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COMPARISON OF HEAVY METALS AND MAJOR NUTRIENTS IN DIFFERENT PARTS OF THE MEDICINAL PLANT *RICINUS COMMUNIS* L. COLLECTED FROM AN INDUSTRIAL BELT (ELOOR) AND COASTAL AREA (WELLINGTON ISLAND) OF KERALA

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The present work was carried out to compare the heavy metal and major nutrient accumulation and their distribution in plant parts of the medicinal plant *Ricinus communis* L. The plant contains triglycerides of ricinoleic, isoricnoleic, stearic, and linoleic acids. The castor oil extracted from the plant is used to treat chronic constipation, acute diarrhoea and joint pains. For the present study the plant was collected from Eloor (industrial belt) and Wellington Island (coastal area) which are two different regions of central Kerala. The metals considered for study were Lead, Cadmium, Manganese, Zinc, Iron and Copper and major nutrients like Nitrogen, Phosphorus, Potassium. The present investigation showed regional variations in the levels of metals in plant parts and soil, It is suggested to evaluate the presence of heavy metals before using for medicinal preparations.

Key words : Heavy metals, Major nutrients, *Ricinus communis* L., Eloor, Wellington Island.

Plants are often found to be excllent indicators of certain environmental contaminante due to their rapid phytotoxic response to sulphur dioxide, ozone, herbicide, etc. Their response to other contaminants such as toxic heavy metals, are also readily visible. Metals are ubiquitous in nature and with increasing industrialization; the potential for metallic poisoning is increasing day by day. Today, heavy metal pollution is a great problem to the environment and is termed as "Devils in disguise". Heavy metal contamination represents a risk for primary and secondary consumers and ultimately humans (Zeller and Feller, 1999; Jiraporan *et al.* 2005).

The present investigation was one on plant *Ricinus communis* L. belonging to the family Euphorbiacceae. It is commonly used medicinal plant in Ayurveda. The castor oil extracted from the plant contains triglycerides of ricinoleic, isoricinoleic, stearic, and linoleic acids and the plant is used to treat chronic constipation, acute diarrhoea and joint pains (kokate *et al.* 1999, Wallis 1985). Medicinally important plant parts are seeds, leaf and root. The main objective of this study was to investigate and compare the distribution of major nutrients Nitrogen, Phosphorus and Potassium, as well as the heavy metals like Lead, Cadmium, Copper, Manganese, Zinc and Iron in different parts of *Ricinus communis* L., collected from the two regions of central Kerala.

MATERIALS AND METHODS

In order to make comparative distribution of elements in the plant, it was collected along with soil from two localities of Kerala- Eloor and Wellington Island. Wellington Island is a man-made Island created from the materials dredged while deepening Kochi port. Eloor (industrial belt) contains more than 247 industries because of which the area suffers from heavy pollution and is rated as one of the toxic hotspots of the world by Green Peace International.

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Table : 1 Determination of soil pH and texture collected from Eloor and Wellington Isaland.

Study Site	pH	Texture
Wellington Islan	6.7	Loamy
Eloor	6.1	Loamy

The plants were collected from ten different areas of Eloor and Wellington Island for the study. The whole plants were uprooted and the soil was collected from rooted zones of the plants. The soil was collected from about 15cm width and 10cm depth by using a trowel. The fresh plants were separated into root, stem, leaf, flower and fruit and kept in hot air oven. The dried, powdered and digested samples were then introduced into Flame Atomic Absorption Spectrometer (FAAS) for the determination of heavy metals Cadmium and Lead; trace metals such as Iron, Manganese, Zinc and Copper. Major nutrients Potassium, Nitrogen and Phosphorus in the soil samples and leaf samples were determined by Kjeldahl method and Colorimeter respectively. Soil pH was determined using Electromagnetic method. All the values shown in the tables are average of ten plants.

Table : 2 The Amount of heavy metals present in ambient soil collected from Wellington Island and Eloor (The overall mean value is presented).

Heavy Metal	Soil Samples	
	Wellington Island	Eloor
Cd	*ND	ND
Pb	50ppm	150ppm
Mn	16ppm	3805.5ppm
Zn	1543.5ppm	7529ppm
Fe	10020ppm	14025ppm
Cu	26.8ppm	16.6ppm

*ND-Not Detected

RESULTS AND DISCUSSION

The analysis of soil pH and soil texture showed that the soil sample of both areas were acidic and loamy in texture (Table1). Vwioko *el al.* 2006 reported that under acid condition almost all the elements are sufficiently soluble in soil.

In the present study Cadmium was not detected in soil as well as in plant parts collected from Eloor and Wellington Island (Table 2 & 3). Lead was detected in the soil and in the plant parts collected from Wellington

Table : 3 Distribution of heavy metals in plant parts of *Ricinus communis* L. collected from Wellington Island and Eloor (The overall mean value presented).

Area of Collection	Plant Parts	Heavy Metals (ppm/dry wt.)					
		Toxic Metals		Essential Metals			
		Cd	Pb	Mn	Zn	Fe	Cu
Wellington Island	Root	*ND	4	ND	52.98	47.40	19.00
	Stem	ND	2	ND	31.32	46.60	15.60
	Leaf	ND	2	ND	27.82	187.60	19.40
	Flower	ND	2	ND	65.54	195.00	19.40
	Fruit	ND	2	ND	70.98	79.00	18.00
Eloor	Root	ND	ND	16.08	176.06	148.30	21.20
	Stem	ND	ND	12.10	164.88	124.40	19.60
	Leaf	ND	ND	20.20	60.78	105.00	22.60
	Flower	ND	ND	ND	79.72	113.00	22.60
	Fruit	ND	ND	ND	79.52	94.60	16.60

*ND-Not Detected

Table :4 Concentration of major elements N, P, and K in Soil samples and lead of *Ricinus communis* L. collected from Wellington Island and Eloor

Study Site	Samples	Major Nutrients (Mean Values)		
		N	P	K
Wellington Islan	Soil	0.56%	40Kg/ha	526Kg/ha
	Leaf	4.20%	0.34mg/ml	3400ppm
Eloor	Soil	1.25%	60Kg/ha	526Kg/ha
	Leaf	6.16%	1.259mg/ml	3140ppm

Island. Though soil collected from Eloor contained Lead, the absence of Lead in the same plant parts indicate that the Lead in that area may be in insoluble form (Table 2 and 3). WHO (1972) reports that if the level of Lead is above 10ppm it is considered to be toxic. In the present study in all the parts, the concentration of Lead was below 5ppm (Table 3).

Highest amount of Manganese in soil of Eloor will be probably due to industrial contamination (Table 2). Manganese was not detected in the plant parts collected from Wellington Island (Table 3). It may be not in the available form or some other metals may inhibiting the accumulation of Manganese by the root. Low concentration of Zinc was found in leaf samples collected from both the localities (Table 3). The level of Zinc in all parts of the plant was found to be below the toxic level. According to Marshner (1993), the permissible limit of Zinc is below 200ppm.

Concentration of Iron was found to be very high in soil and in plant parts collected from both the areas (Table 2 and 3). The higher amount of Iron in plant parts than in the soil may be due to the rapid uptake of the mineral by the plant. Bandita Deo (2004) reported the same trend in her study. In soil analysis for Copper, the soil collected from Wellington Island had higher concentration than the soil collected from Eloor (Table 2). The concentration of this metal was detected to be the lowest in all plant parts when compared to the other metals studies (Table 3).

The levels of studied plant were found to contain considerable amount of major nutrients-Nitrogen, Phosphorus and Potassium (Table 4).

The studies conducted showed tha tthe heavy metal levels are higher in plant parts collected from Eloor area, which may probably be due to industrial pollution. Some of the metals accumulated by the plant were found to be beyond the permissible level. Since, the plant is medicinally important, it can be suggested to evaluate the presence and effect of heavy metals in these plants before using in various medicinal preparations.

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