

An Analytical Study on Effect of Environmental Pollutants on *Ricinus communis* Linn. Root With Special Reference to Heavy Metal Concentration

Ambika Dhiman^{1*}, S.K.Hiremath² and G.M.Patil³

¹J.D. Ayurvedic college, Bhankari , Aligarh, U. P. India

²Department of Agada Tantra, KLE Shri BMK Ayurveda Mahavidyalaya, Belgaum, Karnataka, India

³Co-ordinator, Karnataka pollution control Board, Belgaum Karnataka, India

Abstract

Environmental pollution and exposure to toxic material affects living and non-living organisms. Medicinal plants are most important source of life saving drugs for majority of population. Herbal medicines are consumed worldwide for the treatment of several diseases and such plants are an important source of raw material for pharmaceutical industries. *Ricinus communis* is one of the most important herbal plant used in treatment of various disorders like Gout, RA etc. That is why we need to brief about this plant. These premonitions have accelerated to do such type of study. Therefore, an attempt was made to analyze these heavy metals in *Ricinus communis* Linn. root and soil.

Keywords

Erandamoola, Heavy metal, Environmental Pollutants, Ricinus communis



Greentree Group

[Received 25/02/16](#) [Accepted 06/04/16](#) [Published 10/05/16](#)

INTRODUCTION

Ricinus communis Linn. root is especially used in Panchkarma niruha basti procedure and various other formulations like Eranda saptaka kwath etc. and for treatment of various Vata disorders. Pollution causes heavy metals assimilation in plant and causes harmful effects on other living beings. These stimulation depend on their availability in soil. If soil is polluted it will directly come in plant through roots. These contaminated medicines when taken by us they causes interference to enzyme system and metabolism of body.^{1,2}

An important source of contamination, in plants, is considered to be the foliar uptake of atmospheric heavy metals emissions by the soil.³ In general, most plants grow by absorbing nutrients from the soil. Their ability to do this depends on the nature of the soil. A soil contains some combination of sand, silt, clay, and organic matter. This combination depends on its location. Soil texture and its pH determine the extent to which nutrients are available to plants. The path taken by metal to transport into the plant is: soil > roots > stems > leaves.⁴ The accumulation of metals in plants is associated with nature of soil and climatic conditions.

Heavy metals are dangerous in the form of their cation's and are highly toxic when bonded to the short chains of carbon atoms. Plants may absorb heavy metals from soil, water or air. Medicinal herbs may be easily contaminated during growing and processing, therefore it should be checked for quality assurance.⁵

MATERIALS AND METHODS

Collection of drug

Fresh soil sample and roots of *Ricinus communis* Linn. were collected from the adjacent area of Belagavi Shahapur (Domestic area), Hanumananagar (Agricultural area), Udyambagh (Industrial area). Total 20 samples were collected from one particular area and were randomly mixed, and three samples were prepared. Samples were authenticated in Central research facility, Belgaum (Karnataka). The obtained roots were shade dried and made into coarse powder with the help of mechanical grinder and preserved in a glass container for future studies.

RESULTS

HEAVY METAL ANALYSIS

The soil and root powder for all varieties were analyzed for lead, cadmium, copper, zinc, iron, manganese chromium and nickel

atomic absorption spectrophotometry⁶ was carried out at pollution control board, Belgaum (Karnataka), India.

Sr. no.	Area Name	Sample Used	Pb	Cd	Cu	Zn	Fe	Mn	Cr	Ni
1.	Shahapur	Soil	23.6	N.D	199.5	87.5	71350	688.5	114.4	94.4
		Root	134.2	8	145	176.2	ND	438.6	57.7	36
2.	Hanumannagar	Soil	ND	ND	226.2	149.4	50275	604.7	131.9	55.4
		Root	ND	ND	124.5	209.7	ND	368.3	32.9	20.1
3.	Udyambagh	Soil	ND	ND	236.6	23.2	49150	688.5	128.6	76.5
		Root	109.1	ND	117.7	186.5	ND	460.7	44.7	26.2

DISCUSSION

AND

CONCLUSION

Lead, cadmium, copper, zinc, Iron, Manganese, Chromium and Nickel were analyzed using AAS. If we look towards overall results we can see that this plant is having tendency to absorb or to hyper accumulate metals like lead, cadmium and zinc from soil and environment. These types of plants are called as metallophytes or Hyper accumulator. Root is the major source for nutrition in plant. It absorbs nutrient from soil through circulation. If concentration of these elements increased in soil that leads to accumulate in plant and stored in plants parts as such. The path taken by metal to transport into the plant is: soil >

roots > stems > leaves.^{7,8} The accumulation of metals in plants is associated with nature of soil and climatic conditions. As we can see in results Heavy metals were more in Soil than in root part and least in Leaf part. On the basis of nutritional limit one can assess harmful effects of these elements if they are consumed in excess amounts.

If we see Elements like Ni and Mn in all samples we find that they were found below permissible limit in all collected samples of Erandamoola, which shows to be better, because of producing different effects like enhancement of bioavailability of herbs to cell.^{9,10}

Probable Concepts for cause of heavy metal accumulation in Erandamoola-

For formation of rasa (dravya) pruthvi and jala mahabhoota are the base. In samhita kala they described about classification of dravyas as jangama, audhbhida and parthiva dravya. These Parthiva dravyas can be considered to be as phytometals in samhita kala.¹¹ According to “*sarvadravyaya panchbhootika asmin arthe*”.¹² All dravyas are made up of panchmahabhoota. Eg. Erandamoola is having madhura (pruthvi and jala mahabhoota aadhikya) and Kinchita Kashaya rasa (Pruthvi and vayu adhikya), guru guna (Parthiva bahulya). Due to samanyam vridhi karanam (similar properties enhance the action) concept, heavy metals (parthiva dravya) are found to be more in concentration in Erandamoola in favorable environment.

Plants grown on the prohibited lands may contain heavy metals and other toxic elements. **Shahapur sample:** About 40mtrs away from **cremation ground** & 60mtrs from **temple** – the samples shown highest concentration of Heavy metals as mentioned in classics prohibited area for drug collection because after cremation of human body metals like Cd, Mn, V, Co, Cu, Pb etc went in soil and through soil it will go to plants and like wise cycle will go through. **Udyamabhagh Sample:** Shown second

highest concentration of Heavy metals – that land can be considered as Dushita Desha as explained in Janapadodwansaneeya adhyaya.^{13,14} **Hanuman Nagar Sample:** No Lead & Cadmium were found in this accession sample, which are highly toxic among heavy metals that place is not near to any prohibited area, away from domestic places and away from Industries and traffic.

CONCLUSION

Concentration of heavy metals were higher in Shahapur (Domestic area) than in Udyamabhagh (Industrial area) and lesser in Hanumannagar (Agricultural area). This study also showed the importance of drug collection and further confirms the increased danger of environmental pollution on living Organisms. This plant is able to hyper accumulate Lead, Cadmium and Zinc and were found more in plant root than soil, they all were above the permissible limit established by CODEX (WHO/FAO).

REFERENCES

1. Rates, SMK. 2000. Review: Plants as a source of drugs. *Toxicol.* 39:603-613.

2. Hussain, I. 2006. Investigation of heavy metals in commercial tea brands.
3. Salim, R. Al-Subu, MM. and Atallah, A. 1993. Effects of root and foliar treatments with lead, cadmium, and copper on the uptake distribution and growth of radish plants. *Environment International*. 19(4):393-404.
4. Application Bulletin Metrohm. Polarographic determination of five metal ions (Copper, Cobalt, Nickel, Zinc and iron) in a single operation. Method No. 114/1e.
5. Badam, L. Deolankar, RP. Kulkarni, MM. Nagsampgi, BA. and Wagh, UV. 1987. In vitro antimalarial activity of neem leaf and seed extracts. *Indian Journal of Malariology*. 24:111-117.
6. Mahwash Zahra et al "Determination of some toxic and essential traces metals in some medicinal and edible plants of Karachi city" *Journal of Basic and Applied sciences* Vol 7, no.-2, 89-95, 2011.
7. Karunakar Shukla and Vishal Jain "Heavy metals in Ayurvedic Formulations-safety issues" *The pharmaceutical magazine*, Institute of Pharmacy, Pt. Ravishankar Shukla University, Raipur.