Short Communication | Journal of Research in Environmental Science and Toxicology | 2021 | Vol.10 No.1

The use of rice waste in the purification of drinking water

Moursy E M[1] and Helmy M[2]

[1]Green Global Group for Environmental Services, KSA
[2]General Authority for Meteorology and Environmental Protection, KSA

Abstract

Drinking water treatment is of paramount importance for all people all over the world. Traditional water coagulant, aluminum sulfate poses a great risk for human health as it adds residual aluminum metal to drinking water. A cationic rice starch polymer prepared from waste product (broken rice) was evaluated to be used in water treatment. The suggested polymer is a biodegradable product and environment friendly. Application of cationic rice starch in the treatment of Nile river water showed that the turbidity caused by organic matter, colloidal silica were decreased to the lowest levels by using 6 ppm of cationic rice starch. Also, better results of water treatment were observed than that obtained when using 40 ppm of aluminum sulfate. Maximum treatment results were obtained on using a mixture of (4 and 23) ppm of cationic rice starch and aluminum sulfate, respectively for the treatment of raw water.

Introduction

Removal of water turbidity resulting from suspended mater is a problem facing water treatment plants for producing potable water. Turbidity forming materials are natural organic matter and siliceous materials. Inorganic coagulants such as aluminum sulfate and ferric sulfate have been used for the removal of raw water suspended mater [13]. Finished water contains appreciable amounts from such metals and the sludge as well. These residuals (in drinking water and sludge) pose disposal problems and tend to accumulate in the environment. The residual aluminum which may be present in water as a result of aluminum treatment, is being expressed by the public in connection with Alzheimer's disease [4. 5]

Thus, it becomes necessary to develop more efficient and environment friendly coagulants for the removal of suspended mater in surface waters, by using biodegradable materials. These can be natural or modified natural products such as cationic starch [6-8].

Removal of the above mentioned substances by clarification is generally accompanied by coagulation, flocculation, and sedimentation [2]. The combination of the three processes is referred to as conventional clarification. In most clarification processes, the coagulation involves neutralizing charged particles to destabilize suspended solids then flocculation starts when neutralized or entrapped particles begin to collide to form large particles. These processes is enhanced by the addition of polymeric flocculants which increase floc by charged sites binding and molecular bridging. The effectiveness of polymeric flocculants strongly depends on charge density, molecular weight and other chain structural properties [9, 3]

The charges of most polymeric flocculants such as cationic rice starch are distributed along chain backbones providing stronger attaching points to anionic particle surfaces. Rice starches contain tertiary amino and/or phosphate groups that are considered the most important cationic derivatives and were produced by various di alkyl amino alkyl chloride reagents [7, 10].

The present work deals with the evaluation of newly synthesized cationic rice starch polymer to be used in the clarification of water

MATERIAL AND METHODS

Chemicals

Egyptian broken rice as a natural waste product was obtained from local market, Egypt. Phosphorus pentachloride was supplied by Loba/Chemi India. Triethanolamine was supplied by Nice Chemicals PVT, LTD India. Sodium hydroxide was supplied by Spectrum, Hong Kong. Ethyl Alcohol was supplied by Adwic, German. Commercial aluminum sulfate (A12(SO4)3.18H2O) was used as an inorganic coagulant. The other chemicals used for analysis of water were of analytical grade.

Raw water

Raw water samples were obtained from Nile River at west Cairo, Egypt

Conclusion

Treatment of raw water with cationic rice starch is achieved with an improvement of the water quality without addition of aluminum sulfate ions that result from aluminum sulfate when used in the treatment of water. Also, when using cationic rice starch in combination with aluminum sulfate, a small amount of cationic rice starch (4 ppm), reduced the consumption of aluminum sulfate about 42%.