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EFFECT OF A COMMON WATER PURIFIER POTASH ALUM ON DRINKING WATER QUALITY AND HUMAN HEALTH

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ABSTRACT

Potash alum is double salt commonly known as common alum. This is generally used for purification of drinking water. During rainy season the water resources become turbid and contaminated. To purify this water potash alum is used without knowing much about concentration of its use. In the present investigation, the analysis of drinking water quality is made with respect to DO, Free CO_2, total hardness, calcium hardness, magnesium hardness, carbonate, bicarbonate, chlorides, salinity, pH, EC before and after the treatment of water with potash alum (800mg/L). Due to this many parameters have been changed and are discussed in the light of guidelines described by WHO.

INTRODUCTION

Chemical precipitation and flocculation with various salts of aluminium (alum), iron, lime and other organic and inorganic chemicals are widely used for treatment of water to remove colloidal particles and microbes. Treatment of water by addition of chemical coagulants and precipitants has been practised from ancient times. Similarly use of various plant derivatives such as seed contents of *Strychnos potatorum* and *Moringa oleifera* were also used during ancient times. Romans were using salts and barley for treatment of water. The alum and iron salts, which are most widely used for drinking water treatment can remove calcium, magnesium, iron, manganese and other polyvalent metallic cations that contribute to hardness of water.

Potash alum is used during the rainy season as most of the potable water sources become turbid and contaminated. To treat this water potash alum is used without knowing any quantity, and application and storage. This may affect the water quality and health. In the present investigation the physico-chemical analysis of raw drinking water quality (municipal pipe water) and after its treatment with potash alum has been made. Values of various parameter such as DO, free CO_2, total hardness, calcium hardness, magnesium hardness, acidity, carbonate, bicarbonate, chlorides, salinity, pH and electrical conductivity were estimated, some of which were found to be changed, and are discussed in light of the guidelines of WHO.

Ookn, Aung et al. (1993) have studied effectiveness of potash alum in household water. Chaudhary et al. (1977) have studied effect of potash alum on copepodes and *Vibrio cholerae*. Khan et al. (1984) have used it to prevent cholera. Sakthivel et al. (2005) have determined the water quality, pre and post immersion of Ganesh idols, along the Mumbai cost. Ahirrao et al. (2001) have determined the water quality under the influence of some insecticides. The present work is carried out in the line of above workers as only a few studies have been done so far on the use of chemical agents in decontaminating potable water in India.

MATERIALS AND METHODS

The general potassium alum ($K_2SO_4Al_2(SO_4)_3.24H_2O$), i.e., double sulphate has been used in the

present study. The chemical nature of it is as follows:

Molar mass - 258.207g/mol (anhydrate)
Density - 1.78 g/cm^3
Melting point - 93-96°C
Boiling point - 200°C
Water soluble, an astringent acid
Seed test and reacts acid to litmus and crystallize in regular octahedra.
Used as mordant in paper industry, clarifying water.
Deodorant in cosmetic use.
Colloids to form heavy particles on coagulation and flocculation.

For the present study municipal water samples were used to estimate the dissolved oxygen (DO), free carbon dioxide (CO_2), total hardness, calcium hardness, magnesium hardness, carbonate (CO_3^{2-}), bicarbonate (HCO_3^-), chlorides (Cl^-) salinity, pH, electrical conductivity (EC) and acidity. After the estimation of above parameters the same water samples were used for the treatment of potash alum (800mg/L). Dissolved oxygen has been estimated by using Winkler's method as described by Goltermen (1969) and the other parameters by using standards methods (Trivedy et al. 1987, APHA 1989).

RESULTS AND DISCUSSION

The average values of physico-chemical parameters of waters before and after the treatment are given in Table 1. Several changes have been observed in the water quality due to application of potash alum. The DO has been reduced from 2.9mg/L (municipal water) to 2.1mg/L (alum treated water). The free CO_2 values which were negligible in the initial state have been increased up to 77.2 mg/L in treated water. The total hardness is found decreased from 254mg/L to 248mg/L. Calcium and magnesium hardness was reduced from 50.50mg/L to 36.07mg/L and 38.98 mg/L to 30.45mg/L respectively. The carbonate values were reduced from 22.0mg/L to negligible amount. The bicarbonate has been changed from 209 mg/L to 17.0 mg/L due to application of potash alum. The level of chloride has been increased from 105 mg/L to 133.83mg/L. Salinity increased from 225.38mg/L to 247.0mg/L. Acidity of water has been changed from 6.3mg/L to 5.1mg/L. The electrical conductivity has been increased from 688 µS/cm to 1178 µS/cm. The values which are higher than the normal as describe by potability of water by WHO and the use of potash alum will cause several potential effects on the health such as:

1. Digestive trouble: Due to this acidity may increase and causes several digestion problems.
2. Inhalation: May cause irritation to respiratory tract if fine particles are breath in when it is dissolved in water.
3. Ingestion: May cause irritation to gastrointestinal tract like nausea.
4. Skin and eye contact: May cause imitation with symptoms of redness of eye, itching and pains.

WHO and Water Sanitation and Health (WSH) have describe that the proper use of alum requires a skill. Therefore, there is a need to established a standard value of application of potash alum for common people particularly in the rural areas of India where there is a problem of safe drinking water

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Table 1: Physico-chemical parameters of drinking water and potash alum (800mg/L) treated water.

Parameters	Municipal water sample	Alum treated water sample
Dissolved oxygen	2.9	2.1
Free CO_2	Negligible	77.2
Total Hardness	254.0	248.0
Calcium Hardness	50.50	36.07
Magnesium Hardness	38.98	30.45
Carbonate (CO_3)	22.0	Negligible
Bicarbonate (HCO_3)	209.0	17.0
Chlorides	105.0	133.83
Salinity	225.38	247.0
Acidity	6.3	5.1
pH	7.80	6.0
EC (µS/cm)	688	1178

All values are in mg/L except EC and pH; Values are expressed as mean of ten samples.

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