such as hemolytic anemia, cancer risk, nervous system effect and liver effects.

Naturally occurring coagulants are usually presumed safe for human health. Studies on natural coagulants like *Moringa oleifera* seeds have been carried out. Earlier studies have found *Moringa oleifera* to be non-toxic and recommended it for use as a coagulant in developing countries. Hardness removal efficiency of *Moringa oleifera* was found to increase with increasing dosage [6]. *M. oleifera* seeds act as a natural absorbent and antimicrobial agent. It's seed contain 1% active polyelectrolytes that neutralize the negatively charged colloids in the dirty water. This protein can therefore be useful as nontoxic natural polypeptide for sedimentation of mineral particles and organics in the purification of drinking water. *M. oleifera* seeds are also acting as antimicrobial agent against variety range of bacteria and fungi [2]. The seed contain number of benzyl isothiocyanates and benzyl glucosinolates which act as antibiotic [5]. It is believed that the seed is an organic natural polymer. The active ingredients are dimeric proteins. The protein powder is stable and totally soluble in water. It has been described as adsorbent and neutralizase negatively charged protein particles in dirty water coagulating them. Flocculation by inter-particle bridging is mainly characteristic of high molecular weight polyelectrolytes. Due to the small size of the *M. oleifera* coagulant protein, a bridging effect may not be considered as the likely coagulation mechanism [6]. It is reported that a recombinant protein in the seed is able to flocculate gram-positive and gram-negative bacterial cells. In this case, microorganisms can be removed by settling in the same manner as the removal of colloids in properly coagulated and flocculated water. A general rule of thumb is that powder from one *Moringa* kernel to two liters of water is a good amount when water is slightly turbid, and to one liter when water is very turbid [1].

Due to the presence of natural coagulants and antimicrobial activity, seed powder was used to coagulate-flocculate or precipitate microbes and turbidity in water [3].

2. Materials and Methods

Dried *Moringa oleifera* seeds were collected from Dombivli . The wings surrounding the seed were removed and fine powder was prepared by using mortar and pestle , sieved and this powder was directly used as coagulant. 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 *Moringa oleifera* 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.

3. Observation

It was observed that maximum reduction in turbidity was achieved with concentration of 150mg/l (Photoplate 1, Fig.4). The time required for complete clearing of water with this concentration was 16 hrs.
Photoplate No.1

Figure 1: Untreated ground open well water sample

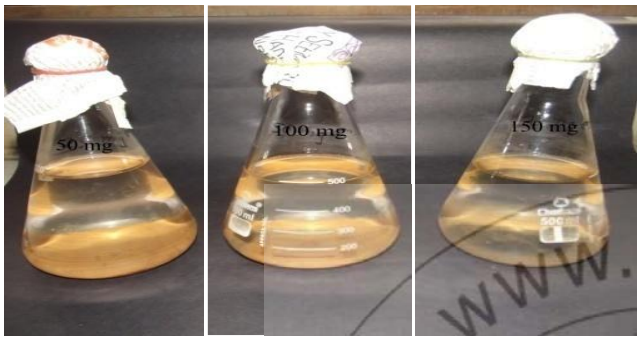

Figure 2: Flask with Fig.3 Flask with Fig.4 Flask with 50mg/l conc^{on} 100mg/l conc^{on} 150mg/l conc^{on}

Moringa oleifera seed powder treatment showing flasks after 16hrs.

4. Result and Discussion

In present study, during the analysis it was observed that after treatment with *Moringa oleifera* seed powder ; The analysis showed that the seed powder of *Moringa oleifera* at all the concentrations used is natural and powerful coagulant, especially at 150mg/l concentration it has reduced turbidity which is below WHO/USPH standards. There was an improvement in the flock size and flock settled rapidly i.e. within 16hrs.

Thus, the most effective dose of *Moringa oleifera* seed powder is 150 mg/l.

5. Conclusion

Moringa oleifera seed powder acts as a natural coagulant, flocculant, absorbent for the treatment of ground open well water. It is most clear at the dose of 150mg/l. Thus we conclude that seed powder of *Moringa oleifera* is natural coagulant. It is ecofriendly and proves to be cheaper method of water treatment. *Moringa oleifera* 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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