



Detection of Macro and Micro Elements in Selected Traditional Medicinal Plants of India

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Abstract:

Medicinal plants have their values in substances present in various plant tissues with specific physiological action in human body. Plants have been integral part of traditional medicine across the continents since time immemorial. The elements present in traditional plants play an important role in treatment of various diseases. Contents of some macro (Ca, Na, K) and micro (Zn, Cu, Fe) in five selected plants by Flame Photometry and ICP-OES. The results revealed that the medicinal plants accumulate the elements at different concentrations. The maximum concentration (mg/l) of macro elements in analysed samples were 21248.75 Ca in Cannabis sativa, 545.2 Na in Pongamia glabra and 13100 K in Eclipta alba respectively. The maximum concentration (mg/l) of micro elements were 21.06, 25.00, Zn, Cu in Datura stramonium and 85.40, Fe in Aloe vera respectively. Although all the plants are found to accumulate good quantity of Fe, Ca, Na and K, hence they are safe for consumption according to the international safety standards.

Key words: Medicinal Plants; Macro; Micro elements

1-Introduction

Plants are one of the most important sources of medicines. The application of plants as medicines date back to prehistoric period. In India the references to the curative properties of some herbs in the Rigveda seems to be the earliest records of use of plants in medicines. The medicinal plants are extensively utilized throughout the world in two distinct areas of health management; traditional system of medicine and modern system of medicine. The traditional system of medicine mainly functions through two distinct streams (1) Local or folk or tribal stream and, (2) Codified and organized Indian system of medicines like Ayurveda, Siddha and Unani etc. The medicinal attributes of many plants are found in leaves, used as alterative, tonic diuretic, blood purifier and antiphlogistic. They are used as remedy against chronic eczema, chronic ulcers, chronic rheumatism, chronic nervous diseases, madness, cholera amenorrhoea, piles and fistula. Usually,

the power of dried leaves is given with milk in mental disability and for the improvement of the memory. The fresh juice of leaves is grown as alterative in jaundice, fevers and gonorrhoea. The same is also useful for children's in cutaneous diseases and for the improvement of nervous system (Mazid et.al.,2012). The scientific documentation of herbal remedies has proved to be beneficial in the further multidirectional researches including drug development. Currently, there is increasing focus on global reaches for new drugs derived from natural plant resource (Chitravadivu *et.al.*, 2009). Even today, majorities of the medicines are prepared from the plant and animal products, minerals and metals etc. In the present study, attempts have been made to study the presence of some macro (Ca, Na and K) & micro elements (Zn, Cu and Fe) in selected medicinal plants i.e *Aloe vera*, *Cannabis sativa*, *Datura stramonium*, *Eclipta alba* and *Pongamia glabra* respectively.



2-Materials and Methods

Samples preparation:

20 gms of fresh leaves of plant species were taken separately and were washed with tap water, then with distilled water, thoroughly to remove the dust. They were washed with 0.15 detergent and with HCl to remove contaminants and they were again washed twice with distilled water. After air dry and dried in oven at 60°C for 24 hrs. They were pounded in mortar to obtain powder form. 0.5 gm of air dried plant powder was dissolved with 3:1 ratio of conc. HNO₃: HCl and digested material on hot plate as well as in microwave oven for about 8-12hrs/overnight till the material was digested completely. The digested material of plant samples were subjected for detection macro elements through Flame photometry and micro elements through ICP-OES.

3-Results and Discussion

Selected Medicinal plants analysed for macro and micro elements, local name, family, parts used and medicinal properties are given in table-1 and 2.

Ca-

The concentration of Ca in the analysed medicinal plants ranges from 3600.23 mg/l to 21248.75mg/l. The maximum concentration of Ca 21248.75 mg/l was found in *P. glabra* while minimum 3600.23 mg/l in *C. sativa* respectively. Calcium used in the development and maintenance of bone structure. It plays function in the clotting process, nerve transfusion, hormone, function and metabolism of Vitamin D etc. (Annalakshmi *et.al.*, 2012a).

Na-

The concentration of Na in the analysed medicinal plants ranges from 85.2 mg/l to 545.2 mg/l. The maximum concentration of Na 545.2 mg/l was found in *P.glabra* while minimum 85.2 mg/l in *E.alba* respectively. The crucial role of Na in conduction of Nerve impulses or its deficiency which may result in thirst and muscles weakness cannot be overlooked (Permann *et.al.*, 1993)

K-

The concentration of K in the analysed medicinal plants ranges from 4285.2 mg/l to 13100.20 mg/l. The maximum concentration of K 13100.20 mg/l was found *P.glabra* while minimum 4285.2 mg/l in *E.alba* respectively. Potassium is essential for smooth flow of communication signals from cell to cell and its deficiency can contribute to diseases like stroke heart problems, diabetes and hypertension. Potassium together with sodium helps to regulate the water balance with in body (Annalakshmi *et.al.*, 2012 b).

Zn-

The content of Zn ranges from 11.5 mg/l to 21.06 mg/l. The maximum concentration of Zn 21.06mg/l was found in *D. stramonium* while minimum 11.5 mg/l in *P.glabra* respectively. As definite permissible tolerant limits of Zn in medicinal plants, foods and agricultural products have not been established by WHO. Bowen (1966) & Alloway (1968) published the tolerable range of elements in agricultural products as 15-200mg/l for Zn. After comparison the results obtained for Zn in table - 2 the values fall in the tolerable limit/range. Zinc maintains various reaction of the body which help to construct and maintain DNA, required for the growth and repair of body tissues.

Cu-

The concentration of Cu in the medicinal plants ranges from 5.04 mg/l to 25.0 mg/l. The maximum concentration of Cu 25.0 mg/l was found in *D. stramonium* while minimum 5.04 mg/l in *A.vera* respectively. According to Bowen (1966) and Alloway (1968) published the tolerable limit of Cu in agricultural products is 4-15 mg/l. However *P. glabra*, *E.alba* and *C. sativa* accumulate Cu outside the range proposed. Cu was an important components of many enzyme systems such as cytochrome oxidase, lysyl oxidase and ceruloplasmin an iron oxidizing enzyme in blood.

Fe-

The concentration of Fe in the analysed medicinal plants ranges from 48.20 mg/l to 85.40 mg/l. The maximum concentration of Fe 85.40 mg/l was found in *A.vera* while minimum 48.20 mg/l in *E.alba* respectively. The permissible limit set by FAO/WHO (1984) in edible plants was 20mg/l. After comparison it is found that all plants accumulate Fe above this limit. Iron sufficient in all studied medicinal plants it make body tendons and ligament, certain chemicals of brain are controlled by the presence or absence of iron, it is essential for the formation of haemoglobin, carry oxygen around the body.

Table1- Medicinal plants, Local name, parts used and Medicinal properties.

S.No	Plant Species	Local Name	Part Used	Medicinal Properties
1	<i>Aloe vera</i>	Ghee –gwar	Leaves	Burns skin, rashes, insect bite, healing wounds
2	<i>Cannabis sativa</i>	Bhang	Leaves	Body inflammation boils, sedative relaxant
3	<i>Datura stramonium</i>	Dahtoor	Leaves	Treatment of asthma and sinus infections, Sedative hypnotic.
4	<i>Eclipta</i>	Bhrangraj	Leaves	Treatment of liver cirrhosis, hepatitis and infective hepatitis. It is also used for liver enlargement, jaundice and other ailments of the liver and gall bladder. It has also shown excellent antifungal and antiviral activity.
5	<i>Pongamia glabra</i>	Tukham- Karanjwa	Leaves	Juice is used for cold, coughs, diarrhoea, dyspepsia, flatulence, gonorrhoea and leprosy

Table-2: Distribution levels (mg/l) of macro elements in the analysed medicinal plants by Flame Photometry.

S.No	Plant Species	Ca	Na	K
1	<i>Aloe vera</i>	2450.45	249.82	12886.50
2	<i>Cannabis sativa</i>	21248.75	112.94	9432.86
3	<i>Datura stramonium</i>	5310.60	348.25	7800.36
4	<i>Eclipta alba</i>	13343.35	85.25	13100.28
5	<i>Pongamia glabra</i>	3600.23	545.20	4285.25

Table-3: Distribution levels (mg/l) of microelements in the analysed medicinal plants by ICP-OES.

S.No.	Plant Species	Zn	Cu	Fe
1	<i>Aloe vera</i>	12.46	5.04	85.40
2	<i>Cannabis sativa</i>	13.69	10.70	50.50
3	<i>Datura stramonium</i>	21.06	25.00	52.30
4	<i>Eclipta alba</i>	13.98	20.00	48.20
5	<i>Pongamia glabra</i>	11.5	24.20	65.01

Figure 1: Concentration of macro elements (mg/l) in selected studied plant species.

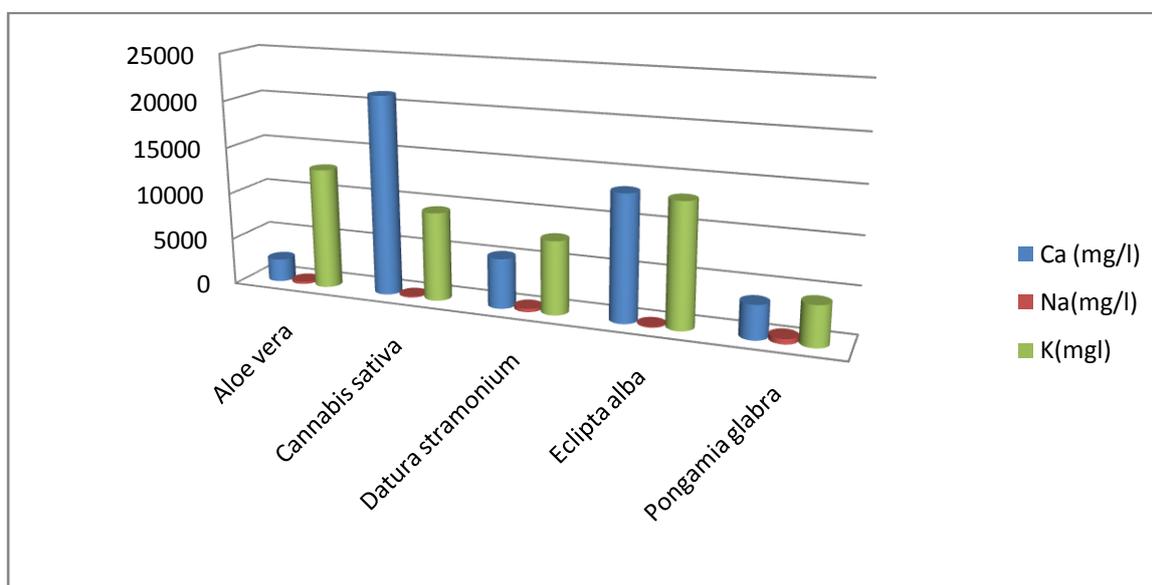
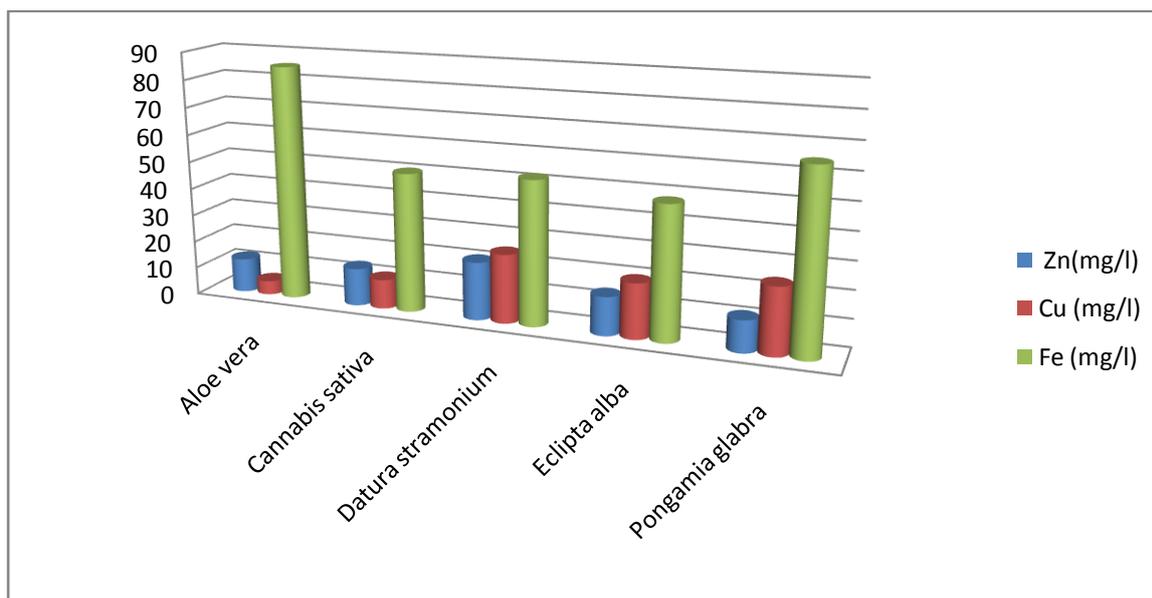


Figure 2: Concentration of micro elements (mg/l) in selected studied plant species.





4-Conclusion

This study revealed that medicinal plants are good source of Fe, Ca, Na and K. The medicinal plants used in some important elements and therefore may have therapeutic properties. The mode of application in nature of these medicinal plants as a source of mineral supplements in the body has been traced to insufficient data on the mineral accumulation in such plant (Lasisi and Yusuf, 2005). Macro and microelements influence biochemical processes in the human organism. Study of elements with respect to indigenous medicinal plants reveals that major and trace elements have significant roles in combining a variety of human ailments and disease. The need to screen medicinal plants, used in traditional medicine for their elemental consumption is highly desirable.

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