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EFFECT OF POLLUTED WATER OF ULHAS RIVER ON THE INORGANIC CONTENT OF ITS VEGETATION-II

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The inhibition was observed in the inorganic contents like sodium, potassium, lithium, calcium, magnesium, iron and phosphorous of the selected eight species. However, there was increase in chloride content of the plant species affected by industrially polluted water of Ulhas River.

Keywords : Inorganic content; Polluted Water; Vegetation.

Introduction

Pollution hazard as a result of increased industrialization is by now a well known fact. The contamination of waterbody takes place due to the discharge of effluents from industries. The various industrial plants situated near Kalyan, a suburb of Bombay, discharge their effluents into the Ulhas river. Denudation of vegetation in heavy metal contaminated area is related to the toxicity of metals. At high levels of pollution, total elimination sensitive community takes place (Thompson, 1928). The metals are found to be interfering with the normal functioning of plant body as a result of which loss in production leading to death may take plece. The adverse effects of pollution on vegetation are found to be morphological, physiological, biochemical and may cause genetic anomalies.

Materials and Methods

Ash solutions were prepared from dried materials of *Blumea lacera* D.C., *Tridex procumbens* L, *Xanthium strumarium* L, *Leucas aspera* Spreng., *Ocimum americanum* L. Syn., *Pogostemon parviflorous* Bentu., *Polygonum glabrum* Willd. and *Euphorbia heterophylla* L. and analysed for inorganic content.

An accurately weighed 2 g of oven dried plant material was heated in crucible at 550°C in a muffle furnace to a constant weight. The ash was moistened with a known amount of concentrate HNO_3 and evaporated to dryness. The residue was moistened with 5 ml of 3N HCl and boiled for 2 minutes. The contents of the crucible were transferred to a beaker with 50 ml hot glass distilled water, heated on water bath for a few minutes and filtered into 100 ml volumetric flask and the volume is made to the mark (Scott, 1939).

SODIUM, POTASSIUM, LITHIUM—These elements were determined quantitatively from ash solution by using Flame Photometric Method on Elico Flame Photometer (Crosby, 1977).

CALCIUM AND MAGNESIUM—They were determined E.D.T.A. titration method (Vogel, 1978).

TOTAL CALCIUM AND MAGNESIUM—To an aliquot of the ash solution added 5 ml of buffer (pH 10), about 30 mg each of Potassium cyanide and hydroxylamine hydrochloride. About 0.2 g of Erichrome Black T indicator was added and titrated against 0.01M E.D.T.A. solution using microburette. The end point was pure blue.

CALCIUM—To an another aliquot, 4 ml of 8M KOH and about 30 mg each of Potassium cyanide and hydraxylamine hydrochloride were added. 0.2 g of Patton and Reeder's indicator was added and titrated against E.D.T.A. Calcium is calculated from the readings.

MAGNESIUM—The content of Magnesium was found out by the difference of above two readings of i) total reading of Calcium and Magnesium and ii) reading of Calcium alone.

IRON—The content were estimated by Farrar's thiocyanate method (Farrar, 1935). To 1 ml of aliquot, 1 ml of glass distelled water (D.W). and 5 ml of 3N Potassium thiocynate were added. 2-3 drops of concentrated Nitric acid were added before added KSCN. It was read on a photolectric colorimeter with 540 μ. Standard iron readings were taken by taking standard iron solution in place of aliquot.

PHOSPHOROUS—Sterges and Hardin (1960) modified method of Bell and Diosy's (1920) hydroquinone method which was utilised for phosphorous estimation. To 1 ml of aliquot, 6 ml of glass D.W., 1 ml of Ammonium molybdate (5%) and 1 ml of Sodium Sulphite (20%) were added. To this 1 ml of freshly prepared hydroquinone (0.25%) solution was added. The total contents in the test tube was 10 ml. It was read on spectrophotometer at 640 μm, after 30 minutes. Standard readings were similarly taken by replacing standard phospate solution in place of the aliquot.

CHLORIDES—It was estimated by Volhard's method from Vogel's Text Book of Inorganic Analysis (1939). To 10 ml of 0.1N Silver nitrate few

Table 1. Effect of Polluted water of Ulhas River on the Mineral Content of Its Vegetation

(Values given are mean ± SE of 10)

Species	Minerals in mg/100 g dry weight							
	Sodium		Potassium		Lithium		Calcium	
	P	% DFC	P	% DFC	P	% DFC	P	DFC
B. lacera	2.70±0.50	–16.83	4.40±0.12	–10.80	3.30±0.28	–25.00	4.60±0.12	–15.38
T. procumbens	2.24±0.90	–14.81	5.40±0.15	12.93	4.00±0.08	–34.69	5.60±0.50	–32.50
X. strumarium	2·70±0.60	–4.90	1.70±0.28	–27.15	3.60±0.18	–3.33	5.62±0.14	–22.44
L. aspera	2.82±0.09	–23·29	2.30±0.70	–17.38	1·50±0.32	–15.45	5.20±0.08	–32.51
O. americanum	4.25±0.32	–3.27	2.60±0.02	–13.17	2.10±0.50	–9.09	4.40±0.60	–14.62
P. parviflorous	2.90±0.15	–4.80	3.00±0.18	–20.15	1.20±0.80	–20.56	4.80±0.70	–30.00
P. glabrum	4.20±0.22	–15.83	3.50±0.70	–11.66	1.90±0.32	–17.24	3.20±0.60	–21.42
E. heterophylla	3.82±0.18	–29.64	4.40±0.60	–28.40	1.40±0.14	–6.81	2.20±0.70	–18.00

DFC, difference from control; P, in samples from polluted area; –, inhibition.

Table 2. Effect of Polluted Water of Ulhas River on the Mineral Content of Its Vegetation

(Values given are mean ± of 10)

Species	Minerals in mg/100 g dry weight							
	Iron		Phosphorous		Magnesium		Chloride	
	P	% DFC	P	% DFC	P	% DFC	P	% DFC
B. lacera	26.15±0.15	−12.52	51.50±0.50	−20.03	0.24±0.05	−12.80	640.00±0.30	+300.00
T. procumbens	29.85±0.05	−14.95	21.45±0.26	−72.88	0.10±0.12	−31.60	1280.00±0.14	+300.00
X. strumarium	8.30±0.12	−66.80	42.65±0.18	−55.57	0.38±0.18	−20.80	800.00±0.07	+400.00
L. aspera	7.45±0.18	−86.34	40.00±0.06	−61.65	0.20±0.05	−18.30	2080.00±0.18	+550.00
O. americanum	6.25±0.23	−57.38	17.15±0.08	−28.39	0.28±0.17	−22.20	160.00±0.21	+100.00
P. parviflorous	23.30±0.18	−30.03	42.65±0.12	−57.77	0.26±0.12	−27.70	480.00±0.16	+200.00
P. glabrum	10.00±0.06	−45.35	32.00±0.24	−45.29	0.45±0.21	−15.12	800.00±0.19	+150.00
E. heterophylla	11.55±0.32	−24.51	20.85±0.16	−31.97	0 48±0.32	−19.34	480.00±0.15	+200.00

DFC, difference from control; P, in samples from polluted area; −, inhibition; +, stimulation.

drops of 6M Nitric acid were added. About 1 ml of Iron alum indicator was added and titrated against 0.1N Potassium thiocyanate. The end point shows brick red colour. This gives the blank reading. Similarly, take another reading by adding 5 ml of aliquot to $AgNO_3$, HNO_3 and Fe-alum indicator and titrating against 0.1N KSCN. The chloride content is calculated from the difference between the two readings. To find out the chloride contents in the plant material, ash solution was prepared as described earlier but Nitric acid was used in place of hydrochloric acid.

Results and Discussion

Except the increase in chloride content, the other mineral contents such as sodium, potassium, lithium, calcium, iron, phosphorous and magnesium of all the species were reduced by the polluted water of Ulhas river (Table 1, 2)

Maximum 29.64% and minimum 3.27% inhibition was seen in sodium content in *Euphorbia heterophylla* and *Ocimum americanum* respectively. Maximum of 28.40% and minimum of 12.93% inhibition caused in potassium content in *E. heterophylla* and *Tridax procumbens* respectively. As high as 34.69% and as low as 3.33% inhibition was caused in lithium content in *T. procumbens* and *Xanthium strumarium* respectively, Maximum 32.51% and minimum of 14.62% inhibition was caused by water pollution in *Leucas aspera* and *Ocimum americanum* respectively. Maximum 86.34% and minimum 12.52% inhibition was caused in iron content in *L. aspera* and *Blumea lecera* respectively. As high as 72.88% and as low as 20.03% inhibition was recorded in phosphorous content in *T. procumbens* and *B lacera* respectively. As high as 31.60% and as low as 12.80% inhibition was noticed in magnesium content in *T. procumbens* and *B. lacera* respectively. However, there was stimulation as high as 550.00% and as low as 100.00% in chloride content in *L. aspera* and *O. americanum* respectively.

Estuarine region of Ulhas river is depleted of nutrients and as a consequence the floristic diversity of the bank vegetation is adversely affected (Aswani Kumar, 1983). Due to lacking and reduction of nutrients there was stunted growth in vegetation, reduction in growth performances, physiological aspects and biochemical changes in plants which lead to their reduction in organic matter production (Shetye, 1982). Oertzen and Finlayson (1984) obser-ved decrease in, K, N and P contents of plant tissues whereas Na and Clcontents increased in waste water acquatic plants.

According to Mohanty and Reddy (1982), Ca and Mg antagonize each other in their absorption by plants.

Liming of acid soils increases the soil pH and supplies Ca Heavy dressings of lime leads to Mg deficiency, in highly leached humus acid soils or on sandy soils as Mg uptake is depressed as a result of Ca-competition. Similarly heavy absorption of Mg may result in Ca-deficiency. Increase in Ca-supply of Mg enhanced their susceptibility. Mineral contents of *Vigna mungo* were not stimulated by 2, 4-D (Theresa Sebastian, 1987).

The mineral content of all the species is inhibited by the polluted water of Ulhas river. As a result of adverse effects of industrial effluents in the river the mineral nutrient content in the habitat is badly affected and the plants have reduced amount of it in their tissues.

Due to industrial effluents the pH of medium shows values above 7 as well as the region of investigation is estuarine in nature. As a result the content of the plant tissue is affected showing increase in chloride content. Thes, the plant species of Ulhas river area show stimulation in chloride content.

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