



## Evaluation of Calcium Concentration of Medicinal Plants Incorporating in Dashmool by Atomic Absorption Spectroscopy

Yogita Choudhary, Abhishek Saxena\*, Yatendra Kumar, Sagar Kumar, Vijay Pratap

Department of Pharmacy, Brahmanand Group of Institution, Bulanshahr (UP), India

### Article Information

Received 15 July 2017

Received in revised form 19 Dec 2017

Accepted 20 December 2017

### Keywords:

Dashmool,  
Calcium,  
Ayurveda

Corresponding Author:

E-mail : [abhiclinical@rediffmail.com](mailto:abhiclinical@rediffmail.com)

Mob.: +917520921727

### Abstract

Ayurveda is one of the traditional medicinal systems of Indian. The philosophy behind Ayurveda is preventing unnecessary suffering and living a long healthy life. Dashmool is Ayurvedic preparation containing various parts of ten medicinal plants. The medicinal plants used in Dashmool are collected from different parts of India and variation in elemental concentration has been observed. The present study was aimed to determine the level of Calcium of *Aegle marmelos* (root), *Clerodendrum phlomidis* (root), *Desmodium gangeticum* (root), *Stereospermum suaveolens* (Stem bark), *Oroxylum indicum* (Stem bark), *Gmelina arborea* (stem bark), *Solanum xanthocarpum* (root), *Solanum indicum* (stem bark), *Tribulus terrestris* (root) and *Uraria picta* (leaves) used for the formulation of Dashmool by using Atomic Absorption Spectroscopy. The findings demonstrated that the concentration of Calcium in selected medicinal plants was under the prescribed limits. Such information could be helpful in standardization of Dashmool and imparts better therapeutic efficacy.

### 1 Introduction

India is known for its traditional medicinal systems namely Ayurveda, Siddha, and Unani. Medical systems are found mentioned even in the ancient Vedas and other scriptures. The Ayurvedic concept appeared and developed between 2500 and 500 BC in India. It is a holistic approach towards life, minerals, diet, lifestyle and spirituality. Ayurveda was developed through daily experiences and mutual relationship between people and nature, and thus not only cure diseases but also prevent disease, maintain health and promote longevity. Ayurveda is widely respected for its uniqueness and global acceptance as it offers natural ways to treat disease and promote healthcare.

The Ayurvedic formulations are multicomponent mixtures, containing plant and animals derived products, minerals and metals<sup>1</sup>. The various Ayurvedic formulations are Bhasmas, Asavas, Arishtas, Taila, Churna etc. The healing verses of Ayurveda can be primarily found, in which more than a hundred hymns were mentioned as the cures for diseases, including fever, leprosy, consumption, heart diseases, wounds,

headaches, parasites, eye and ear diseases, poisoning, rheumatism and epilepsy etc<sup>2,3</sup>.

The medical efficacy of Dashmool plants is attributed to elements present in them. Dashmool is a compound drug used in Ayurvedic System of medicine and this is an ancient formulation used by Charak. Dashmool is a combination of ten different parts of plants. The plants namely *Aegle marmelos* (root), *Clerodendrum phlomidis* (root), *Desmodium gangeticum* (root), *Stereospermum suaveolens* (Stem bark), *Oroxylum indicum* (Stem bark), *Gmelina arborea* (stem bark), *Solanum xanthocarpum* (root), *Solanum indicum* (stem bark), *Tribulus terrestris* (root) and *Uraria picta* (leaves) are used for the preparation of Dashmool. The Dashmool is employed for pain disorders and inflammatory diseases related to a musculoskeletal system including osteoarthritis, gouty arthritis and rheumatoid arthritis etc<sup>4</sup>.

Consumption of these plants contributes to the intake of minerals-essential and non essential by the people including infants and the elderly. Many metabolic disorders resulting in human ailments have experimentally been shown to be

managed by traditionally used medicinal plants. Among the factors attributing to the healing potential of these medicinal plants, are the trace elements present in them. The study of calcium with respect to traditional medicinal plants reveal that significant roles in combating a variety of human ailments and diseases. However, it is widely known that in higher concentration, calcium in medicinal plants is responsible for their toxicity. Due to their potential impact on human health, the pharmacological properties of these medicinal plants must be studied<sup>5-7</sup>.

The knowledge on concentrations of these trace elements is important for determining the effectiveness of the plants in treating various ailments so as to understand their pharmacological actions. Therefore, in the present study, attempts have been made to check the level of calcium in medicinal plants incorporated in Dashmool using atomic absorption spectroscopy (AAS).

## 2 Materials and Methods

### 2.1 Plant material

The plant of material of *Aegle marmelos* (root), *Clerodendrum phlomidis* (root), *Desmodium gangeticum* (root), *Stereospermum suaveolens* (Stem bark), *Oroxylum indicum* (Stem bark), *Gmelina arborea* (stem bark), *Solanum xanthocarpum* (root), *Solanum indicum* (stem bark), *Tribulus terrestris* (root) and *Uraria picta* (leaves) were collected from wild sources in the vicinity of area of University Institute of Pharmaceutical Sciences, Panjab University, Haryana (District /Village –Rewari). The identification of the plants was established by studying Taxonomic and morphological characters and comparing them with those described in standard texts. The plant materials were shade dried, reduced to coarse powder and stored in airtight container till further use.

### 2.2 Dry ashing procedure

One gram of sample was transferred into a porcelain crucible. The muffle furnace temperature was gradually increased from room temperature to 450 °C in 1 h. The sample was dried for 1h in the oven, cooled, and reweighed. The steps were repeated at 1h drying intervals until the differences in the variations in the released water were less than 0.05%. The obtained sample was ashed for about 8 h until a gray or white ash residue was obtained.

The residue was dissolved in 5 mL of HNO<sub>3</sub> (25%, v/v) and, if necessary, the mixture was heated slowly to dissolve the residue. Then the digestion solution was heated up using an electric hot plate at 150 °C until evaporated to near dryness. The residue was filtered through Whatman filter paper and transferred into a volumetric flask and made up to 25 mL with 3% HNO<sub>3</sub>. The blank digestion experiment was also prepared in the same way.

### 2.3 Analytical procedure

AAS is a widely used technique for determining a large number of metals. In AAS, an aqueous sample containing the metal analyte of interest is aspirated into an air-acetylene flame, causing evaporation of the solvent as well as vaporization of the free metal atoms (atomization). Calcium in *Aegle marmelos* (root), *Clerodendrum phlomidis* (root), *Desmodium gangeticum* (root), *Stereospermum suaveolens* (Stem bark), *Oroxylum indicum* (Stem bark), *Gmelina arborea* (stem bark), *Solanum xanthocarpum* (root), *Solanum indicum* (stem bark), *Tribulus terrestris* (root) and *Uraria picta* (leaves) sample was analyzed using AAS equipped with flame and graphite furnace.

The solutions La(III) ions when determining Ca were added to both sample and standard solutions in order to overcome chemical interferences in the flame upon determination. The operation conditions used to operate AAS instrument were as recommended by the manufacturer<sup>9-11</sup>. Data were rounded off properly based on the value of standard deviation from measurement conducted in triplicate.

## 3 Results and Discussions

Good quality control of medicinal plants is important, since they are normally consumed without any limitation. It is almost a consensus that, being a natural product, they do not pose any harm to health. Concerning the element concentrations present in medicinal plants, besides the essential elements, they also may contain toxic and non-toxic elements, but, in concentrations above the permissible levels<sup>12</sup>.

Some of the trace elements known to be essential to our body such as As, Co, Cu, Fe, Mn, Ni, Si, Zn and the other essential major elements are Ca, K, Na, and Mg. So, different trace elements in the different medicinal plants will have their definite role in the functioning of our body.

Calcium plays a vital role in the absorption of dietary vitamin B, also for the activation of enzymes like the pancreatic lipase, and for the synthesis of the neurotransmitter acetylcholine. The recommended daily allowance for taking Ca is 800 mg for adults and for children 500 - 1000 mg. Therefore, in order to attain a Ca level of practically one percent of the total diet would be difficult. The concentration of Ca found in various plant material displayed in table 1.

## 4 Conclusion

The level of Calcium in selected medicinal plants was under the prescribed limits. Dashmool is a marketed Ayurvedic product containing *Aegle marmelos* (root), *Clerodendrum phlomidis* (root), *Desmodium gangeticum* (root), *Stereospermum suaveolens* (Stem bark), *Oroxylum indicum* (Stem bark), *Gmelina arborea* (stem bark), *Solanum xanthocarpum* (root), *Solanum indicum* (stem bark), *Tribulus terrestris* (root) and

*Uraria picta* (leaves), and calcium content under permissible limit in Indian product.

**Table 1: Content of Calcium in plants used in formulation of Dashmool using atomic absorption spectrophotometry**

Plants	Part used	Ca (ppm)
<i>Aegle marmelos</i>	Root	3.04±0.25
<i>Clerodendrum phlomidis</i>	Root	1.05±0.61
<i>Desmodium gangeticum</i>	Root	3.03±0.82
<i>Gmelina arborea</i>	Stem bark	1.40±0.17
<i>Oroxylum indicum</i>	Stem bark	4.85±0.83
<i>Solanum indicum</i>	Stem bark	1.76±0.42
<i>Solanum xanthocarpum</i>	Root	8.11±0.58
<i>Stereospermum suaveolens</i>	Stem bark	1.05±0.49
<i>Tribulus terrestris</i>	Root	4.85±0.73
<i>Uraria picta</i>	Leaves	2.33±0.28

## 5 Conflicts of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

## 6 Author's contributions

YC and AS carried out experimental work, and YK, SK and VP participated in data analysis/interpretation of results.

## 7 References

- Kaliappan I, Kammalla AK, Ramasamy MK, Agrawal A, Dubey GP. Emerging need of pharmacokinetics in Ayurvedic system of medicine. *Int J Res Ayurveda Pharm.* 2013; 4(5):647-651.
- Pandey MM, Rastogi S, Rawat AKS. Indian Traditional Ayurvedic System of Medicine and Nutritional Supplementation. *Evidence-Based Complementary and Alternative Medicine.* 2013; 2013: 1-10.
- Parasuraman S, Thing GS, Dhanaraj SA. Polyherbal formulation: Concept of Ayurveda. *Pharmacogn Rev.* 2014; 8(16): 73–80.
- Rai V, Kakkar P, Singh J, Misra C, Kumar S, Mehrotra S. Toxic metals and organochlorine pesticides residue in single herbal drugs used in important ayurvedic formulation – 'Dashmoola'. *Environ Monit Assess.* 2008; 143: 273–277.
- Anal JM, Chase P. Trace elements analysis in some medicinal plants using graphite furnace-atomic absorption spectroscopy. *Environmental Engineering Research* 2016; 21(3): 247-255.
- Ajasab AMO, Bellob MO, Ibrahim AO, Ogunwande IA, Olawore NO. Heavy trace metals and macronutrients status in herbal plants of Nigeria. *Food Chem.* 2004;85:67–71.
- Shirin K, Imad S, Shafiq S, Fatima K. Determination of major and trace elements in the indigenous medicinal plant *Withania somnifera* and their possible correlation with therapeutic activity. *J Saudi Chem Soc.* 2010;14:97–100.
- Liang Y, Xie P, Chan K. Quality control of herbal medicines. *Journal of Chromatography B.* 2004; 812: 53–70.
- Karpiuk UV, Azzam KM, Abudayeh ZHM, Kislichenko V, Naddaf A, Cholak I, Yemelianova O. Qualitative and Quantitative Content Determination of Macro-Minor Elements in *Bryonia Alba L.* Roots using Flame Atomic Absorption Spectroscopy Technique *Adv Pharm Bull.* 2016; 6(2): 285–291.
- Soylak M, Tuzen M, Hayatisari IN. Comparison of microwave, dry and wet digestion procedures for the determination of trace metal contents in spice samples produced in Turkey. *J Food Drug Anal.* 2004; 12(3): 254–258.
- Pohl P, Dzimitrowicz A, Jedryczko D, Szymczycha-Madeja A, Welna M, Jamroz P. The determination of elements in herbal teas and medicinal plant formulations and their tisanes. *J Pharm Biomed Anal.* 2016; S0731-7085.
- Silva PSC, Francisconi LS, Gonçalves RDMR. Evaluation of Major and Trace Elements in Medicinal Plants. *J. Braz. Chem. Soc.* 2016; 27(12): 2273-2289.