STUDY OF HEAVY METALS PRESENT IN LEAVES AND ROOTS OF AMPELOCISSUS LATIFOLIA

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ABSTRACT

Herbal medicines have the history of therapeutic uses and are still serving many needs of large populations. About 80 % of Worlds population still depends upon traditional medicines. Ampelocissus latifolia is a large herbaceous climber with tuberous root having significant medicinal properties which is used by the tribal communities. It is commomly known as wild grapes. The leaves and roots of this plant is used in the treatment of bone fractures, dysentery, fever and muscular pain. As the therapeutic effect of the plants is based on the chemical constituent present in them, therefore it is essential to analyze the plants for heavy metals before using it as herbal remedies. It is very important to understand the risk associated with heavy metals and thus heavy metals analysis is one of the important parameter for standardization of herbal medicines. The present research work includes the analysis of leaf and root powder of Ampelocissus latifolia material using ICP-AES.

Keywords: AES, Ampelocissus latifolia, Heavy metals, Herbal medicines, Standardization

I. INTRODUCTION

The basic sources of heavy metal are burning fossil fuels, the mining and smelting of metalliferous ores, fertilizers, municipal wastes, pesticides, sewage [1]. In spite of ever growing number of toxic metal contaminant sites, the most commonly used methods of dealing with heavy metal pollution are either extremely costly processes of removal and burial or simply isolation of the contaminated sites. The ability to tolerate the level of heavy metals accumulate them in very high concentrations has evolved both independently and together in number of different plant species [2]. Many plants have the tendency of storing the heavy metals from the soil, atmosphere and polluted water [3,4]. Plants have developed three basic strategies for growing on contaminated and metalliferous soils. Metal Excluders [5] **-** These plants prevent metal from entering their aerial parts over a broad range of metal concentrations in the soil. However, they can still contain large amount of metals in their roots. Metal Indicators **-** These plants accumulate metals in their aerial tissues and the metal levels in the tissue of these plants generally reflect level in the soil. Accumulators **-**The plant containing more than 0.1 % Ni, Co, Cu, Cr, or Pb or Zn in its leaves on dry weight basis is called hyper accumulators irrespective of the metal concentration in the soil[6].

II MATERIALS AND METHOD

The leaves and roots of ampelocissus latifolia were collected from the field areas of Rasayani, Maharashtra. Both the plant materials were cleaned and washed with water to remove dirt and foreign particles. The material

was dried in sunlight and then powdered by grinding in mixer. Further the powder was sieved through Botanical sieve. This leaf and root powder of *Ampelocissus latifolia* was used for heavy metal analysis. Accurately weighed 500 mg of powder was taken in round bottom flask. To this 5 cm^3 of concentrated HNO$_3$ was added and refluxed for half an hour at 80^0 to 100^0 C. It was then cooled and 5 cm^3 conc. HNO$_3$ was added. Then 2 cm^3 of 30 % hydrogen peroxide solution was added to the above mixture and warmed for 10 min till the solution becomes clear. Then it was filtered through Whatmann filter paper no. 42. The above filtrate was collected in 100 cm^3 of volumetric flask and diluted up to the mark with deionised water. By using above procedure three samples were prepared. These samples were analyzed using Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES). ICP-AES is one of the most advance techniques for the trace elements analysis. It is based on principle of Atomic Emission Spectroscopy. It is a type of emission spectroscopy that uses the inductively coupled plasma to produce excited atoms and ions which emits electromagnetic radiations at wavelength characteristic of particular element. The intensity of emission is indicative of the concentration of the element within the sample.

III RESULT AND DISCUSSION

Table 1

Heavy Metals	Ampelocissus latifolia Leaf powder mg/kg	Ampelocissus latifolia Root powder mg/kg
Copper	21.96	21.29
Cadmium	<0.50	<0.50
Chromium	1.17	4.51
Lead	2.84	4.79
Nickel	2.12	3.15
Iron	332.44	397.32
Zinc	25.99	35.67
Sodium	109.3	155
Potassium	3428.50	5732
Magnesium	4389.75	2048
Calcium	11657.15	13110
Phosphorus	4741.92	2534.40

The heavy metals analysis results of roots and leaves powder of *Ampelocissus latifolia* clearly indicates that the concentrations of heavy metals present in *Ampelocissus latifolia* are within the limit of tolerance. It is observed that it possess good amount important minerals such as calcium, phosphorus, magnesium and potassium. It is known that the level of elements in plants depends on environmental conditions, such as type of soil, rainfall, vicinity of industry and extensive agricultural activity [7]. Heavy metals are of two types biologically essential and non biological essential metals. Biological essential heavy metals include copper (Cu), iron (Fe), nickel

(Ni), and Zinc (Zn). Although they play significant role they become toxic when present in high concentration. Whereas non biological essential heavy metals includes lead (pb), cadmium (Cd), Mercury (Hg) and tin (Sn). The tolerance limit of these heavy metals is quite low and becomes toxic at higher concentrations. Its effect may be acute or chronic depending upon the concentration. Minerals like Calcium are known to enhance the qualities of bones and teeth and also of neuromuscular systemic. Potassium, if taken along with sodium, it prevents increase in blood pressure [8]. Magnesium acts in the cells of all the soft tissues and is necessary for the release of energy [9]. Lead causes neurological disorders, kidney damage, anemia [10]. Acute or chronic exposure of cadmium causes respiratory disorder, lung and breast cancers, anemia and cardiovascular disorders [11]. Chromium causes nephro toxicity, nasal and lung ulcers, skin ulcers, hypersensitivity reactions and holes of the skin [12]. Nickel has been reported to cause contact dermatitis, nasal, sinus and lung, cancers, kidney disorders, chronic bronchitis, acute respiratory. The results obtained shows the concentration of heavy metals in ampelocissus latifolia leaves and roots are within the tolerance limit. Thus it can be safely used for medicinal purpose.

IV. CONCLUSION

Heavy metal analysis is a part of guidelines suggested by WHO and AYUSH for herbal drugs as a safety measures. In the present study six heavy metals Copper, Chromium, Lead, Nickel, Iron and Zinc were estimated. Also some important minerals which includes sodium, Magnesium, potassium, calcium and phosphorus were estimated from the leaf and root powder of *Ampelocissus latifolia*. The above results will provide the information about the plant whether it contains some elements in amounts that could be toxic at normal doses if consumed as medicines. Thus the data of heavy metals concentration in leaves and roots of *Ampelocissus latifolia* contribute to the standardization of the plants, whenever they have to be used as an ingredient in the herbal formulation.

REFERENCES

[1.] AJM Baker, PL Walker. Ecophigiology of Metal Uptake by Tolerant Plants, Heavy Metal Tolerance in Plants. In shaw AJ. Evolutionary aspects CRC Press Boca Raton. 1990, 155-177.

[2.] AR Memon, D Aktoprakligul, A Ozdemur, A Vertii. Heavy Metal Accumulation and Detoxification Mechanisms in Plants. Turk, J. Bot. 25, 2001, 111-121.

[3.] AJ Baker. Cited in Raskin fly, PBA Nanda Kumar D. Salvik and ED Salt. Bio -concentrationn of Heavy Metals by Plant, Current Opinion in Biotechnology. 5, 1994, 385-290.

[4.] SA Dahanukar, RA Kulkarni, NN Reghe. Pharmacology of Medicinal Plants. Indian Journal of Pharmacology, 32, 2000, S81-S118.

[5.] M. B. Ogundiran and O. Osibanjo, Heavy metal concentrations in soils and accumulation in plants growing in a deserted slag dumpsite in Nigeria. African Journal of Biotechnology Vol. 7 (17), 3053-3060.

[6.] CA Newall, LA Anderson, JD Phillipson. Herbal Medicines – A Guide for Health Care Professionals. The Pharmaceutical Press London, 1996.

[7.] Markert B. Multi-element analysis in plant materials-analytical tools and biological questions. D.C. (Adriano ed. Boca Raton: Lewis Publishers) 1992, 401–428.

[8.] G. Kolata Value of low-sodium diets questioned. Science 2, 216(4541), 1982, 38-39.

[9.] N K Devi, HN Sarma, S. Kumar. Estimation of essential and trace elements in some medicinal plants by PIXE and PIGE techniques. Nucl. Instr. and Meth. Phys. Res. B 2008, 266, 1605–1610.

[10.] Mudipalli A. Lead hepatotoxicity and potential health effects. Indian Journal of Medical Research, 2007, 126, 518-527.

[11.] Huff J, Lunn RM, Waalkes MP, Tomatis L, Infante PF. Cadmium induced cancers in animals and in humans. IJOEH 2007, 13, 202- 212.

[12.] Costa M, Klein CB. Toxicity and carcinogenicity of chromium compounds in humans. Critical Reviews in Toxicology, 2006, 36, 155-163.