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Macro and Micro Minerals Content in Some Important Indian Medicinal Plants

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ABSTRACT

The mineral composition of the leaves/roots of three commonly used medicinal plants of west India Himalayas were determined. The medicinal plants investigated were *Melia azedarach*, *Asplenium dalhousiae* and *Kalanchoe spathulata*. The macro and micro minerals were analysed by Flame Photometer and Atomic Absorption Spectrophotometer, respectively. The leaves/roots of these plants have also been reported rich in minerals such as Na, K, Ca, Fe, Mn, Cu and Zn. Minerals results suggest that these medicinal plants could be used as raw materials in drug formulation.

Key words: Minerals, medicinal plants, macro and micro minerals

INTRODUCTION

The medicinal value of the plants lies in their chemical substances that produce a definite physiological action on human body (Hill, 1952). Therefore there is need to evaluate the local herbs for mineral and nutrient composition, so as to determine the potential of indigenous source of medicine (Rahila *et al*., 1994). *Melia azedarach* (Meliaceae) is a wild plant native to India, Southern states of America, Africa, South Europe and warmer parts of the globe. It has been widely used for its analgesic, emetic, antiseptic and anthilmintic properties. The plant resembles neem in having the medicinal properties (Rastogi and Mehrotra, 1995; Chopra *et al*., 1956). *Asplenium dalhousiae* (Aspleniaceae) is a wild plant native to India, Mule, Hauchuca and Baboquivari mountains of Southern Arizona. It has been widely used in traditional medicines for spleen ailments, jaundice and diuretic. Rhizomes of the plant are used in abscesses (Dhar *et al*., 1974). Kalanchoe spathulata (Crassulaceae) is a wild plant native to tropical and subtropical Himalayas of India. The plant roots are used in cholera, burnt, applied to wound and diarrhea (Gaind and Gupta, 1971; Supratman *et al*., 2000).

MATERIALS AND METHODS

The leaves and root of these plants were collected from Nainital District of Uttaranchal, India. The plant materials were dried in shade after collection. Mineral content in plant was estimated by wet digestion method. The 1.0 g plant material was first digested with two successive aliquots of conc. HNO_3 (5 mL each). After burning, the organic matter was slowly digested with 15 mL of triple acid mixture (HNO_3, $HClO_4$ and H_2SO_4, 10:4:1, v/v) at 200°C and reduced to about 1 mL. The residue after digestion was dissolved in double distilled water, filtered and diluted to 100 mL. This solution was used for the estimation of minerals. Macro minerals viz., Na, K, Ca and Li were

estimated by AIMIL, Flame Photometer while micro elements viz., Fe, Cu, Mn, Zn and Co were estimated by Atomic Absorption Spectrophotometer, model 4129, Electronic Corporation of India, Ltd.

RESULTS AND DISCUSSION

Minerals are called a "spark plugs of life" because they are required to activate hundred of enzymes reactions within the body. Life is dependent upon the body's ability to maintain balance between the minerals (Watts, 1997). The aim of this study was to characterize the mineral antioxidant value of the above medicinal plants with particular attention to macro and micro minerals. In this study, we have observed that amongst three medicinal plants the range of sodium, potassium and calcium in leaves/roots varied from 1.33-56.51, 1464.48-2010.30 and 248.51-826.85 mg/100 g (Table 1), respectively at dry weight basis. The micro minerals, amongst three medicinal plants leaves/roots, the range of iron, copper, zinc and manganese varied from 19.96-165.47, 0.62-2.15, 4.37-18.99 and 5.12-15.15 mg/100 g (Table 2), respectively on dry weight basis. Cobalt was not absorbed in all three plants leaves/roots.

Maximum sodium content was absorbed in *K. spathulata* roots and minimum content was in the leaves of *M. azedarach*. Potassium content was absorbed maximum in *A. dalhousiae* leaves and minimum in the roots of *K. spathulata*. Calcium content was absorbed maximum in *M. azedarach* leaves and *A. dalhousiae*. The maximum micro minerals iron was absorbed in the leaves of *A. dalhousiae* and minimum in the leaves of *M. azedarach*. The copper content was absorbed maximum in the roots of *K. spathulata* and minimum in the leaves of *M. azedarach*. The zinc content was absorbed maximum in *A. dalhousiae* leaves and minimum in the leaves of *M. azedarach*. The manganese content was absorbed maximum in the roots of *K. spathulata* and minimum in the leaves of *M. azedarach*.

The minerals contained in these medicinal plants may play important role in human nutrition. Magnesium, calcium and potassium in the human were required for building red blood cell and for

Table 1: Macro minerals investigated in medicinal plants (mg/100 g dry weight basis)

	Na		K		Ca	
Medicinal plants	Range	Mean	Range	Mean	Range	Mean
Melia azedarach						
Leaves	20.12-22.54	21.33	1758.12-1772.56	1765.34	825.74-827.96	826.85
Asplenium dalhousiae						
Leaves	34.10-34.18	34.14	2009.13-2011.47	2010.30	249.16-247.86	248.51
Kalanchoe spathulata						
Roots	56.43-56.59	56.51	1471.10-1457.86	1464.48	810.76-812.48	811.62

Table 2: Micro minerals investigated in medicinal plants (mg/100 g dry weight basis)

	Fe		Cu		Zn		Mn		CO	
Medicinal plants	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Melia azedarach										
Leaves	19.08-20.12	19.96	0.56-0.68	0.62	4.31-4.43	4.37	5.09-5.15	5.12	ND	-
Asplenium dalhousiae										
Leaves	164.22-166.72	165.47	2.09-2.13	2.11	18.56-19.42	18.99	7.05-7.11	7.05	ND	-
Kalanchoe spathulata										
Roots	57.60-58.14	57.87	2.11-2.19	2.15	7.29-7.37	7.33	15.11-15.19	15.15	ND	-

body mechanism (WHO, 1996). A deficiency of copper may cause hypertension, antibiotic sensitivity, hyperactivity, hyperglycemia, manic disorders, insomnia, allergies and osteoporosis (Watts, 1997). Calcium plays a major role in CNS function. Calcium is essential for nerve impulse conduction and activates some enzymes which generate neurotransmitters (Watts, 1997). Phosphorous is tied to calcium in bone structure and plays a significant role in CNS function. Many enzymes contain as a base phosphoproteins. Phospholipids are involved in nerve conduction. Phosphate is the primary ion in extra and intracellular fluid. It aids absorption of dietary constituents, helps to maintain the blood at a slightly alkaline level, regulates enzyme activity and is involved in the transmission of nerve impulses (Karade *et al.*, 2004). Potassium has many functions for protein synthesis, activation of many enzymes, stimulation of the movement of the intestinal tract, etc. Excess of potassium can produce neurological disturbances such as numbness of hand and feet (Watts, 1997). Zinc is extremely important for numerous body functions. Zinc deficiencies are associated with mental impairments. Zinc deficiency may be associated with mental lethargy, emotional disorder and irritability (Watts, 1997). Iron plays significant role in oxygen transport in the body. Disturbance in mental function can be caused by flow in the metabolic pathways that require iron. This is because of too little oxygen reaching the brain. Iron is required for DNA synthesis. Iron is also necessary for the activation of enzymes involved in brain neurotransmitters (Watts, 1997).

The high lavel of mineral in these medicinal plants show that the leaves/roots of plants could be provide alternative source of calcium and potassium in diet. Absence of minerals in diet might result in weak, stunted growth and poor bone development. Minerals are intermediate in the biosynthesis of carticosteroids and related hormones. Therefore, nutraceutical and pharmaceutical industries could use these plants for such purposes. Thus the study concludes that *M. azedarach*, *A. dalhousiae* and *K. spathulata* are excellent source of minerals. Thus these plants could serve as good source of minerals when consumed. This conformed to the observation of some researchers who opened that green vegetables are good source of iron, copper and zinc (Barasi and Mottram, 1987). The distribution of minerals in common medicinal plants has important application for the health of people in addition to the basic need of developing countries. There is a great need to further study.

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