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Soil Environment in the Vicinity of Agri-Horti Based Industrial Complex of Kashmir Valley

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Abstract

Research findings on environmental assessment of soil samples collected in the vicinity of an agri-horti based industrial complex located at Rangreth, Budgam, J & K are presented. The results revealed that the soils in general were neutral to alkaline in reaction. A normal range of electrical conductivity was observed in all soil samples. The soils were medium to high with respect to available phosphorous and potassium whereas the available nitrogen was medium in these soils. The water soluble salts viz., total alkalinity, chlorides and sulphates were within the permissible limits recommended for crop growth. The heavy metal status of these soils revealed that the available copper and zinc were medium to high whereas the available manganese was medium.

Key words : Soil environment, Chemical variables, Heavy metals, Agri-horti industrial effluents.

Industrialization is generally considered to be the universal remedy for economic backwardness. In the last three decades, India has concentrated more on this aspect for the advancement towards economic stability. Industry being a voracious consumer of natural resources in the form of raw materials, energy, land, labor, water and air has brought in its wake and environmental degradation of soil environment. Waste material released from industrial sources either in the form of harmful gases such as sulfur dioxide, carbon monoxide, fluorine or dust particles or liquid effluents containing several acids, alkalies, organic and inorganic compounds, colour producing substances pollute the environmental components wherever they are discharged. One of important environmental components is soil which is being polluted by these industrial effluents around industries. Pollution of soil by industrial waste water may cause adverse effects on plant growth and ultimately pose serious threat to animal and human health. The sustenance of soil fertility of industrial effluent irrigated soils is attributed to presence of higher amounts of plant nutrients, but elevated concentrations of toxic heavy metals present in these effluents restrict their use for irrigation (1). Crops raised in these soils accumulate heavy metals in quantities large enough to cause clinical problems in animals and human beings (2). Fresh water is a natural resource of fundamental importance for mankind. It is thus most critical factor for ensuring good harvest. It may be pointed out that out of total water on earth, only 0.4% is available for agricultural and domestic use ; 1.9% is locked in glaciers and poles, and rest 97.6% is in oceans. Therefore, the farmers are compelled to utilize all available sources of water to irrigate their fields, especially in those areas where it is scarce to ensure good harvest. This becomes more important especially in fields adjacent to industrial areas where farmers are constrained to use waste water discharged from various industries.

In recent past, Kashmir valley has witnessed creation / establishment of some agri-horticulture based industries. One such industry in the close vicinity of Srinagar city near Rangreth, Budgam is in operation. Research studies on the impact of such activities on the soil environment of the region / locality have been almost ignored. Keeping these in view the present research project was undertaken to study the various chemical parameters and heavy metal status of soils in the vicinity of this agri-horti based industrial complex during 2006-2007.

Methods

Composite soil surface samples (0—15 cm) were

Table 1. Chemical parameters of soils (monthly averages) around an agri-horti based industrial complex. Figures in parentheses are overall mean values.

Parameters	Sites 1	2	3	4	Range	
pH	7.9	8.2	8.2	8.2	7.9—8.2	(8.13)
EC (dS/m)	0.39	0.36	0.35	0.40	0.35—0.40	(0.38)
N (mg/kg)	145	149	145	161	145—161	(150)
P (mg/kg)	10.4	10.9	9.8	16.1	9.8—16.1	(11.8)
K (mg/kg)	118	127	125	121	118—127	(122.8)
Total alkalinity (mg/kg)	277	361	299	465	277—465	(350.5)
Chlorides (mg/kg)	59	48.5	66	54	48.5—66	(56.9)
Sulfates (mg/kg)	0.37	0.36	0.38	0.38	0.36—0.38	(0.37)

collected in the vicinity of an agri-hort based industrial complex from four different sites on monthly basis. Two samples were collected from each site. The soil samples were air dried, ground and passed through a 2 mm sieve. The pH, EC, available N, P, K and water soluble salts viz., total alkalinity, chlorides and sulphates were determined by standard procedures. DTPA extractable Zn, Cu and Mn were estimated following the method of Lindsay and Norvell (3).

Results and Discussion

Table 1 reveals that the soils were neutral to alkaline in reaction (pH 7.9—8.2) and also a normal range of electrical conductivity (0.35—0.40 dS/m) was observed. The available nitrogen was medium in the soils studied. However, the available phosphorus and potassium were medium to slightly higher in these soils. The higher content of phosphorus can be attributed to the reason that considerable phosphorus was present in domestic sewage due to the use of detergents for washing (4). Also around the study area, there are many small scale detergent industries whose effluent is directly discharged into agricultural field and waste water originating from these industries is the only source of irrigation. The higher content of available potassium can be attributed to the illitic nature of these soils which is further supported by the dominance of illite clay minerals in these soils (5). The concentration of water soluble salts viz., total alkalinity, chlorides and sulfates were within the permissible limits. However, all these parameters were higher during summer and lower during the months of winter. It may be due to evaporation, water soluble chemicals ooze out through capillary rise of water during summer (6). Also the higher amount of chloride could be on account of soil erosion controlling chloride and monsoon water brings thus to surface (7)

The heavy metal status of soils irrigated with industrial waste water is presented in Table 2. A perusal of the data reveals that the heavy metals like Cu, Mn and Zn ranged between medium to high in these soils. The higher amount of copper could be ascribed due to regular addition of plant residues, agricultural chemicals and FYM besides the continuous flow of waste water of different steel manufacturing and electroplating industries in the area which contain substantially higher amount of these metals (8). Soil is an important component of biosphere because it is geochemical sink for pollutants and is also a natural buffer which regulates transport of chemical substances to the atmosthere, hydrosphere and organisms including plants. Persistence of contaminants in

Table 2. Monthly average of heavy metals around an agri-horti based industrial complex (mg/kg). Figures in parentheses are overall mean values.

Parameters	Sites 1	2	3	4	Range	
Copper	2.49	2.85	1.28	1.76	1.28—2.85	(2.10)
Manganese	2.37	4.84	1.18	2.57	1.18—4.84	(2.74)
Zinc	1.54	1.50	1.71	1.61	1.50—1.71	(1.59)

soil is quite longer when compared to other components of biosphere. In addition, the stay of heavy metals in soil may be far more longer period until otherwise those are leached out into the ground water or eroded or removed by the plants. It is believed on the basis of some observations that concentration of some heavy metals including the essential elements is likely to increase with growing industrial and agricultural activities especially with the use of industrial waste water and sewage waste water. It is also observed that the use of industrial waste water for longer period of time may deteriorate the quality of soil and even make it unfit for crop cultivation (9).

The present investigation, a preliminary one is expected to be useful for formulation of further research and development programmes. Also a detailed study is further needed with large number of soils and the waste water originating from industries needs to be analyzed to study their impact on these soils.

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