

ESTIMATION OF MINERALS AND HEAVY METALS ON AERIAL PARTS OF *PHYLLANTHUS LONGIFLORUS*

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ABSTRACT

The objective of the present study was to quantify minerals and heavy metals present in aerial parts of *Phyllanthus longiflorus* (PHL). Essential elements such as sodium (Na), potassium (K), iron (Fe), magnesium (Mg), zinc (Zn) and non essential elements such as copper (Co), lead (Pb), cadmium (Cd), manganese (Mn) and mercury (Hg) were estimated using atomic absorption spectroscopy. Results show that minerals such as Fe, Na and Mg are present in the concentration of 343.9820, 537.7724 and 117.2173 ppm respectively. Heavy metals such as Co, Cd and Pb were present in the concentration of 15.6916, 1.8899 and 0.3591ppm respectively. Also the result revealed that the absence (not detectable) of potassium, manganese, mercury and zinc in the aerial parts of PHL. Therefore, the data provided in the present study could be useful in the preparation of standard herbal products of this plant.

Keywords:

INTRODUCTION

Medicinal plants are found to contain minerals and heavy metals which in turn play an important role in their usage. Minerals are the product of geological processes¹, very essential in the regulation of metabolic process of the body². On the other hand heavy metals are dangerous to the health. World Health Organization guidelines³ also claims that medicinal plants might be checked for the presence of heavy metals. Therefore, estimation of minerals and heavy metals acquire great importance with respect to the safe and correct use of the plant. *Phyllanthus longiflorus* (Tam-Nallapullati) is a small bush with obliquely obovate – oblong leaves, pink flowers and small capsular fruits (0.4cm long). It belongs to the family Phyllanthaceae and distributed in the hills of Kerala and Tirunelveli up to an altitude of 600m⁴. Several species of the genus *Phyllanthus* were reported to possess anti tumour, anti inflammatory, hepatoprotective, diuretic, and anti bacterial activities⁵⁻⁹. *P.amarus*¹⁰, *P.niruri*¹¹ etc have been reported for antidiabetic activity. In our previous work, we have reported anti-convulsion¹², diuretic¹³ antipyretic¹⁴ and anti-inflammatory¹⁵ activity on this plant. In the present study, minerals and heavy metals present in the aerial parts of *Phyllanthus longiflorus* (PHL) was quantified using atomic absorption spectroscopy.

MATERIALS AND METHODS

Plant collection and authentication

The plant material was collected from the Western Ghats, Tamilnadu, India during February 2008. It was authenticated by Dr.V.Chelladurai, Govt. Research officer, Botany C.C.R.A.S. Govt. of India, (Retired), Tirunelveli, Tamilnadu, India. A voucher specimen (PHL001) has been deposited for future reference.

Chemicals

Nitric acid, hydrochloric acid and hydrogen peroxide (Merck, India). Standard solutions of Cu, Pb, Mn, Fe, Mg, Zn, and Na (1000 mg/ml) (Merck Germany). Chemicals used were of analytical grade and all the solutions are prepared using triply distilled water.

Sample preparation

The aerial parts of the plant were washed in running water followed by de-ionized water and then dried under shade and powdered. About 2.0 g of plant powder was transferred in to silica crucible and

heated at 450° C for 3 hours using muffle furnace. The ash obtained was dissolved with 5 ml of 6M HCl. The crucible containing acid solution was allowed to digest on hot plate to obtain clear solution. The residue was dissolved in 0.1 M HNO₃ and diluted to 50 ml. Stock solution was also diluted with 0.1 M nitric acid which served as working standard solution¹⁶.

Experimental design

Na, Fe, Mg and heavy metals like, Cu, Pb, Zn and Mn were quantified using atomic absorption spectrophotometer (AA 6300, Shimadzu, Japan) equipped with flame and graphite furnace. Air-acetylene flame was used as fuel, the flow rate, the inert argon gas flow and the temperature parameters were followed as recommended by manufacturer (table 1).

Statistical analysis

The results were presented as Mean±SD of three duplicates. The statistical significance was analyzed by ANOVA.

RESULTS AND DISCUSSION

The present study showed that aerial parts of *Phyllanthus longiflorus* contains the essential elements such as iron, sodium and magnesium and non essential elements such as copper, cadmium and lead. The results also revealed that the absence (not in a detectable quantity) of potassium, manganese, mercury and zinc. Sodium (537.7724 ppm) was found to be present in larger amount followed by iron (343.9820ppm) and magnesium (117.2173 ppm). The concentration of Co, Cd and Pb was 15.6916, 1.8899 and 0.3591ppm respectively. This concentration was found to be less than the permissible limit and so PHL is devoid of heavy metal toxicity. Therefore, aerial parts of *Phyllanthus longiflorus* could be useful as a source for essential elements. A

Table 2: Quantity of minerals and heavy metals in aerial parts of *Phyllanthus longiflorus*

Sl.no	Elements	Concentration (ppm)
1.	Iron	343.9820 ±0.12

2.	Sodium	537.7724 ± 0.52
3.	Potassium	ND
4.	Magnesium	117.2173 ± 0.11
5.	Manganese	ND
6.	Copper	15.6916 ± 0.16
7.	Cadmium	1.8899 ± 0.69
8.	Mercury	ND
9.	Lead	0.3591 ± 0.95
10.	Zinc	ND

Table 1: Instrumental parameters for heavy metals and minerals

Elements	Lamp current low (peak) mA	Wavelength (nm)	Slit width	Lamp mode	Fuel gas flow rate (L/min)	Support gas flow rate (L/min)	Flame type	Burner height (mm)	Correlation coefficient (r)
Copper	6	324.8	0.7	BGC-D2	1.8	15.0	Air-C2H2	7	0.9997
Cadmium	8	228.8	0.7	BGC-D2	1.8	15.0	Air-C2H2	7	0.9999
Zinc	8	213.9	0.7	BGC-D2	2.0	15.0	Air-C2H2	7	0.9944
Manganese	10	285.2	0.2	BGC-D2	2.0	15.0	Air-C2H2	7	0.9930
Mercury	4	253.7	0.7	BGC-D2	1.8	15.0	NONE	22	0.9894
Sodium	12	589.0	0.2	NON-BGC	1.8	15.0	Air-C2H2	7	0.9931
Magnesium	8	279.5	0.7	BGC-D2	1.8	15.0	Air-C2H2	7	0.9940
Iron	12	248.3	0.2	BGC-D2	2.2	15.0	Air-C2H2	9	0.9948
Lead	10	283.3	0.7	BGC-D2	2.0	15	Air-C2H2	7	0.9991

Values are Mean ± SD; n=3, ND – Not detectable.

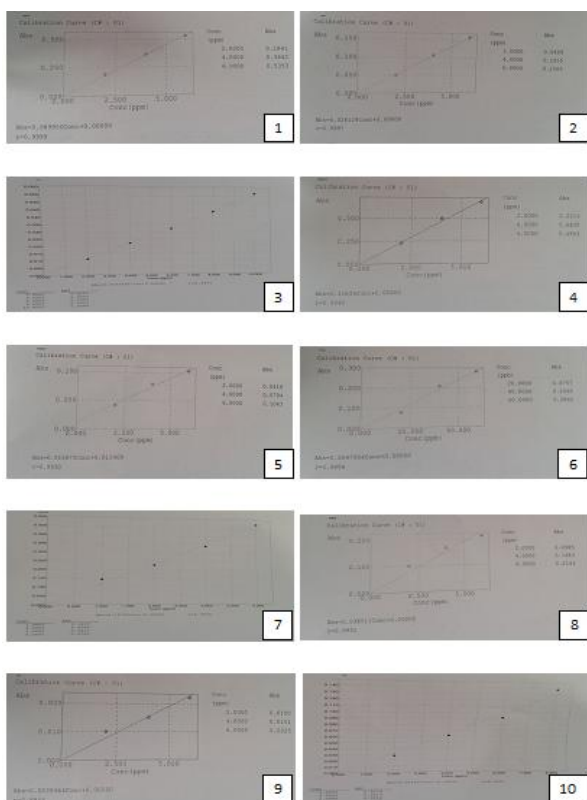


Fig.: Standard calibration curve for 1-Cadmium; 2-Copper; 3-Lead; 4-Magnesium; 5-Manganese; 6-Mercury; 7-Potassium; 8-Sodium; 9-Zinc; 10-Iron.

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