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Bromatological and Mineral Analysis of Tuber of Two Nutritionally Rich *Brachystelma* Species

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ABSTRACT

The focus of this study was to investigate nutritional status of the tuber of *Brachystelma edulis and Brachystelma naoroji.* Wild edible tuber species are an important source of food in India and have a significant place in the dietary habits of forest dwelling communities. Nutritional analysis comprised of determining moisture, ash, protein, fats carbohydrates and fibre. Mineral analysis of calcium, iron, Magnesium, manganese, phosphorous, sodium, zinc were analyzed from tubers. The results obtained from this study shows promising potential to be exploited famine food plants. Raw tuber is eaten as food supplement and tubers are cooked as vegetable with salt and spices. One to two tablespoon tubers powder of (*B. edulis*) given to children in cough and cold for 4-5 day. The tuber powder of *B. naoroji* with honey taken in empty stomach early in the morning up to 7 days to cure stomachache. Since, both the species of *Brachystelma* have got the medicinal importance. Tuber of *B. naoroji* was showing higher content of Calcium, whereas Iron contents in *B. edulis*. The nutritional composition and medicinal uses of Brachystelma species indicated that these neglected plants can be a valuable source of nutrients under famine condition and the high level of some vitamins and minerals can be used to prevent diseases.

INTRODUCTION:

*Brachystelma edulis*Coll. and Helmsl. and *Brachystelma naoroji*P. Tetali, D K Kulk., S Tetali and M S Kumbhojkar belongs to the family Asclepiadaceae. Recently the genus *Brachystelma* included in Apocynaceae (Venu and Prasad 2015). The tuber of *Brachystelma naoroji*is used to cure stomachache, headache and cold in children in Satara district (More and Jadhav 2014). Wild food plants represent inexpensive, locally available and versatile food sources capable of improving nutrition and health quality. Starchy roots and tuber crops play a pivotal role in the human diet. Many starchy wild tuber crops, except the common potatoes, sweet potatoes, and cassava, are not yet fully explored for their nutritional and health benefits. In Asian countries, some edible tubers are also used in traditional medicine. A variety of foods can be prepared using tubers and they may also be used in industrial applications (Anoma *et al.* 2016). *Brachystelma* is a wild edible tuberous plant. Tubers of *B. edulis, B. naoroji*are starchy and somewhat bitter in taste and have got a potential food values (Gaikwad and Yadav, 2004). The name *Brachystelma* is derived from the Greek words 'Brachy' means short and 'stelma' means crown, garland, wreath (for the nature of the corona).The *B. edulis and B. naoroji,* belongs to family Asclepiadaceae (Apocynaceae) and commonly called as Galya or Hanuman batata (Yadav and Salunkhe 1989). It is distributed on partially degraded hill slopes and open hilltops among grasses. It is a perennial dwarf herb with linear to narrowly elliptic leaves bearing tuberous roots. A large no. of wild edible plants is still in use in India. Fifty percent of these species are used for food. The nutritional value of many forest foods is not known but appears to be enough information to indicate that forest foods are nutritionally valuable. The studies on the nutritional value of forest food is extremely important as it will encourages people to consume greater quantity of food and provides them with a better balance of nutrients (FAO, 1989).

MATERIALS AND METHODS

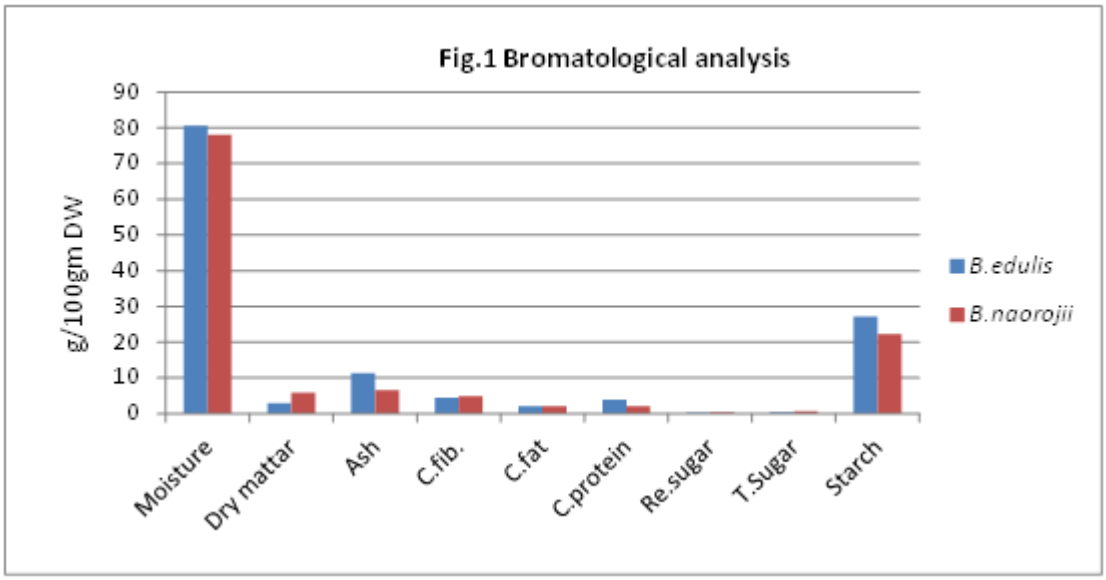
Collection and preparation of samples: Selected wild edible tuberous plants were collected from various localities of Satara, and adjoining areas of Kolhapur. Efforts made to collect these plants in flowering and fruiting conditions for the correct botanical identification. Healthy and disease free edible plant part/s selected and dried them under shade so as to prevent the decomposition of chemical compounds present in them. All the dried material powdered were used for further study.

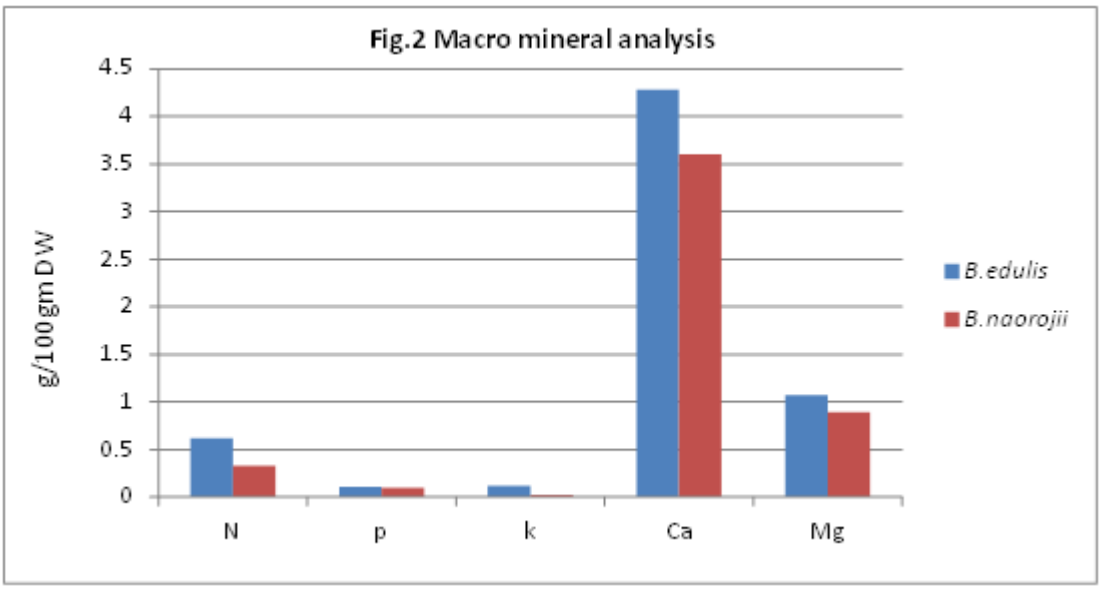
Bromatological analysis

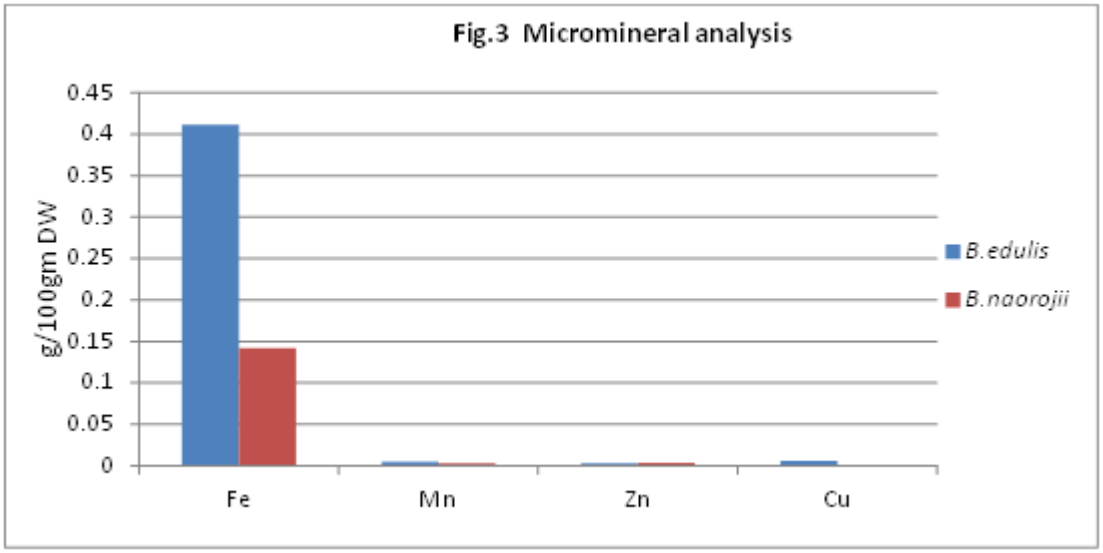
Dry matter and moisture of the material were determined by following the method by AOAC (1990). Ash value is determined by following the method of AOAC (1980). Carbohydrates are estimated according to the method described by Nelson (1944). The Crude fat and crude fibre content are determined by following the method of Sadasivam and Manikam (1992). Total nitrogen is estimated according to the method of Hawk *et al.* (1948). The quantity of protein was calculated as 6.25×N (AOAC, 1990).

Mineral analysis

The acid digestion method of Toth *et al*. (1948) has been followed for the analysis of inorganic constituents. The major and minor elements such as K, Na, P, Cu, Mg, Ca, Fe, Mn and Zn were determined by the atomic absorption spectrophotometric method. The samples, which were digested in acid solution of HNO_3 and perchloric acid were passed through atomic absorption spectrophotometry (AAS) using different lamps and calibrated or different micronutrients. Potassium and sodium weredetermined byusing flame photometer after acid digestion (AOAC, 1980). Phosphorus was determined spectrophotometrically using the endates solution (AOAC, 1980).







RESULTS AND DISCUSSION:

Bromatological analysis:

The nutritional profile of *B. edulis* and *B.naorojii*showingthat moisture, ash, protein, fat and fibre meet with the RDA levels. The plant extract of both the species showed high antioxidant activities such as Polyphenols, Peroxidase, Catalase, Superoxide dismutase, Carotenoids and Ascorbic acid (Vit. C) *etc* (Deshmukh and Jadhav 2014). The nutritional composition indicates that this neglected plant can be a valuable source of nutrients. The wild edible plants can help eradicate malnutrition in areas rife where people are starving. Upadhyay *et al.* (2010) reported the tuber of *Ceropegia bulbosa*was eaten raw for relieving stomachache. In presentstudy, dry powder of the tuber of *Brachystelma naorojii*with honey taken in empty

stomach early in the morning up to 7 days to cure stomachache. Since*B. naoroji*has got the medicinal importance.

The proximate content is depicted in fig.-1. The higher moisture is recorded in tuber of *B. edulis o*f fresh weight basis. The moisture content of tubers ranged from 75 to 80% moisture of fresh weight.The high moisture content is denoted that the plant is succulent. Moisture content is the quantity of water contained in the plant material. Fruits and tubers have 80 to 90 % water content ergo lower with energy value while in breadstuffs and nuts have 5 to 10 % low water content hence high energy value. Water is an essential compound of many foods when these foods are eaten, the water can be absorbed by the body (Bastin and Henkin, 1994). The higher content of dry matter was found in *B. naoroji.* The dry matter content in plants indicates nutritive values. Along with ash, crude fibre, crude protein, starch, carbohydrates were found in maximum amount. The ash content of tubers ranged from 8 to 11.5gm/100gm of dry weight. The high value of ash observed in *B. edulis* proved that it is a good source of minerals. The crude fibre content is higher in tuber of *B. naoroji,* whereas ash content, crude protein and starch are higher in *B. edulis*. The crude fat content is lower in both the tubers.The crude fat content ranged from 0.010 to 0.012 g/100gm. of dry weight. Due to generally low level of crude fat in the tubers, their consumption in large amounts is a good dietary habit and may be recommended to individuals suffering from overweight or obesity (Deshmukh and Jadhav 2013). The range of crude fiber content of tubers was 6 to 7 g/100gm. dry weight. The crude protein of wild edible tubers ranged from 3 to 5g/100g. The higher content of moisture, ash, crude fibre, crude protein and starch represented nutritional superiority of the *Brachystelma* species. In most of the studies,fibre and crude protein content were considered as the main determinant of food type(Anonymous 1970-1988).

Mineral analysis:

The mineral nutrition is an important aspect and it playspivotal role in human life for healthy growth. About 14 elements are essential to human health. Their deficiency causes disease, whereas their presence in excess may result in toxicity. Human bodies' daily need more than 100 mg of major minerals and less than 100 mg of minor minerals. Among the macrominerals calcium is found to be higher in both tubers, whereas nitrogen, sodium potassium is higher in tuber of *B. edulis*. The maximum values of calcium found in tuber are sufficient to grow teeth and bone in infants. Everyday consumption of Ca is 1500 mg is approved for human being beside inflammatory circumstances. People suffering from

rheumatoid, arthritis are required 100 mg Ca in addition 500 IUs of Vit D (Holt 2011). Microminerals, Iron was higher in tuber of *B. edulis* than tuber of *B. naoroji*. High iron content in this wild food plants indicates that its daily intake in our diet could help in boosting the blood level especially in anaemic conditions (Jahnov&Dhananjoy 2016). *Asterushygromatricus (Putpura) and Randiadumatorum* (Manhar) are rich dietary source of various minerals reported by Singh (2011). The level ofmineral elements i.e. iron and zinc among others were fairly significant in the plants analyzed. It was reported that trace elements comprise less than 0.0001% of the total body function. It is necessary component of haemoglobin, myoglobin and in the transport of oxygen. Similarly, zinc functions as co-factor of several enzymes in energy metabolism and immune factor (William and Devlin1991). Desmukh and Rathod (2013) have done nutraceutical evaluation of some edible tuberous plants; *B. edulis* is one of them. They have reported 464.8 mg/100gm dry weight. Calcium of *B. edulis*, and in present analysis 3.60 g/100gm dry weight evaluated from the same plant might be edaphic factor are responsible for variation in calcium content, whereas tuber of *B. naoroji*, shows 4.28 g/100gm dry weight calcium. Consumption of fruits and vegetables is known to lower risk of several oxidative stresses, including cardiovascular diseases, cancer and stroke and such health benefits are mainly ascribed to phytochemicals such as polyphenols, carotenoids and vitamin C (Deshmukh and Jadhav 2014) of these phytochemicals, polyphenols are largely recognized as anti-inflammatory, antiviral, antimicrobial and antioxidant agents. Pandy *et al* (2011) have given medicinal and nutritional attributes of some wild edible plants.

CONCLUSION:

The wild edible tubers may serve as functional foods and nutraceutical ingredients to prevent the noncommunicable chronic diseases and to maintain wellness. The present investigation of tuber of *Brachystelma* species determined that moisture, dry matter, ash, starch, crude fibre and crude protein content were found in sufficient amount, which is essential for human beings. Tuber of *B. edulis* and *B. naoroji* will be used as a best source of iron, calcium, phosphorous, zinc and magnesium. These nutrients prevent the diseases and give healthy life and reduce malnutrition.

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