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DETERMINATION OF THE NUTRITIONAL VALUE OF *URGINEA INDICA* KUNTH.

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ABSTRACT

The ethno botanical information is useful in the conservation of traditional cultures, biodiversity and also for community health care and drug development. In this regard, study was conducted to determine the nutritional values of the bulbs of *Urginea indica.* The nutritional parameters determined were proximate analysis (moisture, ash, crude fiber, lipid, protein, carbohydrate, food energy value, Acid value, pH and calorific value) and minerals (Silica, calcium, magnesium, sodium, potassium, iron, copper, manganese, zinc and phosphorus). *Urginea indica* had a significant level of above nutrients and therefore was identified as promising species with good profile of nutrients. These results further reinforced the growing awareness of such wild or semi wild plants in backyard planting to achieve nutritional and medicinal uses.

KEYWORDS: *Urginea indica,* Silica, calcium, magnesium, sodium, potassium, iron, copper, manganese, zinc and phosphorus, Acid value, pH and calorific value.

INTRODUCTION

Increasing population of the world has doubled the food demands and inundated the available land resources. The fight against poverty, hunger and malnutrition continues to be a basic goal of development and a variety of strategies are being applied. Strategies based nutrient rich food like vegetables are considered essential because vegetables have been recognized as one of the less expensive source of energy (Alertor *et al*., 2002; Hussain *et al*., 2009) and richest natural sources of essential biochemicals and nutrients such as carbohydrates, carotene, protein, vitamins, calcium, iron, ascorbic acid and palpable concentration of trace

minerals (Salunkhe & Kadam, 1995). Besides these biochemicals, the moisture, fibers, and ash contents and the energy values of individual vegetable and plant species have also been regarded important to the human health and the soil quality (Hussain *et al*., 2010).

But in recent years, due various reasons the many important vegetables are becoming pocket heavy for the lower income class of the society. Hence, researchers need to intensify the search for lesser known crops in the wild, many of which are potential valuable as human and animal's foods to maintain a balance between population growth and agricultural productivity, particularly in the tropical and subtropical areas of the world. In many tropical countries, including India rural people traditionally harvest wide range of leafy vegetables, roots, tubers, fruits from wild because of its taste, cultural uses, as food supplements or to tide over food shortage. Labeled as famine or hunger food, wild plants have been recognized to have potential to meet household food and income security. Some wild fruits have been identified to have better nutritional value than cultivated fruits. As a result, in recent years, a growing interest has emerged to evaluate various wild plants for their nutritional features. In this regard, an attempt was made to evaluate the nutritional profile of the lesser known wild plant of India *Urginea indica*.

Urginea indica is a member of the family Hyacinthaceae and commonly called as Indian squill and wild onions. It comprises of about hundred species and found distributed in certain floristic regions of the world. In India it is distributed in southern and peninsular part including the coastal belt as well as temperate regions of Himalayas.

The useful parts are bulbs which are excellent source of medicine with pharmaceutical and biocidal applications mainly as anticancer agent, expectorant, cardiac stimulant, hypertension, dyspepsia and arterio-sclerosis (Louria *et al*, 1985; Kendler, 1987 and Dorant *et. al*, 1996) in treatment of asthma (Marx et al., 2006), rheumatism, edema, dropsy, allergies (Brodnitz *etal*, 1971), gout and to treat various other ailments (Benkeblia, 2004; Deepak and Salimath, 2006 ; Shivakameshwari et al 2006).

Investigations have reported that the bulbs of *Urginea indica* are sources of chemical constituents such as Cardiac glycosides (Patil and Torne 1981), Sterols (Jha and Sen 1981), Carbohydrates, Vitamins etc (Patil and Torne, 1981; Shivakameshwari and Padma, 201). The present study is designed to explore the preliminary phyto-chemical and nutrient analysis of

Urginea indica including the moisture, crude fiber, fat, protein, carbohydrate, food energy and minerals.

MATERIAL AND METHODS

Collection of plant material and preparation of sample

The bulbs were collected from the Yediyur area of Bangalore, Karnataka, India and were grown in the Botanical garden of Department of Botany, Bangalore University, Bangalore, Karnataka, India under uniform environmental conditions. The fully grown bulbs of about 5 years old, weighing nearly 200gms and measuring 25cms in diameter were collected. The collected bulbs were shade dried for about 10 days and were powdered using mortar and pestle. This powder was used for further analysis.

Chemical analysis of nutrients

Proximate analysis

The samples were analyzed for proximate composition (moisture, ash, fat, crude fibre, carbohydrate, protein, pH and energy value). Moisture and lipid were determined by Cocks and Pede method (1996). The method of Nelson (1994) was adopted for the determination of ash and crude fibre. Determination of protein was by the micro-Kjedahl (1980) procedure. The carbohydrate content was obtained by difference that is 100-(sum of percentages of moisture, ash, protein, lipid, fiber) as proposed by Eyeson & Ankrah, (1975). The energy values (kcal/100 g) were determined by multiplying the values of carbohydrates, lipids and proteins by following Okwu & Morah, (2004) and Hussain *et al*., (2010) method and the value pH were determined according to the method prosed by Anon (1988).

Minerals Analysis

0.5g of the sample powder was weighed and was put in a 100ml conical flask and to it was added 30ml of nitric acid (HNO3). The flask was placed on magnetic stirrer heater in fume hood for four hours at 250C^{o} and the color solution was changed to milky solution which was cooled for 10 minutes and then 15ml concentrated Perchloric acid (HClO4) was added and the solution was heated until it turned colourless. This colorless solution was filtered to remove the impurities for mineral elements analysis by Atomic Absorption Spectroscopy. The results were obtained while using a working standard of 1000 ppm for each of the species (Khan & Hidayat, 2008; Hussain *et al*., 2010; Hussain *et al*., 2009).

Statistical Analysis

Three analytical determinations were carried out on each independent replication for every parameter. Three independent replicates (n = 3) were obtained from each treatment and the results presented in tables and are reported as means ± standard deviation (SD).

RESULT AND DISCUSSION

Table 1: Proximate composition.

Sl. No.	Parameters	%/100gm samples
1	Moisture	6.15±0.005
2	Ash	6.62±0.20
3	Crude fiber	12.3±0.01
4	Protein	8.35±0.005
5	Lipid	0.31±0.20
6	Carbohydrate	66.24±0.30
7	Energy value	301.3±0.23K cal
8	pH (5% solution)	4.67±0.015

Results are mean of triplicate determinations on a dry weight basis ± standard deviation

Table 2: Macro Mineral Composition of *Urginea indica*.

Sl. No	Macro Minerals	/100gm (in mg)
1	Silica	290.2±0.46
2	Calcium	80.5±0.5
3	Magnesium	22.1±0.23
4	Sodium	64.6±0.57
5	Potassium	120.3±0.26

Results are mean of triplicate determinations on a dry weight basis ± standard deviation

Table 3: Micro Mineral Composition of *Urginea indica*.

Sl. No	Micro Minerals	/100gm (in mg)
1	Iron	230.3±0.32
2	Copper	0.16±0.01
3	Manganese	0.13±0.005
4	Zinc	0.37±0.005
5	Phosphorus	0.13±0.005

Results are mean of triplicate determinations on a dry weight basis ± standard deviation

The results of the proximate analysis of *Urginea indica* are represented in Table: 1 and the macro and micro mineral analysis are shown in Table: 2 and 3 respectively. From the experimental results the moisture content was found to be 6.15% and 6.62% of ash content. Bulbs of *Urginea indica* had fairly good amount of fiber (12.3%) and protein (8.35%). Lipid (fat) was found to be very low (0.13%) and along with this the carbohydrate (66.24%) and

energy value (301.3%) were found to be appreciable. 4.67 pH was recorded in 5% solution indicating the basic nature of bulbs.

Bulbs of *Urgenia indica* showed a good profile of essential macro and micro minerals indicating bulbs as rich sources of iron (230.3 mg) and silica (290.2 mg). Other macro minerals like potassium (120.3mg), calcium (64.6mg), sodium (80.5mg) along with magnesium (22.1mg) were also present in good quantity. Apart from iron other micro minerals like copper (0.16mg), manganese (0.13mg), zinc (0.37mg) and phosphorus (013mg) were found in required quantity.

Reports on phytochemical data of *Urgenia indica* mainly mentioning about cardiac glycosides (Jha and Sen; 1981 & 1983), flavonoid glycosides (Sultana, et al; 2010), sterols (Jha and Sen; 1981), sugars (Chadha, Y. R.; 1976; Sathish and Bhakuni; 1972), vitamins (Patil and Torne; 1981; **Shivakameshwari and Padma; 201**), mucilaginous and saccharine matter, including a peculiar mucilaginous carbohydrate named Sinistrin (Patil and Torne; 1981), have been reported earlier. Apart from this Sathish and Bhakuni (1972) have identified the following compounds, **alkanol C5,** hentriacontan-1-ol; lipid, octacosanoic acid and β-sitosterol from the bulb of *Urginea indica.* But no cognizant report on nutritional perspective mentioning about proximate and mineral analysis of *Urgenia indica* are available except Kim (1997) and Panduranga Murthy et al., (2011) mentioning just about the presence (preliminary screening) of carbohydrate, proteins, along with alkaloids, phenolic compounds and saponins in *Urgenia indica*.

In this regard, the present paper mentioning about proximate and mineral analysis unravels the nutritional perspective of *Urgenia indica* making the bulbs, a potential source of nutritional elements.

Nutritional significance of minerals in the diet

Minerals are divided into two groups Essential and Trace minerals, which is related to the quantity required and found in the body, the former being present in the largest amounts.

These minerals will now be discussed briefly in this order.

3.1 Essential minerals

The essential metals are the macro metals:

1. Calcium
2. Magnesium
3. Potassium
4. Sodium

Calcium is responsible for strong bones and teeth and accounts for ninety percent of the calcium in the body whereas the other one percent is circulating in fluids in order to ionise calcium. The metal's function is related to transmitting nerve impulses; contractions of muscles; blood clotting; activation of some enzyme reactions and secretion of hormones Magnesium has many roles including supporting the functioning of the immune system; assists in preventing dental decay by retaining the calcium in tooth enamel; it has an important role in the synthesis of proteins, fat, nucleic acids; glucose metabolism as well as membrane transport system of cells. Magnesium also plays a role in muscle contraction and cell integrity. Potassium and sodium work together in muscle contraction nerve transmission. Sodium is important in muscle contraction and nerve transmission Sodium ions are the main regulators of extra cellular fluid and volume (Whitney and Rofles 2002).

3.2 Trace minerals

These are particularly important for health promotion and prevention of disease. Trace metals being considered in this work are:

1. copper,
2. chromium,
3. iron,
4. manganese,
5. molybdenum
6. selenium
7. zinc.

The non-metals also in the group are iodine and fluorine that will not be discussed.

Copper has the role of assisting in the formation of haemoglobin, helping to prevent anemia as well as being involved in several enzymes. Chromium function is related to stabilising blood sugar levels with respect to insulin required for release of energy from glucose. Iron is

the central metal in the haemoglobin molecule for oxygen transport in the blood and is portion of myoglobin located in muscles. Manganese is one of the co-factors in a number of enzymes as is molybdenum. Selenium has several roles such as regulating the thyroid hormone as well as being part of an enzyme that protects against oxidation (Whitney and Rofles 2002). Selenium has also been reported as assisting in deactivating heavy metals.

3.3 RDI of minerals according to age and gender

The Recommended Daily Intake, RDI of metals is related directly to age, and gender. The requirements for babies,, toddlers,, children , adolescents, and elderly vary with gender and country due to soil type. These requirements are continually being reviewed in the light of more research that is undertaken by food regulating bodies such as Food Standards Australia and New Zealand, FSANZ, United Stated of America, Food and Drug Administration, FDA, and European Authorities to name three such groups. The work done by these bodies includes all food groups in addition to vitamins, minerals: cereals, fat, protein, carbohydrates, sugars and so on, as well as research on different age groups in particular locations in many countries, to assist in maintaining and improving the health of the various groups and the population in general.

Major minerals	**Recommended Daily Intake, RDI**
Calcium	1000 mg
Magnesium	350 mg
Potassium	3500 mg
Sodium	2400 mg
Trace minerals	
Chromium	120 µg
Copper	2 mg
Iron	15 mg
Manganese	5 mg
Molybdenum	75 µg
Selenium	35 µg
Zinc	15 mg

Table 1. The table above represents RDI values recommended by experts and agencies for a normal adult population. http:// lenntech.com/recommended-daly-intake.htm

pH of the plants were determined according to Anon (1988).

Anonymous (1988). Test and Analyses of Foods. T.C. Tarim Orman ve Koyisleri Bakanlingi, Koruma ve Kontrol Genel Mudurlugu, Yayin, No:65, Bursa.

CONCLUSION

Study of wild food resources, ethno botanical information on its adaptability coupled with nutritional evaluation can only establish the non cultivated variety as real substitute for domesticated or cultivated species. Scrutiny of plants of various tropical areas through constituent analysis may lead to selection of valuable wild species that can be taken through crop improvement and hybridization process to establish it as cultivated variety.

Considering the growing need to identify alternative bio-nutritional sources, bulbs of *Urgenia indica* plants were evaluated for their nutritive value in order to prioritize for suitable domestication. The nutritional value of bulbs of *Urgenia indica* were evaluated in terms of protein, carbohydrate, fat, fiber, ash, moisture content, energy value, reducing sugars and minerals. *Urgenia indica* had a significant level of above nutrients and therefore was identified as promising species for promotion as backyard planting especially farming systems suffering from crop loss, food shortage and chronic malnutrition. However, the plant is cautioned for its toxicity due the presence of a chemical scilliroside. Hence this plant further needs to be scrutinized continuously and the present result can be a significant supporting data in order to introduce this species as promising nutritional vegetable.

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