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Trace Elements in Two Varities of Indigenous Medicinal Plant *Catharanthus roseus* (*Vinca rosea*)

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Abstract: The study was conducted to investigate the elemental constitutes in two varieties of indigenous medicinal plant *Catharanthus roseus* Vern Sada Bhar misapplied name was *Vinca rosea*. All parts of both varieties i.e. *V. rosea* with pink flower and other with white flower were analysed for elements, Ca, Na, K, Mg, Zn, Fe, Cu, Co, Mn, Ni, Cr, Cd, Pb, Ba and Al, by wet digestion method and available elements in decoction of each part of both varieties, using atomic absorption spectrophotometer. The level of essential elements such as Zn, Fe, Mn, and Cu is present in considerable amount. The level of available Zn was observed in decoction of flower as compared to other parts of plant. High level of Fe was observed in pink flower variety of *V. rosea*. The level of Al was high in flower of *V. rosea* white variety as compared to flower of *V. rosea* pink variety. In decoction the level of essential elements is high as compared to toxic elements.

Key words: *Vinca rosea*, medicinal plant, decoction, trace elements

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Introduction

Unani crude drugs are mostly used as Joshanda or Decoction, a Persian word "prepared by boiling", which is aqueous containing some water soluble organic principles such as glycoside, saponin sugars and mostly inorganic compounds (Vohora, 1986). The attention for the investigation of inorganic constituents was drawn by Hakim Abdul Hamid President Hamdard National Foundation India, who is the originator of the discipline "Elementlogy" (Arora *et al.*, 1984). He believe that health depends upon the organized state of elements in the body and their imbalance causes disease (Golden, 1988). According to him restoration of balance by drugs can cure diseases. Medicinal properties have been attributed to a large variety of plants cultivated in different parts of Pakistan (Rajput *et al.*, 1996). The active constituents especially inorganic elements present in plant are very variable quantity (Gauch, 1972) if grown under unfavorable or favorable conditions and different type of varieties used for cultivation. Keeping these factors in view, standarization of medicinal plant species is essential to provide drugs of good average quality for obtaining desired results.

The aqueous extract gave +ve test for glycosides, saponin, which are water soluble, water insoluble organic compounds were absent. The level of essential elements is low in decoction of each part of *V. rosea* as compared to total elements. It is well known fact that inorganic trace elements are active even in very low concentration.

Materials and Methods

Plant samples: Five to ten samples of both verities of Sadabhar were collected from different area of Hyderabad city and Sindh University ,Jamshoro Campus. Reference samples were identified by Botany department of Sindh University Jamshoro, Pakistan.

Reagents and apparatus: All the reagents and chemical used were of AR grade. All the solution of standards and samples were prepared in deionized water. Mineral elements analysis of all parts of samples and reference materials was carried out by Atomic Absorption Spectrophotometer Hitachi Model 180 - 50 using flame absorption mode.

Experiment: Four method were adopted for the wet digestion and dry ashing of all parts of plants such as

1. Plant samples digested with H_2SO_4: HNO_3 : $Hclo_4$ (1:1:1)
2. Dry ashing at 500°C.
3. Samples digested with H_2SO_4: HNO_3 and 30% H_2O_2(2:2:1).
4. Sample digested with HNO_3: 30% H_2O_2 (2:1), (Kazi *et al.*, 1999).

Digestion method No. 4 is applied for whole experiment because this method is rapid and percentage recovery of all elements is better than other digestion methods. The different parts of plants were washed with distilled water and dried at 120°C in electric oven till a constant weight is obtained is obtained. The dried plant material was then ground to powder. Each part of sample plants and reference sample was weighed into separate flasks and treated with 5ml HNO_3, side by side and 5 ml HNO_3 was also added in empty flask which served as blank. The flasks were covered with watch glasses and heated to reflux on an electric hot plate at 80 to 100°C. After heating for one hour, the contents of flasks were treated with additional 5ml of HNO_3, followed by 2ml of 30% H_2O_2 and the heating at gentle reflux was continued till the clear solution obtained, diluted with deionized water and filter through Whatman # 42 paper into volumetric flasks marked as stock sample solution.

Determination of mineral elements: Working standard solutions of Al, Ca, Cd, Co, Cr, Cu, Fe, Pb, Mn, Mg, Ni, K, Na and Zn were prepared from stock standard solution 1000 ppm in 2N HNO_3 and calibration curves were drawn for each element using Atomic absorption Spectrophotometer Hitachi model 180 - 50. The calibration curves obtained for concentration VS absorbance data were statistically analyzed using fitting of straight line by least square method in Table 1. These 15 elements were determined in medicinal plants. A blank reading was also taken and necessary correction was made during the calculation of percentage concentration of various elements.

Percentage recovery test: The efficiency of extraction method was checked by standard addition method. The matrix of standards and sample solutions was same by using 2N HNO_3 . The percentage recovery test for different elements by this digestion method was 98.5 to 99% in range.

Results and Discussion

Presently many patients have been turning to traditional medicine as 'alternative' medicine, in search of the relief which routine present day medical care has not been able to give them. In developing nations, alternative medicine could help to solve many of the common as well as peculiar medicinal problems facing the people.

Medicinal plants are now increasingly being used in raw, semi-processed and polypharmaceutical form as medicine in Eastern medicine which is playing a significant role in providing relief to a great number of people in Asia.

According to Dr. S.B. Vohora (1986) disturbance of the element contents was detected during development of more than 135 diseases. (Aikawa *et al.*, 1971) have found that supplementation of diet with Mg on time could induce remission of early symptoms of leukemia among experimental animals. In cancer disease (Dobrowolski, 1987) the change of Ca and Mg index is very symptomatic.

It is well known fact that inorganic trace elements are very active in very low concentration and the analysis of different parts of both verities and the decoction of each part has shown the presence of many essential and important elements such as Ca , Mg, Zn, Fe, Co and Mn etc. Zn is very effective in killing virus (Randal, 1984).

The distribution of the elements in various genera and species of plants will highlight in the knowledge of the distribution of certain useful trace elements and their availability from medicinal plants. The uptake of mineral constitute were depend on different factors such as, the amount of mineral elements present in soil, their availability and the botanical factor. The variation in mineral composition was observed in different varieties of the same specie.

The uptake of Ca, K is different in both varieties of *V. rosea* (Table 2 and 3). The level of Fe and Zn was observed high in flower of pink varieties as compared to variety having white flower. It was concluded that the level of toxic elements was very low in all parts of both varieties. Mineral elements such

Table 1: Statistical data for standard of elements

Elements	Conc. Rang ppm (x)	Absorption range (Y)	Statistical calculation y=mx+c		
			m	c	r
Sodium	0.0-1.0	0.0-0.313	0.3079	0.0032	0.999
Potassium	0.0-1.0	0.0-0.565	0.5654	0.0026	0.999
Calcium	0.0-1.0	0.0-0.0305	0.0304	0.0002	0.999
Magnesium	0.0-1.0	0.0-0.883	0.886	0.0133	0.996
Iron	0.0-4.0	0.0-0.255	0.0641	0.001	0.999
Zinc	0.0-1.0	0.0-0.286	0.2861	0.0006	0.999
Maganese	0.0-1.0	0.0-0.09	0.0886	0.0018	0.998
Chromium	0.0-0.5	0.0-30*	60	0.35	0.999
Cobalt	0.0-1.0	0.0-72*	72	0.4	0.999
Copper	0.0-1.0	0.0-0.097	0.0966	0.001	0.999
Aluminum	0.0-10	0.0-0.03075	0.0032	0.001	0.996
Nickel	0.0-0.5	0.0-45*	89.6	0.4	0.999
Lead	0.0-0.5	0.0-41*	82	0.175	0.999
Cadmium	0.0-0.5	0.0-88*	176.8	0.35	0.999

Key= (*) =y is division of recorder at expansion X5

Table 2: Determination of metals in *V. rosea* ver. white, family Apocyanceae by Atomic Absorption Spectrophotometer Hitachi model 180 – 50. (mg/100g dried basis)

Elements	Leaf	Stem	Flower
Sodium			
	61.40-103.32	950.8-981.2	68.0-68.8
	(53.8-55.4)*	(104.3-107.5)*	(26.19-34.3)
Potassium			
	379.13-384.06	292.52-301.38	542.52-552.36
	(265.6-311.50)	(228.05-256.23)	(177.75-191.01)
Calcium			
	637.33-966.3	565.38-596.21	277.5-453.1
	(383.44-410.38)	(149.96-167.92)	(266.70-293.64)
Magnesium			
	161.11-192.65	134.98-134.32	183.63-185.12
	(108.9-162.39)	(125.81-132.9)	(39.75-62.32)
Maganese			
	6.37-8.55	9.34-12.9	4.40-4.96
	(1.07-1.20)	(3.55-3.74)	(1.58-1.71)
Zinc			
	5.01-5.52	4.95-5.52	3.10-4.31
	(1.90-20.4)	(3.56-3.74)	(2.58-3.78)
Iron			
	7.95-10.75	3.75-5.71	2.49-4.59
	(7.95-8.42)	(3.58-3.90)	(2.34-2.40)
Chromium			
	0.143-0.223	0.264-0.43	0.183-0.262
	(0.110-0.127)	(0.127-0.144)	(0.060-0.077)
Nickel			
	0.327-0.513	0.402-0.476	0.402-0.476
	(0.051-0.062)	(0.074-0.085)	(0.062-0.085
Cobalt			
	0.243-0.412	0.159-0.243	0.243-0.299
	(0.175-0.188)	(0.119-0.105)	(0.119-0.133)
Copper			
	0.435-0.563	0.85-0.908	0.377-0.430
	(0.403-0.507)	(0.227-0.238)	(0.186-0.196)
Aluminum			
	3.90-18.75	3.11-6.25	46.9-54.7
	(1.24-189)	(0.956-1.26)	(1.89-2.18
Lead			
	0.444-0.481	0.143-0.218	0.293-0.331
	(0.075-0.087)	(0.063-0.075)	(0.050-0.063)
Cadmium			
	0.261-0.312	0.133-0.184	0.158-0.184
	(0.30-0.036)	(0.41-0.053)	(0.041-0.052)

Key: ( )*Values in parenthesis are for decoction samples

Table 3: Determination of metals in *V. rosea* ver. pink, family Apocynaceae, by Atomic Absorption Spectrophotometer Hitachi model 180 – 50 (mg/100g dried basis)

Elements	Leaf	Stem	Flower
Sodium	66.46-71.20	226.1-666.6	38.4-79.10
	(23.24-56.63)*	(92.51-98.38)*	(29.36-30.15)
Potassium	190.16-237.40	259.06-264.96	176.38-179.33
	(92.63-136.30)	(112.53-149.00)	(82.13-121.93)
Calcium	1008.4-1153.4	185.03-472.9	140.98-149.96
	(185.88-230.78)	(123.02-132.00)	(81.20-92.5)
Magnesium	141.35-153.25	45.74-62.32	85.69-87.39
	(106.41-132.9)	(38.34-53.9)	(51.03-56.7)
Maganese	3.69-5.81	2.00-2.85	2.70-3.27
	(1.96-20.9)	(0.95-1.05)	(1.33-1.39)
Iron	4.99-5.61	5.14-5.46	10.56-11.54
	(1.56-2.35)	(1.93-2.17)	(1.93-2.49)
Zinc	2.60-3.05	2.21-2.28	6.89-7.00
	(0.740-1.12)	(0.99-1.25)	(2.84-3.72)
Chromium	0.26-0.34	0.106-0.18	0.22-0.26
	(0.060-0.094)	(0.0775-0.094)	(0.060-0.077)
Nickel	0.327-0.402	0.25-0.36	0.21-0.36
	(0.062-0.152)	(0.129-0.162)	(0.118-0.151)
Cobalt	0.085-0.41	0.13-0.18	0.638-0.777
	(0.067-0.105)	(0.119-0.133)	(0.15-0.21)
Copper	0.642-0.775	0.801-0.961	0.377-0.536
	(0.178-0.207)	(0.35-0.378)	(0.217-0.238)
Aluminum	35.93-45.31	11.71-14.06	2.34-3.12
	(2.15-2.95)	(1.85-2.12)	(0.45-0.98)
Lead	0.444-0.519	0.180-0.293	0.143-0.331
	(0.0509-0.087)	(0.063-0.075)	(0.087-0.099)
Codmium	0.210-0.363	0.107-0.158	0.133-0.184
	(0.0.302-0.0472)	(0.047-0.052)	(0.0302-0.024)

Key: ( )*Values in parenthesis are for decoction samples

as Na, K, Mg, Mn, Zn, Co, Cr and Fe are present in water extract or decoction of all parts of both varieties in considerable amount and may be directly or indirectly helpful in the management of many diseases.In recognition of the important role that major and trace elements play important roles in health and diseases of human body in the building up and restoration phenomenon.

As the aqueous extract of two varieties of *V. rosea*, showed the presence of saponin and glycoside only, it is unlikely that these two ingredients should have any anti- viral activity, so in decoction of medicinal plants the active constituents are inorganic trace elements. The analysis of both varieties of *V. rosea* and its decoction showed the presence of several important trace elements such as Zn and Fe.

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