Nutritionally Rich Minor Fruits: Conservation, Evaluation and Sustainable Utilization

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Background

Malnutrition affects one in every three persons on the planet. A total of 159 million children under the age of five are estimated to be stunted. Two billion people are deficient in one or more micronutrients and nearly the same number are overweight or obese. Diversity in food plates balances the diets by supplying missing nutrients. Underutilized minor fruits can bridge this gap as they grow in adverse conditions on all kinds of soil. This strength of minor fruits is particularly useful in a country like India, where majority of the farmers are resource-poor and carry out farming under not so favourable conditions.

Bioversity International, at its genetic garden, is conserving minor fruits collected from different sources and evaluating them for medicinal and nutritional values. Among the important tropical minor fruit crops, jackfruit, custard apple, jamun, ber and drumstick are excellent sources of essential vitamins, minerals and anti-oxidants.

Jackfruit

Jackfruit (*Artocarpus heterophyllus* Lam.) is a high-yielding fruit crop with a rich nutritional value. Several food products are prepared and consumed from its tender and mature fruits and seeds. It can be grown on marginal lands and provides a good income. Its fruits have fat-free calorific value, vitamin A and readily digestible sugars. The fruits are known for their distinct sweet aroma. The flake is starchy, fibrous and rich in vitamin C. 100 g of edible flake provides about 95 calories. The seeds provide starch and protein. Every part of the plant has distinct uses. Jackfruit flakes are used in preparation of jams, jelly, chips, papads and other products.

Five species of the *Artocarpus* genus with 45 varieties have been collected and planted in the genetic garden. Besides, information on ethno-botanical importance, food value and local food recipes have been collected. Studies are underway for analyzing its genetic variability, and intra- and interspecific variation of nutritional molecules. Market potential of elite genotypes is also being studied.

Top image: Jackfruit

Credit: Bioversity International/ S. Dsouza

Ber

Ber (*Ziziphus mauritiana* Lam.) is supposed to be native to India while *Ziziphus jujube* is native to China. Indo-Malayan region including Myanmar is considered the home of ber. It is commonly found in drier regions. Its fruits are mostly eaten fresh, but can be also be processed into delicious murabba, candies and dehydrated products. Fruits are also used to prepare jam and wine.

Ber- Zizyphus mauritiana
Credit: Bioversity International / S.B. Dandin

Out of all the elite types identified, four have been planted in the genetic garden. We are gathering information on local recipes and studying the development of value-added products and their market potential. Intraspecific variation of nutritional composition analysis is being undertaken.

Jamun/Jewish plum

Jamun (*Syzygium cumini.* L. Skeels) is a perennial tree found in many Asian countries. Its fruits are a good source of iron, sugar, minerals, protein and carbohydrates. Fully ripe fruits are eaten fresh and can also be processed into jam, jelly, squash, wine, etc. In Ayurvedic medicine,

Jamun- Sizygium cumini
Credit: Bioversity International / S.B. Dandin

its fruits and seeds are used to treat diabetes. Large variability is found both at intra- and interspecific level. Genus *Syzygium* has several other species whose fruits are edible, nutritious and have potential for commercial use.

So far, 10 species and 15 varieties of *Syzygium* genus have been planted and are being studied. Since many of the species are used for medicinal purposes, identification of such important biomedical molecules is being attempted.

Custard Apple/Sweet Sop

Genus *Annona* has five edible species. Among them, custard apple (*Annona squamosa* L.) is an important table fruit. Apart from fresh consumption, the pulp of *A. squamosa* can be processed to prepare products like pastries, chocolates, ice cream and mixed fruit jam. Extracts of *A. muricata* (sour sop) are currently being studied as a potential treatment for various types of cancer. Seeds of most of these species contain insecticidal properties and are locally used to control pests. Green leaves yield essential oil.

In the genus Annona, six species and 24 varieties have been collected and planted in the genetic garden. Among them, *A. squamousa*, *A. reticulata*, *A. atemoya* and *A. muricata* are being investigated for the variation in food and nutraceutical value.

Custard apple - Annona squamosa
Credit: Bioversity International / S.B. Dandin

Drumstick

Drumstick (*Moringa oleifera* Lam.) is a perennial multipurpose tree and commonly grown in home gardens in India, Sri Lanka, Indonesia, Vietnam, Thailand, Malaysia and the Philippines. It can be grown in a wide range of soils with varied fertility status. Almost all parts of the tree such as leaves, flowers, fruits and seeds are used as food and for medicinal purposes. It is rich in vitamin A, vitamin C, iron, calcium, potassium and amino acids. The plants produce pods throughout the year which are used very popularly as vegetable. Several dishes are prepared either exclusively or in combination with other vegetables.

Fruits of drumstick
Credit: Bioversity International / S.B. Dandin

Leaves are a good source of iron and fibre and are considered to be very good for anaemic women and children. All the genetic variability available in the species is being collected and planted. Different parts of the plants, leaves, flowers, pods and seeds are being subjected to comparative nutritional profile.

Tamarind

Tamarind (*Tamarindus indica* L. 1753) is indigenous to tropical Africa and some parts of south India. It is highly drought-tolerant and suitable for all types of marginal lands including wasteland. Unripe fruits are used in vegetable preparation while ripe fruits are a rich source of vitamin C and tartaric acid. Tamarind pulp is an important ingredient in many Asian culinary preparations. Based on the rind colour and taste, different varieties have been identified as green and red type; and sweet and sour type. Seeds contain a good amount of starch, protein and oil. A large amount of intraspecific variability is reported.

Many available genetic variants have been collected and planted in the genetic garden to analyze the comparative nutritional strength of these genotypes.

Tamarind
Credit: Bioversity International / S.B. Dandin

Food Components	Jackfruit	Custard apple	Jamun	Tamarind	Ber	Drumstick
Water (g)	72-94	69-75	83.7-85.8	17.8-35.8	81-83	69.9
Calories (Kcal)	72-98	88-96	62.00	-	63.00	-
Protein (g)	1.3-2.0	1.53-2.38	0.7	2.0-3.0	0.8-1.8	2.5
Fat (g)	0.1-0.4	0.26-1.10	0.15-0.3	0.6	0.07	0.1
Carbohydrate (g)	16.0-25.4	19-25	14.0-16.0	41.1-61.4	14.17	3.7-8.5
Fibre (g)	1.0-1.5	1.14-2.50	0.3-0.9	2.9	0.6	4.8
Calcium (mg)	20-37	19.4-44.7	8.0-15.0	34.0-94.0	25.6	30.0
Phosphorus (mg)	18-38	23.6-55.3	15.0-16.2	34.0-78.0	26.8	110.0
Iron (mg)	0.5-1.1	0.28-1.34	1.2-1.62	0.2-0.9	0.8-1.8	5.3
Vitamin A (IU)	152-540	5.0-7.0	80.0	-	34.0-35.0	184.0
Thiamine (mg)	0.03-0.09	0.1-0.13	0.01-0.03	0.33	0.02	0.05
Riboflavin (mg)	0.03-0.05	0.11-0.17	0.01	0.10	0.02-0.04	0.07
Niacin (mg)	0.4-4.0	0.65-0.93	0.2-0.29	1.00	0.7-0.9	0.2
Ascorbic acid (mg)	8.0-10.0	34.0-42.0	5.7-18.0	44.00	65.0-76.0	120.0

Source: Pareek and Sharma (2009)

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