INTRODUCTION

Surface water contains very high pathogenic microbial contaminants, mainly bacteria and virus, due to animal and organic matter decomposition (Ozacar and Sengil, 2003). Intake of the raw water is a high risk for health that affects mainly children and old people (Ghebremichael et al., 2005). Lack of safe drinkable water is a serious problem that affects people from developing countries, conditioning health, social economical development. In fact, people are supplied with water from rivers or surface waters, without any treatment (Sobsey, 2006).

Conventional drinking water treatments are often inappropriate in developing countries, due to its high cost, lack of inappropriate infrastructures or availability of chemicals (Lye, 2002). Unlike cities where fairly large population is using water filters, Aqua guards, UV-ultra filters, the rural population is thriving on the contaminated water supply owing to prohibitive cost and low availability of chemical coagulants and disinfectants and the heavy investment in settling up the conventional water treatment plants at village level is not only a theoretical exercise but practically impossible for several reasons. Such projections have prompted interest in using traditional methods for treating the water. The combined use of natural coagulants and solar disinfection technology for potabilization could be feasible, effective and workable alternative for potable water treatment.

MATERIALS AND METHODS

Surface water normally contains high turbidity and microbial content, mainly viruses and bacteria that cause illness, such as diarrhea (Berney et al., 2006). Approaches to alleviate this situation are focused on sustainable water treatment, low cost, robust and which require minimal maintenance (Kehoe et al., 2004). Natural coagulant and solar disinfection technology when used sequentially is a better method to treat this water and produce safe drinking water.

Coagulation technology is based on polyelectrolyte mechanism where quantity of low molecular weight (water soluble proteins) which carry positive charge when added to raw water, the polysaccharide produce positive charge acting like magnets and attract the predominantly negatively charged particles such as silt, clay, bacteria and toxic particles in water (Babu and Chaudhuri, 2005). Where as solar disinfection is a process of disinfection where organisms are exposed to sunlight, photo sensitizers absorbs photons of light in the UV-A and early visible wave length regions of 320 to 450 nm (Tandon et al., 2005). The photo sensitizers react with oxygen molecules to produce highly reactive oxygen species (Connroy et al., 2001). In turn, these species react with DNA, this leads to strand breakage, which is fatal, base changes, which results in mutagenic effects such as blocks to replicate (Fujiooka and Yoneyama, 2002).

ABSTRACT

Present study deals with use of indigenous or natural treatment methods using plant material and solar radiation as alternatives to conventional treatment method. The coagulation ability of Zeemays (Maize) extract was assessed by the use of standard jar test measurements in water with various turbidities. Investigation of Zeemays as natural coagulant was confirmed by its positive effective coagulation activity. An optimum dose of 200 mg/L, 220 mg/L and 300 mg/L of this coagulant resulted in 75 %, 65% and 70% coagulation activity for clarification of 20 NTU, 40 NTU and 80 NTU water along with inactivation of bacteria in 60 minutes. Further clarified water with natural coagulant was exposed to sunlight which showed 100 % inactivation of both E. coli and Coliforms counts within 2 hr, with no subsequent reactivation of growth after 24 hr.

KEY WORDS

Turbidity
Natural Coagulant
Solar Disinfection
Zeemays
E.coli, Rural people

Received : 02.09.2009
Revised : 12.12.2009
Accepted : 21.01.2010
*Corresponding author
Experimental works evaluate, identify and compare the coagulation effect of the coagulant extract from Zeemays seeds by using jar test method. This test was performed by measuring turbidity of a sample made of coagulant extract and synthetic turbid water (kaoline clay suspension). After 1 hour of settling, the reduction in absorbance relative to the control defines coagulation activity shown in Fig. 1. The results of turbidity reduction with natural coagulant were compared with WHO standards. The turbid water clarified with natural coagulant was exposed to solar radiation for disinfection for 5 hours for inactivation of E.coli and Coliforms along with a control. Antimicrobial studies were carried out in agar plate, for untreated and treated samples with natural coagulants and solar disinfection.

RESULTS AND DISCUSSION

Results of the treated samples from natural coagulant Zeemays and solar disinfection are shown in Table 1 and 2. Jar test method for natural coagulant (Zeemays) showed high turbidity reduction and high coagulant activity in samples treated as it contain active ingredient starch, which is non-ionic polymer which forms positive and negative ions in water and the mechanisms of coagulation is by bridging shown in Fig. 2. Where as water clarified with natural coagulant when exposed to solar disinfection showed drastic inactivation of E.coli and Coliforms in sample treated which is depicted in Fig 3 and 4.
CONCLUSIONS

Studies have shown that the combination of natural treatment methods using plant seeds (Zeemays) and solar disinfection indicate that this method can effectively clarify and disinfect household drinking water, so the use of natural coagulants that are locally available in combination with solar radiation, which is abundant and inexhaustible, provides a solution to the need for clean and safe drinking water in the rural communities.

ACKNOWLEDGEMENT

The authors thank the Department of Science Technology (DST) who has granted project under water initiative technology, New Delhi.

REFERENCES


APPLICATION FORM
NATIONAL ENVIRONMENTALISTS ASSOCIATION (N.E.A.)

To,
The Secretary,
National Environmentalists Association,
D-13, H.H.Colony,
Ranchi-834002, Jharkhand, India

Sir,
I wish to become an Annual / Life member and Fellow* of the association and will abide by the rules and regulations of the association.

Name _________________________________________________________________________________________________

Mailing Address _________________________________________________________________________________________
___________________________________________________________________________________________________________

Official Address __________________________________________________________________________________________
___________________________________________________________________________________________________________

E-mail ____________________________ Ph. No. __________________________ (R) __________________________ (O)

Date of Birth ____________________________ Mobile No. __________________________

Qualification _____________________________________________________________________________________________

Field of specialization & research __________________________________________________________________________

Extension work (if done) __________________________________________________________________________________
___________________________________________________________________________________________________________

Please find enclosed a D/D of Rs........................................... No. ......................... Dated ......................... as an Annual / Life membership fee.

*Attach Bio-data and some recent publications along with the application form when applying for the Fellowship of the association.

Correspondence for membership and/or Fellowship should be done on the following address:

SECRETARY,
National Environmentalists Association,
D-13, H.H.Colony,
Ranchi - 834002
Jharkhand, India

E-mails : m.psinha@yahoo.com Cell: 94313 60645; 91352 47800; 95255 21335; 95726 49448
   dr.mp.sinha@gmail.com Ph.: 0651-2244071