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Application of AAS in Study of Metal Cations Available In Leaf Extract of Some Medicinal Plants

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Abstract: *The plants selected for study is known to have Antidiabetic and Hepatoprotective properties. This study includes extraction of leaf content to know the level of metal cation (Chromium, Manganese, Iron, Nickel, Copper, Zinc and Cadmium, lead), Since such metal cations are known to work as micronutrients which is toxic if it's level of concentration goes on increase. Thus this study using Atomic absorption spectroscopy (GBC Avanta Ver 1.33, Australian) leads to know the level of metallic cation is under permissible limit or not.*

Keywords: *Antidiabetic, Extraction, Hepatoprotective, Micronutrients, Toxic.*

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I. Introduction

India is known for it's variety of medicinal herbs and plants [1], which are distributed throughout the country and known by the people living in nearby area. We find that some tribes living in remote, down trodden and neglected places do not depend on doctors for the usual medication [2, 3]. It creates a thrust of interest in researchers to know the medicinal value of plants available. Present work is done to define the level of micronutrient available in the leave extract of *Aegle marmelos*, *Swertia chirayita*, *and Syzygium cumini* respectively. The study of concentration of metal cation is done with the help of Atomic Absorption Spectrophotometer (GBC Avanta Ver 1.33, Australian) available at Pollution Control Board, Indore. This study is useful because medicinal plants containing metal cations like Chromium, Manganese, Iron, Nickel, Copper, and Zinc are essential nutrients but it creates harmful and toxic effects when their concentration exceeds above safe level [4]. We consider Cadmium and lead are extremely toxic even in a very less quantity [5].

The basic objective of this research work is to estimate and determine the level of concentration of different micronutrients (Chromium, Manganese, Iron, Nickel, Copper, Zinc) and toxic elements (Cadmium, lead) available in medicinal plants collected from the study sites.

II. Materials and Methods

2.1 Sampling

The plant leaves of *Aegle marmelos*, *Swertia chirayita*, and *Syzygium cumini* were collected from local market (Indore, Madhya Pradesh), were separated, cleaned with deionized water to remove impurities, shade dried at temperature not exceeding 39^0C afterwards subjected for grinding process and then passed through 0.2 mm sieve to be obtained a uniform material in powder form, which is kept in individual plastic bags for further study.

2.2 Sample preparation and analysis

0.5 g of dried and powered sample of each plant was dissolved in 10 ml conc. HNO_3. To increase the solubility, the sample solution was heated at 90^0C for 2-3 hrs. After cooling sample solution transferred to a volumetric flask, make up to 50 ml and filtered through whatman filter paper No. 42. Standard solutions of the metals (Chromium, Manganese, Iron, Nickel, Copper, Zinc and Cadmium, lead) were prepared for calibration. The resulting absorbances of the metal cations were determined from the calibration graph and concentration recorded as mg/kg of metal ion using atomic absorption spectrophotometer (GBC Avanta Ver 1.33, Australian). For each plant sample two solution were prepared and results recorded in averages.

Table 1: medicinal plants selected for study and their pharmacological properties found in plant leaf.

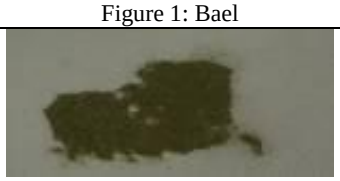
name of plant and family	Photograph of sample material and Local name	Properties
Aegle marmelos (Rutaceae)	 Figure 1: Bael	Antidiabetic[6], Antibacterial and Antimutagenic [7],Hepatoprotective[8]
Swertia chirayita (Gentianaceae)	 Figure 2: Chiraita	Antidiabetic[9],Antiviral[10], Anthelmintic[11], Anti-inflammatory[12],Hepatoprotective[13]
Syzygium cumini (Myrtaceae)	 Figure 3: Jamun	Antidiabetic[14] Hepatoprotective,[15], Anthelmintic[16], Anti-inflammatory[17]

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Table 2: Working conditions for Atomic Absorption Spectroscopy

metal cation	Wave length (nm)	Lamp Current (mA)	Slit Width (nm)	Fuel Flow (min^{-1})	Flame type
Chromium	357.9	6.0	0.2	2.30	Air-Acetylene
Manganese	279.5	5.0	0.2	1.30	Air-Acetylene
Iron	248.3	7.0	0.2	1.80	Air-Acetylene
Nickel	232.0	4.0	0.3	1.80	Air-Acetylene
Copper	324.7	3.0	0.5	1.14	Air-Acetylene
Zinc	213.9	5.0	0.5	1.50	Air-Acetylene
Cadmium	228.8	3.0	0.5	1.80	Air-Acetylene
lead	217.0	5.0	1.0	2.0	Air-Acetylene

III. Results and Discussion

The extract prepared from leaf powder of *Aegle marmelos*, *Swertia chirayita*, and *Syzygium cumini* respectively contains Manganese 0.278 2.051, 0.079 which indicates they are having enough Manganese required in metabolic process [18].

Copper is obtained 0.035 *in Aegle marmelos* and 0.135 in *Swertia chirayita*, it is absent in *Syzygium cumini*. Iron is available 7.315, 1.101, 1.117 respectively is meant for better source of iron. Zinc is found 0.14, 0.165, and 0.049 as important growth factor in these plant materials [19].

Chromium and Nickel although present in *Swertia chirayita*, are available in significant amount which eliminates the all possibility of its harmful effect [20, 21].

It is noticed that harmful metal ions like Cadmium and lead [22] are almost absent except lead in *Aegle marmelos* and *Syzygium cumini* in a limiting concentration of 0.213 and 0.206 respectively.

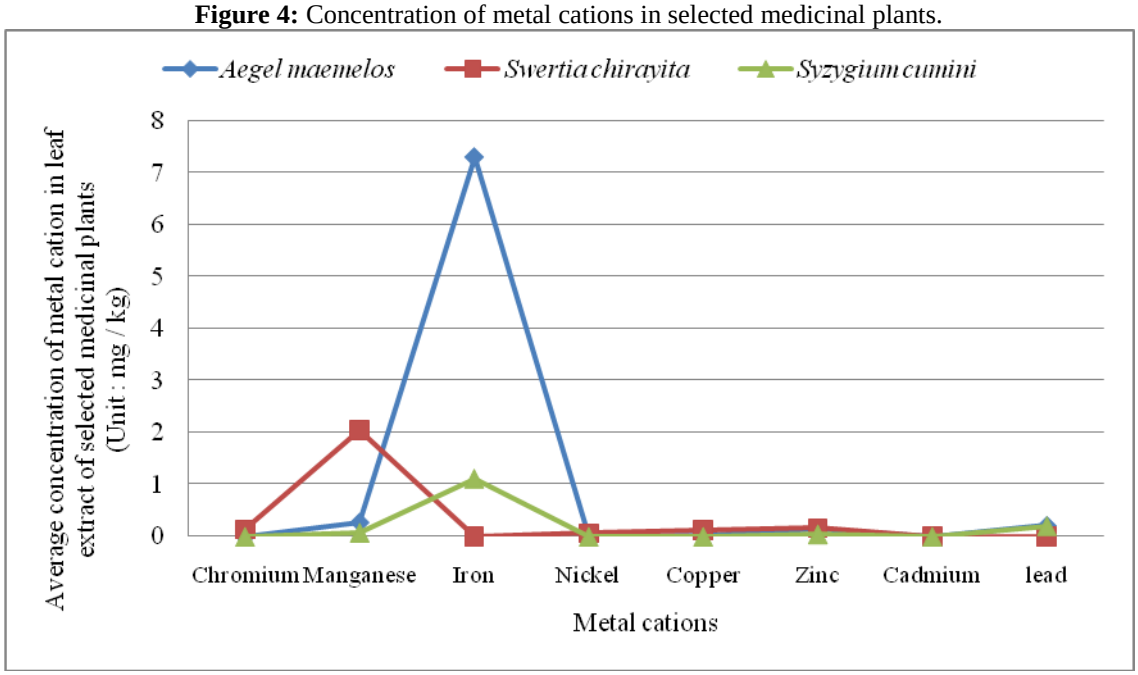
Table 3: Illustrating the average concentration of metal cations in selected medicinal plant sample using Atomic absorption spectroscopy (unit: mg/kg)

Metal cation	Average concentration of metal cations in leaf extract of selected medicinal plants		
	Aegle marmelos	*Swertia chirayita*	*Syzygium cumini*
Chromium	-	0.138	-
Manganese	0.278	2.051	0.079
Iron	7.315	1.101	1.117
Nickel	-	0.063	-
Copper	0.035	0.135	-
Zinc	0.14	0.165	0.049
Cadmium	-	-	-
lead	0.213	-	0.206

IV. Conclusion

All selected medicinal plants contain metal cations under permissible limits. So uses of these plant materials as medicine are safe. This study can help other researcher to know the level of metal ions in such significant herbs.

Figure 4: Concentration of metal cations in selected medicinal plants.



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