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Research Article

TRACE ELEMENT ANALYSIS AND VITAMINS FROM AN INDIAN MEDICINAL PLANT *NEPETA HINDOSTANA* (ROTH) HAINES

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ABSTRACT

Indian subcontinent excels in medicinal plant diversity which supports the health care systems of most rural and tribal communities since long ago. The present paper deals with analysis of trace elements and vitamins present in an Indian medicinal plant, *Nepeta hindostana* (Roth) Haines. The results revealed the presence of bioactive ascorbic acid, riboflavin, thiamine and niacin. Along with this it is a best source of trace elements like Na, K, Mg, Zn, Fe and Mn., indicates the promising potential of this plant as medicine.

Keywords: *Nepeta hindostana*, Vitamins, Trace elements.

INTRODUCTION

Medicinal plants provide about 80% drugs worldwide. Medicinal value of the plant is due to presence of a variety of phytochemical and elemental composition. Therefore, it is essential to investigate the phytoconstituents, elements and vitamin supplements present in the medicinal plant to assess their medicinal values. *Nepeta* is a multiregional and largest genus of Lamiaceae comprising about 250 species distributed over North Africa, North America, Europe, South-western and central Asia. South-west Asia supports greatest abundance of these plant species. Most of the Indian species of *Nepeta* are annual herbs. Several *Nepeta* species are used as traditional medicine i.e. diuretic, diaphoretic, vulnerary, antispasmodic, antiasthmatic and sedative agent. This plant is also been used against nervous, respiratory and gastrointestinal disorders. Previous reports indicated that *Nepeta* species are rich in fatty acids, flavones, steroids, glycosides, terpens and carbohydrates[3,5,8,9,13]. The objective of the present study is to evaluate the phytochemical constituents, vitamins and trace elements present in *Nepeta hindostana* (Roth) Haines, a species found in hilly forest tracks of eastern Maharashtra, India.

MATERIAL AND METHODS

Areal parts of *Nepeta hindostana* were collected from the tribal zone of Narnala forest range and Melghat reserve forest area (eastern MS) India in August 2009 and identified by regional taxonomist using flora of Maharashtra. The herbarium specimen of the plant was deposited in Department of Botany, Shri Shivaji College, Akola (MS) India. The collected material was shade dried, chopped and ground to coarse powder with the help of electrical grinder and stored in air tight packets until further analysis.

Chemical analysis

The elemental analysis of calcium, sodium, phosphorus, magnesium, potassium iron and copper was done according to Shahidi et al., [14]. The ground sample of *N. hindostana* was sieved with a 2mm sieve and 5gm of sample was subjected to dry ashing in a well cleaned porcelain crucible at 550°C in muffle furnace. The resulting ash was dissolved in 10 ml HNO_3/HCl/H_2O (1:2:3) and heated gently until brown fumes disappeared. To the remaining material of crucible 5ml distilled water was added and heated until colorless solution was obtained. The mineral solution of crucible was transferred to 100ml volumetric flask by filtering through Whatmann filter no. 42 and volume was made up by distilled water. This solution was used for elemental analysis by Atomic absorption spectroscopy. Concentration each element was calculated as percentage of dry matter. Phosphorus content was analyzed calorimetrically using the method of Nahapetian and Bassiri [11]. To 0.5ml of digested sample 4ml of distilled water, 3ml of 0.75M H_2SO_4, 0.4ml $(NH_4)_6$ $MO_7O_{24}.4H_2O$ and 0.4ml 2% ascorbic acid were added and mixed. The solution was allowed to stand for 20min and absorbance was recorded 660nm.

Estimation of vitamins

Thiamine: 5gm of sample was homogenized in 50 ml ethanolic sodium hydroxide. Its 10 ml filtrate was added to 10 ml potassium dichromate and absorbance was recorded at 360 nm after development of color.

Niacin: 5gm of sample was treated with 50 ml of 1N sulphuric acid for 30 minutes and 0.5ml of ammonia solution was added to it. It was filtered; to 10 ml of this filtrate 5ml of potassium cynide was added and then acidified with 5 ml 0.02N H2SO4. The absorbance of the resulting solution was recorded at 420nm.

Riboflavin: 5gm sample was extracted with 100ml ethanol for 1hr. 10 ml of this filtered extract, added 10ml 5% potassium permanganate and 10ml 30% H2O2 and allowed to stand on hot water bath for 30 min. To this added 2ml of 40% sodium sulphate. The volume was made up to 50 ml and absorbance was recorded at 510nm.

Ascorbic acid: Ascorbic acid was determined as per the method given by Barkat et al., 1973. 5gm of sample was taken into 100 ml EDTA/ TCA (2:1) and mixed well. This mixture was centrifuge at 3000 rpm for 20 min. It was transferred to 100ml volumetric flask and volume was made up. 20ml of this mixture with 1% starch solution was titrated with 20% $CuSO_4$ till the appearance of dark end point.

RESULTS AND DISCUSSION

The present investigation is focused on the analysis of phytoconstituents of medicinally important plant *Nepeta hindostana* from eastern Maharashtra, India. The phytochemical analysis indicates significantly high quantity of alkaloids, flavonoids and saponins in sample indicating its antimicrobial and antioxidant potential (Data not shown).

Its known fact that the plant growth is regulated by various biochemical processes involving inorganic elements present in the soil. Trace quantities of these elements are essential for enzyme catalyzed biological processes. These elements are made available to human beings by the plants. Hence, their presence is vital for the health and to cure diseases [7].

The presence of trace elements indicates the medicinal value of the plant. Sometimes different combinations of the elements present in medicinal plants helps to cure the ailments. The mineral content of *N. hindostana* was shown in table 1. Magnesium (Mg) was the most abundant macro element (10.523mg/ 100gm) closely followed by sodium (7.628mg/100g). Amongst the microelements, copper was most abundant (12.44mg/ 100g) while the content of iron was

8.45mg/ 100gm of sample. The Manganese and cadmium content was very low (Table 1).

Analysis of Vitamins showed the high quantity of Ascorbic acid (Vitamin C) 25.32mg/ 100gm. Niacin, Riboflavin and Thiamine were also detected but in very low quantities (Table 2).

N. hindostana is a potential medicinal plant having analgestic and antipyretic activity attributed to its chemical and elemental compositions. The mineral Mg detected in this plants are involved over 300 enzymatic reactions of the body involving glycolysis, krebs cycle, nucleic acid synthesis, amino acid activation, muscle regulations, and protein synthesis [12, 15]. Thus due to high content of Mg, *N. hindostana* may have the potential to cure the ailments related with above mentioned activities.

Copper (Cu) is an essential redox-active transition element that ply vital role in various metabolic processes. Being toxic, its quantity should be mentioned very low. It is well known that the high content of transition metal like Cu catalyzes the formation of hydroxyl (OH) radicals, hence their excess quantity can cause oxidative stress in plants and consequently increase the antioxidant response [5]. As *N. hindostana* contain high level of Cu, it might be a good source of antioxidant potential.

This plant also showed presence of ascorbic acid, riboflavin, Niacin and thiamin. Natural ascorbic acid is very good for body performance. Lack of ascorbic acid impairs the normal formation of intercellular substances in the body viz., collagen, bone matrix and tooth dentine. The striking patho-physiological change resulting from this defect includes the weakening of the endothelial walls of the capillaries due to reduction in the amount of intercellular substances. Therefore, the clinical manifestations of scurvy hemorrhage from mucous membrane of the mouth and gastrointestinal tract, anemia, pains in the joins can be related to the association of ascorbic acid. This function of ascorbic acid can also be accounts for its requirement in normal wound healing[13]. As a result of the availability of ascorbic acid in *N. hindostana*, this plant may be used as herbal medicine in future for the treatment of various ailments.

Table 1: Elemental detection of whole plant of *N. hindostana* on a dry weight basis expressed as mg/ 100gm sample.

Minerals		Quantity
Macro elements	Magnesium	10.523 ± 0.22
	Sodium	7.628 ± 0.53
Micro elements	Copper	12.44 ± 0.18
	Iron	8.45 ± 0.68
	Manganese	0.32 ± 0.10
	Cadmium	0.09 ± 0.03

Results are mean of triplicate estimation on dry weight basis ± standard deviation.

Table 2: Vitamin composition of whole plant of *N. hindostana* on a dry weight basis expressed as mg/ 100gm sample.

Vitamin	Quantity
Ascorbic acid – Vitamin C	25.20 ± 0.65
Riboflavin	0.20 ± 0.03
Niacin	1.39 ± 0.45
Thiamine	0.48 ± 0.12

Results are mean of triplicate estimation on dry weight basis ± standard deviation.

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