

Review Article

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The Potential of Underutilized Vegetables of Assam as a Source of Nutrition - A Review

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ABSTRACT

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The underutilized indigenous vegetables are rich source of, protein, essential vitamins, micronutrients and other phytonutrients etc. and many of these vegetables have a better nutritional value compared to other known vegetables like tomato or cabbage. But the potential of these vegetables are not explored commercially. Various underutilized vegetables like Water spinach, Common Purslane, Indian spinach, tree bean, winged bean etc. are embedded with vitamins, amino acids, minerals, protein, dietary fibre etc. have high antioxidant activities and hence can effectively address the issues related to mal nutrition and nutritional security. Apart from creating stability to the eco system these underutilized vegetables can be a help in increasing the economy of the rural poor.

Introduction

With the annual population growth rate of 1.8%, the demand for food, feed and bio fuel in the world is growing day by day. It is projected that to cater the food demand of whole world, the production of agriculture has to increase by 70% by the year 2050. Till date, there are estimated 75000 species of edible plants of which interestingly only 30% are being utilized to provide 90% of the world's food. Therefore, there is a huge potential to explore the underutilized crops as

food source. In the year 2017-18 from an area of 10249 hector, India produces 18, 7474 MT of vegetables and this amazing achievement was contributed by only few major vegetables like brinjal, cauliflower, cabbage, peas, onion etc. Though the underutilized vegetables are always been a part of peoples everyday diet, but underutilized vegetables has not been given much consideration to explore commercially. India has the advantage of having a varied agro climatic situation which allows to grow more than 60 cultivated and about 30 lesser known vegetable crops. Even

though the underutilized vegetables has the tremendous potential to contribute to livelihood improvement, nutritional security and environment sustainability, the research and cultivation of these crops on commercial basis is still very narrow.

Importance of underutilized vegetables

The indigenous underutilized vegetables are not only packed with protein, essential vitamins, micronutrients, and other phytonutrients etc but many of these vegetables have a better nutritional value compared to other known vegetables like tomato or cabbage (Keatinge *et al.*, 2011). Many social world issues like poverty, malnutrition, and economic upliftment can be addressed efficiently by giving proper emphasis on underutilized vegetables. As the traditional crops typically do not meet modern standards for uniformity and other characteristics they have been neglected by breeders from the private and public sectors. But the traditional varieties have an immense potential to contribute to the world food production for their biotic resistance, tolerance to abiotic stress, yield and quality. Underutilized vegetables are rich source of nutrients including vitamins, minerals and other health promoting elements including high antioxidant activity which help in the diversification of diet leading to more balanced source of micronutrients. Apart from creating stability to the eco system these underutilized vegetables can be a help in increasing the economy of the rural poor.

Nutritional potential of some underutilized vegetables

***Ipomoea aquatica* (Water spinach)**

Water spinach is a herbaceous aquatic or semi-aquatic trailing type perennial plant belonging to the family *Convolvulaceae*

whose tender twigs with leaves are used as vegetable in many parts of India including North east India, Kerala and Tamilnadu. The plant is generally grown wild and rich in minerals. The leaves consist of high moisture ($72.83 \pm 0.29\%$), ash ($10.83 \pm 0.80\%$), crude lipid ($11.00 \pm 0.50\%$), crude fibre ($17.67 \pm 0.35\%$) and available carbohydrate ($54.20 \pm 0.68\%$). The leaves have a remarkable amount of magnesium (301.64 ± 12.69 mg/100 g) potassium ($5,458.33 \pm 954.70\%$), calcium (416.70 ± 5.77 mg/100 g) and phosphorus (109.29 ± 0.55 mg/100 g), (Umar *et al.*, 2006). Iron deficiency, according to World Health Organisation (WHO); affect about 3.7 billion people out of which 2 billion people are anaemic (Meng *et al.*, 2005) and *Ipomoea aquatica* can be used as a reliable source against iron deficiency as it contains a significant amount of iron (210.30 ± 2.47 mg/100 g).

***Dendrocalamus strictus* (Bamboo shoot)**

Bamboo shoot is a traditional food for many people around the world and every year two million tonnes of edible bamboo shoots are consumed in the world (Yang *et al.*, 2008). Generally the young shoots are cooked for vegetables. Bamboo shoots contain high proteins, amino acids, carbohydrates, many important minerals, and vitamins and thus have an immense potential of being used as important health food. The shoots have a good profile of minerals, consisting mainly of potassium (K), calcium (Ca), manganese, zinc, chromium, copper, iron (Fe), plus lower amounts of phosphorus (P), and selenium (Shi and Yang 1992; Nirmala *et al.*, 2007). Fresh shoots are a good source of thiamine, niacin, vitamin A, vitamin B6, and vitamin E (Visuphaka, 1985; Xia, 1989). They are rich in protein, containing between 1.49 and 4.04 (average 2.65 g) per 100 g of fresh bamboo shoots. Bamboo shoots contain 17 amino acids, 8 of which are essential for the human

body (Qiu, 1992; Ferreira *et al.*, 1995). Amino acid content in bamboo shoot is found to be much higher than in other vegetables such as cabbage, carrot, onion and pumpkin (Nirmala *et al.*, 2001). In bamboo shoots Tyrosine amounts to 57% to 67% of the total amino acid content (Kozukue *et al.*, 1999), which is required to facilitate biochemical metabolism of our body. As the fat content is comparatively low (0.26% to 0.94%) so it can be a healthy food for people with diabetes and heart disease.

***Portulaca oleracea* (Common Purslane)**

This traditionally grown vegetable can be termed as power food because of its high nutritive and antioxidant properties. It has a better nutritional quality than the major cultivated vegetables, with higher beta-carotene, ascorbic acid, and alpha-linolenic acid (Lui 200 *et al.*,) . Purslane contains the highest content of vitamin A among green leafy vegetables. It also contains vitamin C and B-complex vitamins like riboflavin, niacin, and pyridoxine. It provides highest dietary minerals such as potassium (494 mg/100 g) followed by magnesium (68 mg/100 g), calcium (65 mg/100 g), phosphorus (44 mg/100 g), and iron (1.99 mg/100 g).

Basela rubra (Indian spinach): Commonly known as Indian or Malabar spinach, this herbaceous annual or biennial climbing herb is found in tropical and sub-tropical areas It belongs to family Basellaceae, is a branched, succulent,, twining herbaceous vine and several meters in length. The easy adaptation to a variety of soils and climates, Basella sp is considered one of the best tropical spinach. This wild leafy vegetables, is significantly rich in various nutrition and per 100 grams (g) edible portion of Indian spinach leaves contain 23.0(kcal) of Energy; 2.0 gm protein; 0.3 gm of fat; 3.0 gm of Carbohydrates; 0.9

gm of Fiber and 2.2 gm of ash. It also contains calcium 2.32, potassium 5.8, magnesium 0.06, sodium 5.11, iron 0.04mg/100gm. (Nirmala *et al.*, 2011). Indian spinach is also rich in Vitamin A (456.0mg); Thiamine (0.04mg); Riboflavin (0.12mg); Niacin (0.5mg) and Ascorbic acid (89.027 mg). Moreover, it was found that daily consumption of Malabar spinach affects storage of vitamin A positively (Haskell et al 2004) (Table 1).

***Psophocarpus tetragonolobus* (Winged bean)**

The winged bean is an underutilised species but has the potential to become a major multi-use food crop. The entire winged bean plant is edible. The leaves, flowers, roots, and bean pods can be eaten raw or cooked; the pods are edible even when raw and unripe. The seeds are edible after cooking. Each of these parts are very nutritious and contains vitamin A, vitamin C, calcium, and iron. The tender pods, which are the most widely eaten part of the plant, are best when eaten before they exceed 2.5 centimetres (1.0 in) in length. The young leaves can be picked and prepared as a leaf vegetable, similar to spinach. The nutrient rich, tuberous roots have a nutty flavour. They are about 20% protein; winged bean roots have more protein than many other root vegetables. The leaves and flowers are also high in protein (10–15%). The seeds are about 35% protein and 18% fat. Winged beans consist of high amount of niacin which helps in reducing the formation of blood clots by reducing platelet aggregation which reduce the risks of cardiovascular disease.

***Parkia roxburghii* (Tree Bean)**

Tree bean is a much-branched legume of medium height (10-12 m) with bipinnate leave and is very popular in North East India where the long tender pods are used as

vegetables. The total essential amino acids amounted to 33%, 36% and 39% in the tender, immature, mature pods, respectively, and 42% in the kernels (Table 2).

Table.1 Purslane (*Portulaca oleracea*) (Nutritive value per 100 g) Source: USDA National Nutrient data

Component	Nutrient value
Energy	16 Kcal
Carbohydrate	3.4 g
Protein	01.30 g
Total Fat	0.1 g
Folates	12 µg
Niacin	0.480mg
Riboflavin	0.112 mg
Vitamin A	1320IU
Vitamin C	21 mg
Sodium	45 mg
Potassium	494 mg

Table.2 Nutrient content of *Parkia roxburghii* (Longvah and Deosthale, 1998)

Nutrition	Tender pod	Immature pod	Mature pod	Mature kernel
Protein(%)	12.1	15.6	18.8	28.8
Fat(%)	1.0	7.8	15.5	33.5
Ash (%)	7.4	6.9	6.1	5.7
Carbohydrate & fibre (%)	71.1	62.6	52.9	22.0
Energy(Kcal)	342	383	426	505
Phosphorous(mg 100 g ⁻¹)	320	315	298	270
Magnesium (mg 100 g ⁻¹)	520	505	480	420
Calcium(mg 100 g ⁻¹)	176	181	172	180
Iron(mg 100 g ⁻¹)	8.8	8.4	9.1	13.3
Manganese (mg 100 g ⁻¹)	2.8	2.1	2.4	2.9
Zinc (mg 100 g ⁻¹)	3.1	3.4	3.3	5.6
Copper (mg 100 g ⁻¹)	0.6	0.5	0.6	0.7

Colocasia esculanta

This ancient crop belongs to family Araceae and is grown throughout the humid tropics for its edible corms, cormels and leaves, as well as for other traditional uses. Fresh colocasia leaves (green variety) contain moisture 82.7 g, protein 3.9 g, fat 1.5 g, minerals 2.5 g, crude fiber 2.9 g, carbohydrate 6.8g, energy

56 Kcal, calcium 227 mg, phosphorus 82 mg, iron 10 mg, copper 0.18mg (Gopalan *et al.*, 1989). The high level of dietary fibre found in the leaf of colocasia is also beneficial as it takes an active role in the regulation of intestinal transit by increasing the dietary bulk (Saldanha, 1995). The corm of colocasia contains 11% crude protein and 87% carbohydrate content on DM basis. These

reported carbohydrate and protein values are even higher than other root crops like yam, cassava or sweet potato (FAO, 1999)

In conclusion though the prospective of the underutilized vegetables to utilize as foods is enormous, it has not been explored properly. The main probable causes behind this due to lack of planting materials, absence of information on nutritional as well as medicinal importance and lack of information on production technique of these crops. The soil and climate of Assam are favourable for the cultivation of diverse minor vegetables but the information on package of practices of the minor vegetables are very limited. The underutilized vegetable can also be vital in employment generation and also has the capability to handle adverse climatic conditions. These advantages may boost these underutilized vegetables profitable to growers, consumers and environmentalists also. But if the food and nutritional security has to safeguard, there is an immediate & urgent need is to take up programmes on genetic resources exploration, management, and utilization & improvement of underutilized vegetable crops. These underutilized vegetables imbedded with all the nutritional benefit can play an significant role in shortening the gap of per capita consumption availability of poor which help in tackling the nutrition deficiency problem to a great extend.

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