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Elemental Compositions of *Cadaba fruticosa* (L.) Druce Leaf by ICP-MS.

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ABSTRACT

Analysis of heavy metals, minerals and trace elements of *Cadaba fruticosa* (L.) Druce belonging to Capparaceae 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: *Cadaba Fruticosa* (L.) Druce, Heavy Metals, Leaves, Permissible Limits and ICP-MS

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INTRODUCTION

Cadaba fruticosa (L.) Druce is a medicinally important plant used in indigenous traditional medicinal systems, belonging to Capparidaceae family. Leaves are anthelmintic and deobstruent: decoction used in uterine obstructions and poultice on sores [1], also used for the treatment of syphilis [2]. It is well known fact that the plants absorb and accumulate various elements like Chromium, Cobalt, Copper, Zinc, Cadmium, Nickel etc. when leaves of *Cadaba fruticosa* consumed in various forms of traditional drugs continuously, these heavy metals accumulate in human body and may produce 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 Aluminium, 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 to 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 leaves of medicinally important plant *Cadaba fruticosa* is analyzed by ICP-MS.

MATERIAL AND METHODS

500 mg of dried, leaf powder of each plant material 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 5 ml 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 100 ml in volumetric flask. If the colour concentration of the solution is more, 5 ml 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 elements. Using Inductively Coupled Plasma-mass Spectroscopy (ICP-MS) instrument Perkin Elmer Sciex ELANDRC 11, carrier gas was Argon and the flow rate was 0.85 liter/min., standard elements (NIST-1640a) were used [3].

RESULTS AND DISCUSSIONS

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 [4], grown under similar [5] or different environmental conditions [6]. The elemental analysis of *Cadaba fruticosa* leaf sample revealed presence of 16 elements (Table-1), Heavy metals like Selenium, Lead, Arsenic, Cadmium, Nickel, Chromium, mineral and trace elements such as Iron, Copper, Manganese, Zinc, Cobalt, Calcium, Sodium, Potassium, Magnesium and Aluminium were detected. The different concentrations of the elements in *Cadaba fruticosa* leaf are shown in Table I. Nickel, Chromium were in the range of 2.285 ppm to 17.171 ppm while Cadmium, Lead, Arsenic and Selenium were in the range of 0.111 ppm to 0.522 ppm while Potassium, Calcium, Magnesium, Sodium elements found to highest concentration ranges from 6802 ppm to 1548 ppm, other trace elements Iron, Aluminium, Manganese, Zinc, were found to moderate levels, ranges from 35.207 ppm to 14.168 ppm and Cobalt, Copper concentration is found to lowest concentration (0.046 ppm) 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 were very low in the leaves. Mineral and trace elements were observed to be considerable amount which is useful in management of different diseases.

Table 1: Heavy and Trace / Mineral elements (ppm) in *Cadaba fruticosa* (L.) Druce. leaf

Elements	Concentrations (ppb)	Concentrations (ppm)
Heavy metals		
Selenium	0.000522x1000	0.522
Lead	0.001119 x1000	1.119
Arsenic	0.000139 x1000	0.139
Cadmium	0.000111 x1000	0.111
Chromium	0.017171 x1000	17.171
Nickel	0.002285 x1000	2.285
Trace /Mineral elements		
Iron	0.035207 x1000	35.207
Copper	0.000046 x1000	0.046
Manganese	0.016543 x1000	16.543
Zinc	0.014168 x1000	14.168
Cobalt	0.000046 x1000	0.046
Calcium	5.106048 x1000	5106.048
Sodium	1.548524 x1000	1548.524
Potassium	6.802406 x1000	6802.406
Magnesium	3.03973 x1000	3039.73
Aluminium	0.024681 x1000	24.681

CONCLUSION

The heavy metal and trace elemental concentration levels in *Cadaba fruticosa* 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 leaf 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 leaf of *Cadaba fruticosa* is safer drug and promising source of drug.

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