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DETERMINATION OF TRACE ELEMENTS IN SOLANUM NIGRUM L. BY ATOMIC ABSORPTION SPECTROSCOPY

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Abstract

Solanum nigrum L. was analysed for the mineral and toxic elements by atomic absorption spectroscopy. In the root, stem and leaves the following trace and toxic elements were detected: Iron, Copper, Lead, Chromium, Nickel, Cadmium, Sodium, Potassium, Calcium and Magnesium.

Introduction

Solanum nigrum L. is locally called Mako or Kaval belongs to the family Solanaceae was analysed for trace and toxic elements. This species is commonly found in wild conditions and mostly recognized as weed[12]. As early as the first century B.C. the Greeks military doctor Dioscoridies pointed out the significance and toxicity of *S.nigrum*[4].

S.nigrum was probably originated in Southern Europe and it is now cosmopolitan species. It is a small annual herb 0.1-0.6 m tall branched with more or less angular stem, leaves ovate to broad triangular to rhombic acuminate. Flowers short pedicellate, in umbel-like cymes. Fruit black, glossy.

Because of the characteristic morphology the identification of *S.nigrum* offers no difficulty. This species is generally regarded as toxic and poisonous, yet it constitutes most valuable drug to treat a range of diseases.

The trace and toxic element studies of biologicaly important material has attracted the attention of research workers, since last three decades. Some trace metals are essential for plant growth, others are phytotoxic and some are toxic to

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animals and human beings. The ancient medical science Ayurveda realized the importance of mineral in health and disease[1].

Recently trace metals have been shown to play an important role in normal functioning of various organs of the body, especially the cardio vascular system. Experiments performance on animal and epidemiological studies the elements which can be associated with the pathogensis of hypertension are, Cd, Pb, Hg, and Na as pressors and Zn, Cu, Mg, K and Se as depressor[1]. some unani poly Pharmaceutical preparation claimed to be effective in hypertension e.g. seed coat of *Cicer arietinum*, L. and grains of *Hordeum vulgare*, L. keeping in view of the significance of trace elements in plants, the present work is aimed to identify the trace and toxic elements in *Solanum nigrum* species; so far no such type of work has been done on the above cited species in Pakistan.

Material and Method

The plant samples of *S.nigrum* were collected from Shah Abdul Latif University Campus at Khairpur mirs. for vouchers, herbarium sheets were prepared, following the standard techniques, and are lodged at Sindh University herbarium at Jamshoro.

The plant organs i.e. root, stem, and leaves were washed with deionized water, and were dried at 100°C in an electric oven for the determination of moisture percentage. The dried samples were grind to powder, 500 mg of each powder tissue were weighed into separate 100 ml beakers and were treated with 5 ml. of Nitric acid. 5ml of Nitric acid was also added to empty 100 ml beaker serving as blanks.

The beakers were covered with watch glasses, and their contents were heated to reflux gently on an electric hot plate. After refluxing for an hour, the content of the beakers were treated with 5 ml of Nitric acid, 2 ml of 30% Hydrogen peroxide was added, and heating at gentle reflux was continued for an another hour. The watch glasses were removed from the beakers and the heating was continued until the volumes of their contents were reduced to 2-3 ml. The contents of the beakers were cooled to room temperature, and diluted with higher purity water, filtered through whatman No.42 paper, and brought to volume of 50 ml in volumetric flask with deionized water, and labeled a stock sample solution.

The stock sample solutions were atomized in air acetylene flame for following elements: Ca, Cr, Na, K, Fe, Cu, Ni, Pb, Mg, Mn, and Zn. The stock solutions of the test samples were appropriately diluted to obtain signal within experimental range. A series of standard solutions were simultaneously run on Atomic absorption spectrophotometer, Hitachi Model 180-50. The calibration curves were obtained for concentration Vs. absorbance data which were statistically analyzed using fitting of straight line by least square method.

Results and Discussion

All parts of *S.nigrum* specially the unripped fruit contains the glycoalkloid solanine; other toxic alkaloids reported by Keeler in 1978[9] are chaconine and salasodine. Liebenow (1970)[10] reported the nitrates and nitrites in *S.nigrum* which are present in variable amounts, and may contribute to its toxic effects. Hubbs (1947)[6], Hart (1963)[5] and Faweett & Jenning (1979)[3] reported poisoning due to *S.nigrum* in animals and human respectively. According to Muenscher (1951)[11] solanine poisoning may cause narcosis and paralysis.

Beside the toxic effect, *S.nigrum* also contain some valuable medicinal properties. Leaves are used as poultice over rheumatic and gouty joints in skin diseases. Berries are used in dropsy, heart diseases, enlargement of spleen and liver[9,2].

Due to the relationship between the content of an element in tissue and its biological effect the elements analysis is an important tool in all the fields of life sciences. Different tissues of *S.nigrum* were analysed for trace elements, and two main groups were identified. the first group containing Sodium, Calcium, Potassium, Magnesium, Iron and Magnese, and second group containing Nickel, Lead, Copper, Zinc, Chromium and Cadmium elements.

The leaves of *S.nigrum* contain high K values and root contains high amount of Ca, and Fe,. The concentration of Mn and Ni were observed high in stem, for detail see table 1.

As far as the trace elements are concerned, the high values of Mg, Cu, Ni were obtained in leaves of *S.nigrum.* Zn level was also high both in leaves and stem of this species.

Table 1

Determination of trace elements in Solanum nigrum a by atomic absorption Spectrophotometer Hitachi Model 180-50.

Elements	Conc–Range ppm	Absorption Range.	Calibraliai (y=ax+c)	Curve Stastical		Amount of elements in Solanus nigrum Total mg/100g on dried base		
	x	y	m	c	r	Root	Stem	Leaves
Iron	0.00-1.0	0.0-0.082	.080-.08228	0.100-.00021	0.998	37.71	7.29	20.88
Manganese	0.00-1.0	0.0-0.118	0.1128-0.1186	0.000518-0.004	0.999	1.745	1.4522	2.6155
Chromium	0.00-100	0.0-0.032	0.000.0308	0.00125	0.9967	00.00	0.12175	0.12175
Copper	0.01-1.00	0.0-0.061	0.624	0.0016	0.996	1.41025	1.16985	1.41025
Zinc	0.00-1.0	0.0-0.204	0.1998	0.0015	0.999	29.27	68.31	66.81
Nickel	0.00-0.25	0.0-0.13	0.0519	0.000125	0.0998	0.7586	1.144	0.4696
Lead	0.00-1.0	0.0-7 Divi.	7.028	0-.2	0.996	1.565	1.565	1.565
Potassium	0.00-5.00	0.00-450	0.0895	0.000169	0.999	236.6	310.9	2020.4
Magnesium	0.00-100	0.085-0.605*	0.631-0.598*	0.0058–0.0122	0.996	8.0	12.99	524.74
Sodium	0.00-2.00	0.075–.601*	0.3022–0.3002*	$2\times1^{-11}.001$	0.999	1312.45	169.8	426.8
Calcium	0.00-2.5	0.00-0.68	0.274	–0.00092	0.999	506.00	143.06	160.29

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Trace elements in Solanum nigrum L.

Among the known essential trace elements only Zinc have received sufficient attention. Zinc deficiency has a pronounced effect on skin in human and animals, yet very little is known about other metals. *S.nigrum* leaves have a very high amount (66.81 mg/100 mg) of Zinc element that proves their efficiency for skin diseases.

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