

A study of iron and some traces elements in ground water of Bhandar and Seondha block (Datia, M.P.)

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ABSTRACT

Ninety six (96) ground water samples collected from Bhandar and Seondha block (Datia District) were analyzed for Iron, Copper, Manganese, Zinc, and Lithium. Average was found for Iron, Copper, Manganese, Zinc, and Lithium were 0.257, 0.019, 0.037, 0.014, 0.011 ppm respectively.

Key words: Iron, Copper, Manganese, Zinc, and Lithium.

INTRODUCTION

Ground water is one of the best source for public water supplies in many parts of the world. The physiological importance of trace elements in agriculture is well known while some of the elements like iron manganese, zinc and copper are considered to be essential micro nutrients the elements like lithium and boron have been found to be toxic to plants even in small quantities beyond certain limits Gupta et al (1972) reported lithium in saline ground waters of Mathura district (U.P.) and also examined the lithium tolerance or different crops at germination and seedling stage though Gupta (1974) observed the critical limits of lithium as 5ppm to be toxic to wheat and barley, Bingham et al (1964) reported the concentration limit of even 0.05 to 0.1 ppm as toxic to citrus crops. In the present investigation an attempt has been made to determine the concentration of some trace element viz.. iron, zinc, copper, manganese and lithium.

MATERIAL AND METHODS

96 samples water from different parts of the Bhandar and Seondha Block (Datia district) were collected and analyzed for all major cations, anions, pH and E.C. the determination of trace elements was carried out by atomic absorption spectrophotometer. The water have been classified into 4 groups on the basis of electrical conductivity (micromhos per cm at 25 °C) each class average, minimum and maximum concentration of each elements was determined. EC values of the ground water samples under investigation were measured using systronic EC meter.

RESULTS AND DISCUSSION

Iron is an essential element in the metabolism of animal and plants. If present in water in excessive amounts. However, it forms red oxyhydroxide precipitates that stain laundry and plumbing fixtures and there fore is an objectionable

Table - 1

E.C Class and range	E.C. average Range	No. of Samples	IronA/M ^N -M ^X	Copper/M ^N -M ^X	Manganese A/M ^N -M ^X	Zinc A/M ^N -M ^X	LithiumA/M ^N -M ^X
A ₁ (0-1000)	750/450-970	20	0.24/NIL-0.40	0.013/NIL-0.040	0.07/NIL-0.040	0.010/0.009-0.020	0.005/NIL-0.010
A ₂ (1000-2000)	1700/1110-1920	34	0.21/0.05-0.35	0.020/0.008-0.027	0.05/0.002-0.041	0.014/0.002-0.024	0.009/NIL-0.017
A ₃ (2000-3000)	2400/2110-2740	28	0.31/NIL-0.64	0.022/NIL-0.064	0.10/0.005-0.021	0.007/NIL-0.014	0.013/NIL-0.028
A ₄ (>3000)	3400/3050-3560	14	0.29/NIL-0.50	0.14/NIL-0.034	0.015/NIL-0.034	0.034/NIL-0.040	0.021/NIL-0.026
TOTAL	1954/450-3560	96	0.257/NIL-0.64	0.019/NIL-0.064	0.037/NIL-0.041	0.014/NIL-0.040	0.011/NIL-0.028

All (Fe, Cu, Li, Mn, Zn) the values are in ppm except E.C., E.C. is in micro mhos per cm at 25°C, M^N = minimum value, M^X = maximum value, A = Average value

impurity in domestic and industrial water supplies for this reason, iron determinations are commonly included in chemical analyses of water. A recommended water supplies is 0.3mg/L (NAS-NAE, 1972). The maximum permissible limit for Iron in Drinking water, prescribed by W.H.O. is 0.3-1.0 ppm, and I.S.I. has maximum limit 0.3 ppm. High intake may cause bacterial activity (red rot disease). Iron in ground water samples were varied from 0.000 ppm to 0.64 ppm. Modern industrial civilization uses copper extensively and many of these uses result in its dispersal in the environment. Copper is an essential element in plant and animal metabolism.

The U.S. environmental protection Agency (1976b) mandatory drinking water standard do not include a value for copper. An upper limit of 1mg/L of copper in public water supplies was suggested in Water quality criteria, 1972 (NAS-NAE, 1972), which also stated that this limit was based on the taste threshold for this element. The same report suggested an upper limit of 0.5mg/L in water to be used by livestock, and 0.20mg/L for continuous use in irrigation of crops. Toxicity for fish varies with species and major ion concentrations of the water, but the NAS-NAE report implies that concentrations greater than a few hundredth of a milligram per liter are potentially harmful for many species. The maximum permissible limit for copper in drinking water, prescribed by W.H.O. is 1.0mg/L and I.S.I. has maximum limit 0.5 -1.5 ppm. Deficiency of copper may cause nutritional anaemia in infants.

The value of copper in ground water samples were varied from 0.000 ppm to 0.064 ppm. Manganese is an undesirable impurity in water supplies mainly owing to a tendency to deposit black oxide stains. The recommended upper limit for manganese in public water supplies in the United States is 0.05 mg/L (NAS-NAE, 1972) no mandatory limit is specified for this element by the U.S. Environmental protection agency. It is an essential element for both plant and animal life forms. The maximum permissible limit for Manganese in drinking water, prescribed by W.H.O. is 0.1 ppm and I.S.I. has maximum limit 0.1- 0.5 ppm. Its deficiency may cause inhibition of growth and disrupt the nervous system and interfere with reproductive system. High intake may cause manganese

disease .The value of manganese in ground water samples were varied from 0.000ppm to 0.0041ppm Zinc is essential in plant and animal metabolism but water is not a significant source of the elements in a dietary sense. Water quality standard suggested by water quality criteria 1972(NAS-NAE1972) gave an upper limit of 5mg/L for zinc, be cause above that limit a significant number of people can detect zinc by taste. No health effects were considered likely .Zinc is an undesirable contaminant for some species of aquatic life at much lower concentrations (NAS-NAE 1972p182) ,but the amount that can be tolerated is also a function of other properties of the solution. The maximum permissible limit for Zinc in drinking water, prescribed by W.H.O. is 5.0 ppm and I.S.I.has maximum limit 5-15 ppm. High in take may cause Diarrhoea, Weight loss, hair loss. Zinc Values varied

for ground water samples from 0.000ppm to 0.040 ppm Lithium can be toxic to plants according to Bradford (1963) citrus trees may be damaged by irrigation water containing 60 to 100 micro gram/ Liter .Lithium in ground water samples were varied from 0.000ppm to 0.028 ppm. Among the trace elements iron is most abundant in ground water and is also present in most of the water samples. The maximum concentration of Iron, Copper, Manganese, Zinc, and Lithium has been observed as 0.64, 0.064, 0.041, 0.040, 0.028 ppm respectively.

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