

Nutritional Evaluation of *Ceropegia bulbosa* Tubers from Different Regions of Rajasthan

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ABSTRACT

Ceropegia bulbosa is of economic importance due to its highly medicinal edible tubers. The root tubers are eaten raw or cooked and have tonic & digestive properties. Nutritional evaluation of *Ceropegia bulbosa* tubers was carried out in order to evaluate their use as food supplement. Moisture, ash, sugar, fat, fibre contents were determined using standard procedures. These were found to contain sugar (7.53-18.8 %), protein (6.3-8.74%) and vitamin C (27-45.1 mg/100g). Crude fat content was found to vary from 1.3-1.5 %. Determination of mineral content showed that they were rich source of minerals. Mineral contents and nutritional values of the plants were found higher than conventional vegetable crops. Though most of the *Ceropegias* are threatened today owing to destructive collection or habitat degradation but through proper cultivation techniques their population can be increased and their incorporation into the diet through value added products can help to explore the uses of this priceless nature's gift.

Keywords: Nutritional, Tubers, Elements, Proximate, Supplement, Dietary.

INTRODUCTION

Ceropegia bulbosa Roxb. (family–Asclepiadaceae), is a slender, small, perennial, climber or twining tuberous herb with very wide distribution. *Ceropegia* is a genus of climbers, herbs, rarely sub shrubs and consists of about 200 species distributed in the tropical and subtropical Asia, Africa, Australia, Malaysia and Canary and Pacific islands (Anonymous, 1992; & Bruyns, 2003). In India it is found in Andhra Pradesh, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh. It is popularly known as Hedulo, Khedula, Tedula

in Rajasthan and reported to occur sparsely in Sikar, Udaipur, Jalore, Kota districts. It has variable, elliptic-oblong to, acute or, base rounded leaves. The flowering and fruiting time of *Ceropegia bulbosa* is reported between July to October (Bhandari, 1990). Flowers are hermaphrodite, green, inpedunculate cymes, umbellate cymes, narrow and slightly funnel shaped. Follicles are cylindrical, tapering towards apex. Seeds are flattened and ovate oblong. The tuber is spherical or oblong, turnip like with roots at its base.

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As many as 48 spp. of *Ceropegia* are found in India however most of these are threatened owing to destructive collection or habitat degradation (Nayar & Sastry, 1987; Walter & Gillet, 1998; & Dhir & Shekhawat, 2014). They are therefore scarcely available in wild. *Ceropegia bulbosa* is commonly distributed throughout the country (Botanical Survey of India, 2002).

Ceropegia species are economically important due to their starchy edible tubers. The tuberous roots of *Ceropegia bulbosa* species are edible and also have medicinal properties (Arora & Meena, 2018a, 2018b). Tubers are a rich source of carbohydrates and eaten either raw or cooked (Nikam, 2007). The tubers are also used as a thirst quencher. Leaves are also edible and possess tonic and digestive properties. The root tubers are known to contain an alkaloid 'Ceropegin' (Nadkarni, 1976). Bitterness of the tubers can be removed by boiling (Mabberley, 1987). The alkaloid has medicinal value and is used to cure cold, sneezing and eye diseases. *C. bulbosa* seeds are brayed to a paste and dropped into the ears to cure deafness. Decoction of the tubers is used to remove urinary bladder stones (Swarnkar & Katewa, 2008; & Khan & Pradhan, 2012). The whole plant extract is used as an antidote for snake bite (Anonymous, 1980).

Indigenous people use various wild plants for their food, medicines, and other economic products. Many of these wild plants have been documented for their utilization as future foods and medicines based on these people's information. However, information about the nutrient components of many wild edible plants has yet to be scientifically tested. There are only very few reports evaluating nutritional composition of *Cerpegia bulbosa*. Complete analysis of is lacking. Therefore, this study evaluated its nutrient components with an aim to explore its potential as an alternative food. This information may serve as a basis for conservation for its increased consumption and utilization.

MATERIALS AND METHODS

Collection & processing of material

Reconnaissance survey was carried out in three different Districts of Rajasthan viz. Beda

(Pali), Udaipur and Jaswantpura (Jalore) for collection of *Ceropegia* tubers for three consecutive years 2012-2014. Sites were selected by gathering information from local people, Forest Department and Universities. Collected tubers were washed with water to remove dirt and foreign materials and then cut into thin slices and dried in shade. Finally these were ground and stored in neatly labelled air tight bags.

Nutritional Analysis

All the chemicals used in the study were of analytical grade and procured from Merck. Standards were procured from SIGMA. All the values are mean of three readings.

Proximate analysis

Moisture, fat, crude protein, total sugar (TSS), ash and dietary fibre (TDF), were determined using standard methods (AOAC, 1984). Moisture was determined by oven drying method. Ash content was determined by incineration of the sample in a muffle furnace at 600°C for 6 h. Total Dietary fibre was determined by assay kit (SIGMA). It is a combination of enzymatic and gravimetric methods. Samples were gelatinized with heat stable α -amylase and then enzymatically digested with protease and amylo glucosidase to remove the protein and starch present in the sample. Ethanol is added to precipitate the soluble dietary fibre. Total sugar content was estimated by phenol-sulphuric acid method. Total nitrogen was estimated by the Kjeldahl method. Crude protein was calculated by multiplying the value by 6.25. Fat was determined by petroleum ether extraction in a Soxhlet apparatus.

Vitamin C was determined by Indophenol Method (AOAC, 1984).

Mineral Analysis

Mineral elements (Cu, Zn, Fe, Mn, Mg) were determined by wet digestion methods using Atomic Absorption Spectrophotometer (AAS, Perkin Elmer). An acid digestion procedure was used for sample preparation. A weighed amount of plant material were placed in a digestion tube (Kjeldahl flasks) and a mixture of HNO₃ and 70% HClO₄ was added to each sample. Mixture was heated slowly at a low

temperature. After digestion, the samples were diluted to appropriate volume and the concentration of the elements was determined. Standards for each element were prepared by suitable dilution of the stock standard solutions. K, Ca & Na were estimated by flame photometer (Systronics).

RESULTS AND DISCUSSION

Table 1: Moisture content (%) and Morphological evaluation of *Ceropegia bulbosa* tubers

Region	Beda	Udaipur	Jaswantpura
Moisture Content (%)	90.59	84.54	87.3
Average wt of one tuber (g)	20.17	31.11	21.56
Av. Length (cm)	3.42	4.49	3.15
Av. Width (cm)	3.69	4.94	3.28

Nutritional value

Nutritional evaluation of *C. bulbosa*, tubers was carried out from three locations in Rajasthan. The results are shown in Table 2. Maximum ash (11.16 %) and Vitamin C (45.17 mg/100g) was found in samples from Beda. Maximum fat (1.5 %) and sugar content (18.86 %) was found in samples from Udaipur. Protein content was higher in samples from Jaswantpura (8.74%). Average fibre content in

Vegetative Characteristics

Ceropegia was found to have more or less flattened tubers with an approximate diameter of 30 to 50 mm. The flowering and fruiting time of *Ceropegia bulbosa* was found from September to November. Moisture content in the collected tubers varied from 84.54% to 90.59%. Average weight of medium size tuber varied from 20.2 g to 31.11 g (Table 1).

the tubers was found as 29.94%. Deshmukh and Rathod (2013) have evaluated the nutritive value of *Ceropegia bulbosa* samples from Maharashtra. They have obtained slightly low values viz. fat (0.1%), ash (10.2%), crude fibre (8.7%), crude protein (4.62%), total sugar (2.138%). Our values are slightly higher which may be due to stress conditions existing in Rajasthan.

Table 2: Mineral Content in *Ceropegia bulbosa* tubers

	Cu mg/100g	Zn mg/100g	Fe mg/100g	Mn mg/100g	Mg mg/100g	P mg/100g	K g/100g	Ca g/100g	Na g/100g
Udaipur	1.33	5.33	42.33	5.5	270	0.165	2.95	0.10	0.44
Beda	1.2	3.8	22	1.3	250	0.045	6.94	0.71	0.55
Jaswantpura	1.9	2.7	22.3	0.8	278.9	0.011	2.98	0.59	0.43

Mineral analysis showed that samples from Udaipur were rich in all the micro elements viz. Fe (42.33 mg/100g), Zn (5.33 mg/100gm), Mn (5.5 mg/100g) and Phosphorus (0.165 mg/100g) and samples from Bali were rich in all the macro elements except Mg (270 mg/100gm), which was more in Jalore samples (Table 3).

The recommended dietary allowances (RDA) for minerals for adult males is calcium 1000 mg/day, phosphorus 800 mg/day, copper

900 µg/day, zinc 11 mg/day, magnesium 420 mg/day, manganese 2.3 mg/day and iron 8 mg/day for adults (Food and Nutrition Board, Institute of medicine, National Academies, www.nap.edu). Thus, a *Ceropegia bulbosa* tuber of average weight of at least 20 g can provide upto 10 - 20% of the RDA. These tubers are especially rich in Iron and contain 10 times RDA (22- 42.33 mg/100g).

Table 2: Nutritional evaluation of *Ceropegia bulbosa* tubers

Year\ Region	Udaipur					Beda					Jaswantpura				
	Ash	Fat	Sugar	Protein	Vit C	Ash	Fat	Sugar	Protein	Vit C	Ash	Fat	Sugar	Protein	Vit C
2012	9.33	1.7	23.9	6.59	28.5	10.7	1.5	7.04	5.17	31.05	6.1	1.4	6.97	7.32	24.6
2013	9.9	1.57	14.9	10.45	43	11.9	1.42	7.9	8.62	60.46	4.3	1.3	7.5	9.4	35.8
2014	8.9	1.25	17.8	7.87	34	10.9	1.55	8.14	6.12	44	5.9	1.22	8.14	9.52	20.6
Mean±SE	9.37± 0.28	1.5± 0.13	18.86± 2.65	8.3± 1.13	35.16± 4.22	11.16 ±0.37	1.49± 0.03	7.69± 0.33	6.63± 1.02	45.17± 8.51	5.43± 0.56	1.3±0 .05	7.53± 0.33	8.74± 0.71	27± 4.54

CONCLUSION

Wild edible *Ceropegia bulbosa* is not only of botanical importance but also economically important as tubers are a source of sugar, fats, fibre, minerals and medicines. Tubers analyzed contained more minerals, fibre, protein and sugar than conventional vegetables. With time the knowledge on these tubers has diminished and young generation is not familiar with them. Our results suggest that these wild tubers cannot be ignored and can be a useful food supplement. Hence, it is very necessary to initiate work for their conservation.

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