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MINERAL COMPOSITION OF EDIBLE MOMORDICA CYMBALARIA FENZL

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***Abstract* - The fruit extract of tuber, stem, leaves, fruits and seeds of *Momordica cymbalaria* Fenzl were analyzed for mineral composition by inductively coupled plasma atomic emission spectroscopy (ICP-AES). The mineral concentrations were ranges, as N, 0.72-3.64; P, 0.18-0.31; K, 3.7-5.0, Ca, 5.65-50.0; Mg, 2.35-4.76; Na, 1-12.5 and S, 13.45-20.96 (gm/100gm dry weight), Fe, 2.14-4.32; Zn, 1.2-4.03; Mn, 2.99-6.0; Cu, Mo, 13-85.87 and B, 5.6-19.8 (ppm dry weight). Mineral composition of *M. cymbalaria* was found relatively higher as compared to the other vegetables, and it is in concurrence with the recent macrobiotic recommendation for western countries. Hence Bioprospecting of this wild vegetable as food supplement improves the nutritive value of the human diet.**

***Keywords* - Minerals, *Momordica cymbalaria* and Nutrition**

1. INTRODUCTION

Momordica cymbalaria Fenzl. belongs to family Cucurbitaceae and locally known as Kadvanchi (Marathi). It is perennial climber prominent only during the Monsoon season and originating in tropical regions of South East Asia and South Indian states i.e. Tamilnadu, Andhra Pradesh, Karnataka besides Madhyapradesh and Maharashtra. The plant is climbing annual or perennial herb with slender, scandent, branched, striate stem and tuberous root. The fruits are used as vegetables and pickles by local inhabitants and are sold in market as wild fruit vegetable during August to November months. It has been used in various Asian traditional medicine systems for a long time. The plant is traditionally used for the treatment of diabetes mellitus and as an antiovulatory agent (Jeyadevi *et al*., 2012). According to Gopalan *et al*. (1993) the fruits of *M. cymbalaria* contain higher level of Calcium and Iron, content of this species is two times higher than that of *M. charantia*. Its versatile utility as a nutritious vegetable, folk medicine and functional food ingredient prompted us to undertake the study on this multipurpose plant.

The feasible alternative is to explore additional sources of food and minimize the load on production of conventional food plants. The plant is disease resistant and its fruits have medicinal value. The plant is used as hypoglycemic, antidiabetic and hypo-lipidemic (Rao *et al.*, 2001). Its crude fiber decreases the absorption of cholesterol form the gut. It delays the digestion and conversion of starch in to sugars. Such attribute would be desirable for diabetic patients (Gopalan *et al.*, 1993).The present study will helps to improve knowledge regarding their nutraceutical properties.

2. MATERIALS AND METHODS

2.1. SAMPLE COLLECTION

All the samples have been collected from different places along western Maharashtra particularly Solapur district India. The collection was made after rainy season from above mentioned locations in October 2015.

2.2. Mineral analysis - (Inductively Coupled Plasma Atomic Emission Spectroscopy, ICP-AES) Samples were brought to the laboratory and washed thoroughly with tap water to remove attached epiphytes and adhered dirt particles if any and dried in the shade. The material was kept in the oven at 110°C for 12 h, pulverized in the grinder and sieved through a screen with an aperture of 0.5 mm. This powdered material was kept in airtight plastic bottles at room temperature until analysis. Samples were subjected to acid digestion and analyzed according to the procedure described by Farias, et al (2002). Mineralogical analysis was carried out using inductively coupled plasma atomic emission spectroscopy (ICP-AES, Perkin–Elmer, Optima 2000). All determinations were performed in triplicate and data represented on dry weight basis as mean values} standard deviation.

3. RESULTS AND DISCUSSION

Among the analyzed minerals K, 3.7-5.0, Ca, 5.65-50.0; Mg, 2.35-4.76 were found to be highest content than the other elements while heavy metals were lower in levels (Table 1). In the tuber sample showed highest sulphur content (15.26 gm/100 g d wt), with least concentration of Pb (0.08 mg/100 g d wt). The vegetative parts of *M. cymbalaria* exhibits good source of macro elements i.e. sulphur, calcium, magnesium, potassium and sodium. Similar results were reported in *Chlorophytum comosum* root tubers, *Portulaca oleracia* and *Eulophia ochreata* (Aberoumand, 2011). *M. cymbalaria* fruit with seeds also showed good source of macroelements (Ca, S, Mg, Na, K) and micro elements (Mo, Mn, Fe, Zn), overall approximately similar observations were reported in *Momordica dioicia* fruit (Aberoumand, 2011). The values of sodium in the plants varies from 1 (tuber) to 12.25% (leaves) while that of potassium varies from 1.2 (leaves) to 5% (tuber). The ratio of sodium to potassium is less than 1; therefore consumption of the plants would reduce high blood pressure disease because Na:K is less than one as recommended by FND (2002).

Table 1. Macro, micro and trace elements of *M.cymbalaria* determined by ICP-AES

Mineral	**Tuber**	**Stem**	**Leaves**	**Fruit**	**Seed**
Na (%)	1±0.02	1.25±0.75	12.5±1.25	8.5±0.75	7.5±0.08
K (%)	5±0.06	3.70±0.05	1.2±0.41	5±0.31	4.07±022
Ca (%)	10.2±0.01	28.85±0.64	50±0.75	26.85±1.05	5.65±046
Mg (%)	4.76±0.05	2.93±1.02	3.63±1.05	2.64±0.41	2.35±006
Total	**20.96±2.01**	**36.73±3.04**	**67.33±3.05**	**42.99±1.95**	**19.57±1.02**
N (%)	0.72±0.04	0.84±0.01	1.8±0.05	0.72±0	3.64±001
P (%)	0.27±0.02	0.18±0.05	0.16±0.04	0.23±0	0.31±0
S (%)	15.26±0.41	16±0.43	13.45±0.77	20.96±0.09	14.86±0.07
Pb (pp	0.8±0.06	2.6±0	ND	3.1±0.12	2.38±001
Cr (pp	1.7±0.01	ND	0.4±0	2±0.07	1.2±0
Fe (pp	4.32±0.81	2.67±0	3.3±0.02	2.4±0.04	2.14±005
Zn (pp	4.03±0.72	2.5±0.03	3.08±0.01	2.24±0.21	1.2±0
Mn (pp	6±1.02	3.74±0.04	4.62±0.03	3.37±0.32	2.99±006
Hg (pp	ND	ND	ND	4.54±1.01	4.97±001
Cu (pp	2.35±1.05	1.41±0	1.74±0	1.27±0	1.13±0
As (pp	ND	5.31±0.07	6.95±0.08	ND	ND
Ni (pp	ND	1.9±0	2.3±0.01	1.1±	ND
Cd (pp	ND	1.14±0	1.26±0.1	ND	ND
Mo (pp	22.54±2.01	13±1.04	19.41±0.4	13.26±1.0	85.87±0.52
B (pp	7.08±0.04	5.6±0.9	10.51±0.06	13.74±0.91	19.8±004
Total	**65.07±1.1**	**56.89±0.88**	**68.98±0.48**	**68.93±0.89**	**140.49±0.78**

ND* below the detection limit.
Mean values of triplicate determination ±standard deviation.

The value of calcium and phosphorous *M. Cymbalarias* varied from 5.65 % (seeds) to 50 % (leaves) for calcium and from 0.16 % (leaves) to 0.31 % (seeds) for phosphorous. Calcium and phosphorous are associated with each other for growth and maintenance of bones, teeth and muscles (Okaka *et al.,* 2006). The calcium level in the leaves studied compared favourably with the values reported in some green leafy vegetables consumed in Nigeria and some wild edible leaves grown in Eastern Amatolia, Turkey (Ladan *et al.,* 1996).The phosphorous content was higher than that of *Ipomeae batatas* reported by Antia *et al.,* (2006).Therefore, *M. Cymbalaria* is a good sources of calcium and phosphorous which aids intestinal absorption because the ratio of Ca: P close to unity (Gull-Guerrero *et al*., 1998). Magnesium content varies from 2.35% (seeds) to 4.76% (tuber). These values are higher than the *O.gratissimum, M. scandens, L. guineensis, M. Scandens and Xylopia aethiopia* (Fagbohun *et al., 2011 and* Abolaji *et al.,* 2007). Magnesium is a composition of chlorophyll and it is an important content in connection with Ischemic heart disease and calcium metabolism in bones (Ishida *et al.,* 2000).

Zinc content was reported from 2.1 PPM (seeds) to 4.3 PPM (tuber). These are low when compared to the minerals reported by (Fagbohun *et al.,* 2011 *and* Elegbede, 1998). Zinc is involved in normal functioning of immune system (Ibrahim *et al.,* 2001) and is associated with protein metabolism. Iron values varies from 2.14 (seeds) to 4.32

(tuber). These values are lower when compared to the values of other green leafy vegetables as reported by Ibrahim *et al.,* (2001). Iron is an essential trace element for haemoglobin formation, normal functioning of central nervous system and in the oxidation of carbohydrates, protein and fats (Adeleye and Otokiti, 1999).The values of manganese in the *M. Cymbalaria* varies from 2.99 ppm (seeds) to 6 ppm (tuber). This suggests that it may be involved in the boosting of the immune system and are antitoxidant micronutrient (Talwar *et al.,* 1989).

Table 2. *Momordica cymbalaria:* elemental composition in relation to permissible limits in human nutrition.

Elements	*M. cymbalaria* (mg $100g^{-1}$ dry wt)	Permissible limit (mg g^{-1} dry wt)
Zn	1.305	6 – 11
Cd	0.24	0.274
Pb	0.88	13.48
Hg	0.95	0.041
As	1.22	3.09

Muñoz et al. (1999) permissible daily intake value (mg kg^{-1}).

The micro nutrients (Zn + Fe + Mn + B+ Mo) were found to be higher (13.05– 154.08 ppm of d wt) than the land vegetables as well as edible seaweeds (Pise et al., 2012). As, Cd, Cu, Pb, Hg, Cr, Ni and Zn are relevant elements and are of immediate concern due to their potential toxicity for living organisms. Depending upon the permissible daily dose for different toxic elements (Muñoz et al., 1999 and IOM, 2004**)** recommended daily intake has been calculated and provided in Table 2. Cu + Zn content was in the range of 0.79–1.305 mg/100 g d wt, which is below the toxic limits allowed in *M. cymbalaria* for human consumption.

4. CONCLUSION

The *Momordica cymbalaria,* as wild seasonal vegetable is utilised during monsoon season. This species has sufficiently high essential mineral content and the toxic elements also showed below the permissible limit hence, this species could safely be utilized to improve the nutritive value of the human diet. Data generated from present investigation could be helpful for food additives in future for Nutraceutical industries.

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