

Elemental Compositions of *Lannea coromandelica* (Houtt.) Merr. Stem Bark by ICP-MS

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Available Online: 29th November, 2014

ABSTRACT

Analysis of heavy metals, minerals and trace elements of *Lannea coromandelica* (Houtt.) Merr. belonging to Anacardiaceae family will be presented by using Inductively Coupled Plasma Mass Spectroscopy. ICP-MS is a new and fast technique for ultra trace elemental analysis. The concentrations of these elements in plant drug will be discussed in relation to human health. Study revealed that heavy metals are within permissible limits. The data evolved in the present work will aid in identifying the drug in dry form and standardization of the drug and control the adulteration of raw drugs. Heavy metal contents such as Selenium, Lead, Arsenic, Cadmium, Nickel, Chromium and mineral and trace elements such as Iron, Copper, Manganese, Zinc, Cobalt, Calcium, Sodium, Potassium, Magnesium and Aluminum (a total 16 elements) were analyzed. The results in comparison the values of permissible limits will be presented.

Keywords: *Lannea coromandelica* (Houtt.) Merr., Heavy metals, Leaves, Permissible limits and ICP-MS

INTRODUCTION

Lannea coromandelica (Houtt.) Merr. is a medicinally important tree used in indigenous traditional medicinal systems, belonging to Anacardiaceae family. The bark is acrid, astringent, sweet, thermogenic, stomachic and anodyne. It is useful in cuts, wounds, bruises, ulcers, ophthalmia, gout, ulcerative stomatitis, odontalgia, sprains, diarrhoea and dysentery (Prajapati and Kumar, 2005). The bark lotion is also useful in leprosy ulcers and decoction is used to treat toothache and gum trouble (Bhattacharjee, 1998). In siddha system stem bark decoction used in menorrhagia and metarrhagia (Thyagarajan *et al*, 1975). It is well known fact that the plants absorb and accumulate various elements like Chromium, Cobalt, Copper, Zinc, Cadmium, Nickel etc. when bark of *Lannea coromandelica* (Houtt.) Merr. consumed in various forms of Ayurvedic and Siddha drugs continuously, these heavy metals accumulates in human body and may produces several disorders. Hence it is necessary to check the crude drugs thoroughly for these metal ion concentration before they are being prescribed for human consumption. The trace elements in the medicinal plants play a vital role in the treatment of diseases. Quantities of the trace elements are such as Iron, Copper, Manganese, Zinc, Cobalt, Calcium, Sodium, Potassium, Magnesium and Aluminum of these trace elements in different medicinal plants are found to be varied leading to the conclusion that they are used for specific purpose. Many workers had been engaged in the extraction of biochemical's, structure analysis and antioxidant property of them. The deficiency or excess of trace elements leads various complications and metabolic

disorders in human beings. The objective of the study is to establish the levels of the heavy metals and trace elements in raw drug. Therefore presently an attempt has been made to know the quantitative accumulation of Heavy metal elements and mineral and trace elements (a total 16 elements) in botany of medicinally important plant *Lannea coromandelica* (Houtt.) Merr. is analyzed by ICP-MS.

MATERIAL AND METHODS

500 mg of dried, bark powder of *Lannea coromandelica* (Houtt.) Merr. was taken in a round bottom flask / 50 ml beaker and 10 ml concentrated Nitric acid was added and put on hot plate till the solution is reduced to 5ml at 100° C and 2 ml of Hydrogen peroxide was added to the above mixture, warmed till clear solution was obtained for 10 minutes. It was then cooled and filtered through whatman-42 filter paper, diluted with deionized water, made up to 100ml in volumetric flask. If the colour concentration of the solution is more, 5ml from 100 ml was taken solution and diluted to 100 ml (make up 100 ml solution in standard flask) and filtered with whatman filter paper no. 42 and resulting solutions were subjected to quantitative analysis for determination of 16 metals (or) 16 elements. Using Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS) instrument Perkin Elemer Sciex ELANDRC 11, carrier gas was argon and the flow rate was 0.85 liter/min., standard elements (NIST-1640a) were used (Sahito *et al*, 2001).

RESULTS AND DISCUSSION

Table 1: Heavy and Trace / Mineral elements (ppm) in *Lannea coromandelica* (Houtt.) Merr. Stem bark

S.No	Elements	Concentrations (ppb)	Concentrations(ppm)
<i>Heavy metals</i>			
1	Selenium	0.062 X 1000	62
2	Lead	1.925 X 1000	1925
3	Arsenic	0.119 X 1000	119
4	Cadmium	0.015 X 1000	15
5	Chromium	17.768 X 1000	17768
6	Nickel	1.735 X 1000	1735
<i>Trace / Mineral Elements</i>			
7	Iron	42.386 X 1000	42386
8	Copper	0.057 X 1000	57
9	Manganese	10.036 X 1000	10036
10	Zinc	7.406 X 1000	7406
11	Cobalt	0.057 X 1000	57
12	Calcium	8873.972 X 1000	8873972
13	Sodium	609.751 X 1000	609751
14	Potassium	1462.917 X 1000	1462917
15	Magnesium	1353.572 X 1000	1353572
16	Aluminium	24.510 X 1000	24510

It is commonly observed that the accumulation of heavy metals not only vary from taxon to taxon but also from one part to the other part of the same taxon (John & Laerhoevn, 1976) grown under similar (Bhatia et al.1988) or different environmental conditions (Alina & Henryk, 1984).The elemental analysis of *Lannea coromandelica* (Houtt.) Merr. bark sample revealed presence of 16 elements, Heavy metals like Selenium, Lead, Arsenic, Cadmium, Nickel, Chromium and mineral and trace elements such as Iron, Copper, Manganese, Zinc, Cobalt, Calcium, Sodium, Potassium, Magnesium and Aluminum were detected. The different concentrations of the elements in *Lannea coromandelica* (Houtt.) Merr. bark are shown in Table I. Nickel, Lead, Chromium were in the range of 1735 ppm to 17768 ppm while Cadmium Selenium and Arsenic and were in the range of 15 ppm to 119 ppm while Potassium, Calcium, Sodium Potassium, Magnesium, elements found to highest concentration ranges from 8873972 ppm to 1353572 ppm other trace elements Iron, Aluminium, Zinc, Manganese, were found to moderate levels, ranges from 42386 ppm to 10036 ppm and Cobalt and copper concentration (57 ppm) is found to lowest concentration comparatively to other trace elements. All Heavy metal contents of the drug were found to be within the permissible limits. As per WHO and FDA (Pb -10 ppm, Cd-10 ppm, As-10 ppm and Hg -1ppm). It was concluded that toxic elements was very low in the bark. Mineral and trace elements were observed to be considerable amount which useful in management of different diseases.

CONCLUSION

The heavy metal and trace elemental concentration levels in *Lannea coromandelica* (Houtt.) Merr. stem bark have been determined. It has been concluded from this study that estimation of heavy metals and trace elements are highly essential to raw drugs used as the medicine, it will help full in quality assurance and safer use of herbal drugs.

It can be concluded on the basis of results that the heavy metals viz., Selenium, Lead, Arsenic, Cadmium, Nickel and Chromium of the tem bark was found to within permissible limits as per WHO guidelines. Mineral or trace elements are found in considerable amount, which may be directly or indirectly helpful in the management of many diseases and to check the adulterants in crude drug. Thus the results of the present study support the view that bark of *Lannea coromandelica* (Houtt.) Merr. is safer drug and promising source of drug.

ACKNOWLEDGEMENTS

Authors are thankful to Head Department of Botany, Prof. B. Prathibha Devi for her support and encouragement. The authors are very grateful to Dr. V. Balaram, Head Geochemistry Division, NGRI, Hyderabad for providing facilities for carrying out this work.

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