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HEAVY METAL CONTENTS IN SOIL OF VEGETABLE FARMS NEAR NAYAWAS AND MANDRELLA BY-PASS AT JHUNJHUNU CITY

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ABSTRACT

In Jhunjhunu city, sewage water is used for irrigation in vegetable farms near Nayawas and Mandrella by-pass. This polluted water degrades land quality and deteriorate soil productivity. Therefore 12 soil samples were collected from the vegetable farms. The heavy metals Fe, Cu and Zn were determined by using atomic absorption spectrophotometer. The results show the presence of these heavy metals beyond the limits of Indian standards. Therefore, the sewage water should be used after proper treatment.

Key words: Heavy metals, Iron, Copper, Zinc

INTRODUCTION

Soil is the living stratum of the earth. Any alteration in the physical, chemical and biological characteristics of soil may adversely affect all organisms[1]. Soil pollution refers to the surplus increase of toxic minerals in soil, which are added through domestic, agricultural, industrial and sewage effluents[2].

Due to rapid industrialization and urbanization during the last two decades contamination of soil by heavy metals on globe increases[3]. Heavy metals are indicated in many studies as one of the major environment problems of their persistence in soil[4,5]. On irrigation with sewage water, there is tremendous and incredible increase of heavy metals in filthy soil. The metals Zn, Cu and Fe may be parenthetic nutrient for plant and soil microbes but their deficiency or excess may allure to a number of disorders[6].

Therefore, a better understanding of heavy metal sources, their accumulation in soil, effects of their presence in plants and animals seems to be particularly important issues of present day research[2]. The main emphasis of present research is on monitoring the concentration of Cu, Zn and Fe in soil and to establish base line data for their levels in soil.

EXPERIMENTAL

Sample collection

Soil samples were collected from the vegetable farm near Nayawas and Mandrella by-pass at Jhunjhunu city, where waste water is used for irrigation. Upper top layer of soil was removed at the depth of 5 inch. These were collected in clean plastic bags. Samples number N-1 to N-6 were from vegetable farms near Nayawas and M-1 to M-6 from Mandrella by-pass. These samples were collected at the distance of 15 meters.

Processing of sample

In 10 g soil sample, 20 mL of diphenyl triamine pentaacetic acid (DPTA) was added. Then it was shaken in shaker for 2 hours and water was removed by the help of suction pump. Soil extract thus obtained was used for analysis using atomic absorption spectrophotometry.

RESULTS AND DISCUSSION

Zinc

Zinc is essential for plant growth and it regulates the transformation of carbohydrates[7]. On analysis of soil samples, Zn concentration varies from 2.6 to 9.4 ppm. Zn concentration was found higher at Nayawas in comparison to Mandrella by-pass. In soil, Zn content of about 1000 ppm may be harmful to the rice paddy plants[8]. Range of optimal growth for plant is 0.05 to 1.0 ppm. So, this soil is not suitable for optimal growth of plant and shows toxic range.

Copper

Copper aids to root metabolism and protein utilisation[7]. At higher level in soil, Cu can inhibit growth of plants. In soil samples, concentration of copper ranges from 0.6 to 34.0 ppm. It is in toxic range and cause adverse effect on plant growth and indirectly to human beings.

Iron

Iron is essential for chlorophyll formation, nitrogen fixation and respiratory link dehydrogenase. Concentration of Fe in soil ranges form 17.8 ppm to 18.6 ppm. Toxic range for iron is 30 ppm. and optimal growth needs 5-10 ppm iron. Except sample M-6, all other soil samples were in toxic range and harmful for plant growth. The excess iron can

induce possible bronzing of leaves with tiny brown spots. Results obtained during the course of investigation are tabulated in Tables 1 and 2 and graphically represented in Fig. 1 and 2.

Table 1. Heavy metal concentration in different soil samples

S. No.	Zinc (ppm)	Copper (ppm)	Iron (ppm)
N-1	9.4	34.0	186
N-2	9.0	6.2	124
N-3	7.8	5.4	118
N-4	6.8	3.4	113
N-5	5.8	2.8	82.6
N-6	5.4	1.8	52.2
M-1	7.0	7.0	73.0
M-2	6.8	5.2	64.8
M-3	5.8	5.0	58.5
M-4	6.2	2.0	57.4
M-5	5.4	1.2	55.9
M-6	2.6	0.6	17.8

Table 2. Variation in values of heavy metal contents with distance in Nayawas and Mandrella by-pass

S.No.	Name of Heavy metal content	Concentration with distance	
		Nayawas	Mandrella by-pass
1.	Zn	Decreasing 9.4 to 5.4	Decreasing 7.0 to 2.6
2.	Cu	Decreasing 34 to 7.8	Decreasing 7.0 to 0.6
3.	Fe	Decreasing 186 to 52.2	Decreasing 7.3 to 17.8

From the above table, one can conclude that the concentration of Zn, Cu and Fe in soil samples decreases with increasing distance.

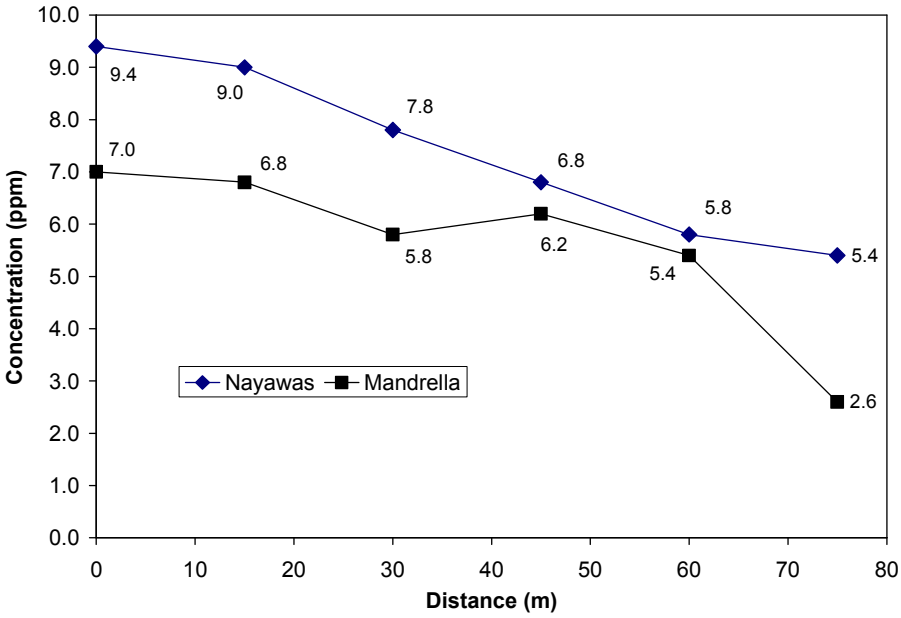

Fig. 1: Variation of Zn concentration with distance

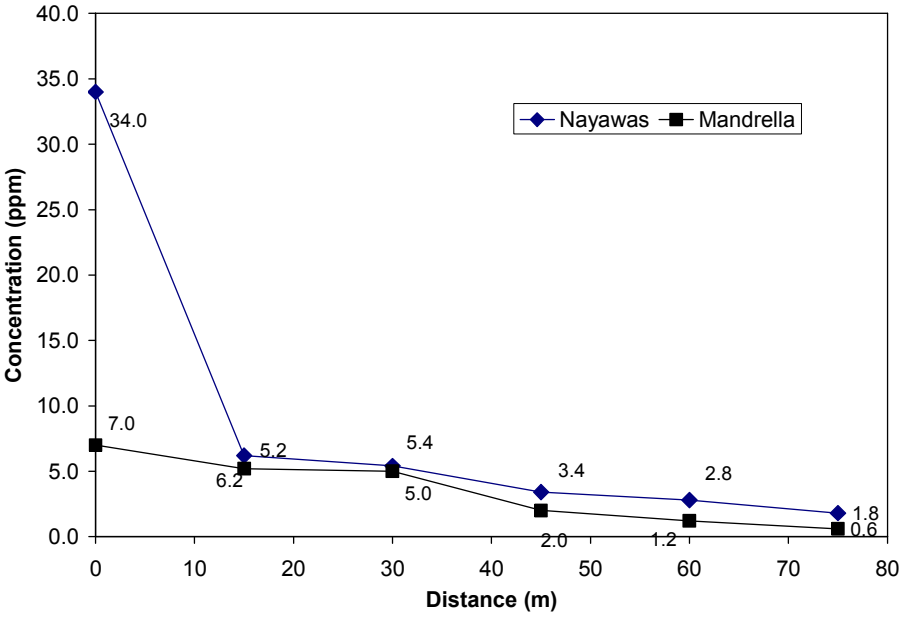

Fig. 2: Variation of Cu concentration with distance

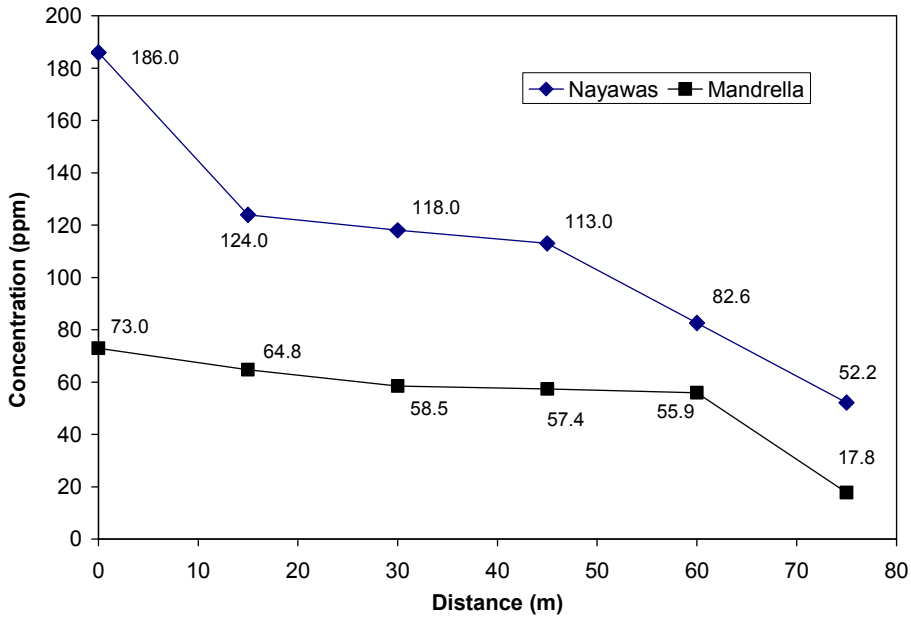

Fig. 3: Variation of Fe concentration with distance

As shown in Table 2, the concentration of heavy metals decreases as we move from Nayawas to Mandrella by-pass. From the graphs, it is clear that concentration of heavy metals is higher at Nayawas than Mandrella by–pass. Heavy metal contents of soil samples were recorded, which were above the toxic levels. Hence, continuous use of sewage water for irrigation may cause hazards for plant's growth. Accumulation of these heavy metals should not be tolerated even at extremely low concentrations.

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