Under-Exploited and Nutritionally Rich Wild Fruits of Telangana, India

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Abstract

Telangana is part of tropical region on east of India, endowed with rich biodiversity. It is need to emphasize about the occurrence of enormous biodiversity existing in well-known Deccan plateau of Indian subcontinent. The rich wealth of flora and fauna of this region has made it a paradise of nature as it houses rich genetic diversity. One of the most fundamental values of plant diversity is in supplying the food, protective foods and medicinal herbs, besides many industrial raw materials, for the benefit of mankind. Here comes an array of fruit crops into picture. The agro climatic conditions and edaphic factors of the region including Telangana are uniquely favourable for a number of fruit crops.

Introduction

State of Telangana encompasses an area of 1,12,077 km² (44,340 sq mi) and lies between the latitudes 15°46′00″ N and 19°47′00″ N, and longitudes 77°16′00″ E and 81°43′00″ E, bound by the states of Maharashtra and Chhattisgarh on the north, Karnataka on the west, and Andhra Pradesh on the south and east. Telangana is a semi-arid area and has a predominantly hot and dry climate. Summers start in March, and peak in May with average high temperatures in the 42°C (108°F) range. The monsoon arrives in June and lasts until September with about 755 mm (29.7 inches) of precipitation in a multimodal distribution pattern. A dry, mild winter starts in late November and lasts until early February with little humidity and average temperatures in the 22–23°C (72–73°F) range. The annual rainfall is between 900 and 1500 mm in northern Telangana and 700 to 900 mm in southern Telangana, from the southwest monsoons. A dry, mild winter starts in late November and lasts until early February with little humidity and average temperatures in the 22–23 °C (72–73 °F) range. Geographically the region can be divided into three main areas. They are: 1) Mid- Godavari basin, 2) Plateau of Telangana which is about 600 metres above mean sea level and 3) Mid- Telangana which is 150 to 300 metres above the mean sea level. Though industrial sector and mining are at playing important role in terms of employment generation, agriculture has been providing livelihood support to almost 73% of the population and is essential for the state to support the latter two
Various soil types abound, including chalkas, red sandy soils, dubbas, deep red loamy soils, and very deep black cotton soils that facilitate planting mangoes, oranges and flowers. Major soil series are coarse to medium textured, while some are medium to fine textured. These soils are well drained but have good water holding capacity, although dense vegetation and grass cover have contributed to high contents of organic matter (0.5 to 1.5 % organic carbon) in several soils. The pH of the soils is 4.5 to 6.5. Soils, in general, are productive with irrigation and fertiliser management (Gangapuram, 2014).

Since time immemorial, edible wild fruits have played a very vital role in supplementing the diet of the people of Indian Sub-continent. Apart from customary use as food, wild edible fruits have various health advantages as it potentially give immunity to many diseases. Accordingly, Ayurveda, the Indian Folk medicine was developed from wild fruits and plants. Major fruit crops like Mango, Litchi, Guava etc. are commercially cultivated while the wild edible fruits refer to species that are neither cultivated nor domesticated, but it come from their wild natural habitat and used as one of the sources of food (Beluhan and Ranogajec, 2010; Urvashi and Bhardwaj, 2015). Although the term ‘underutilized’ crop has been defined in various ways in world literature, most of these have been given importance to features, among others, like linkages with the cultural heritage of the locality, multiple uses, traditional crops in localized areas, and neglected by agricultural research and development agencies (Thakur, 2014). We believe this applies equally to fruit crops and tree spices. For the purpose of this paper, we have adopted the definition given by IPGRI- Underutilized crops are those marginalized by farmers and consumers due to agronomic, genetic, economic, environmental and cultural reason, which were once important and major crop in the community (IPGRI, 2000). UUF’s have poor shelf-life, un-recognized nutritional value, poor consumer awareness and reputational problems, therefore, also called as, “poor people’s food”. As the demand for food changes (re-discovery of nutritional and culinary value, therapeutic value—whole ethnobiology), UUF’s can overcome the constraints to the wider production and use by the poor people. Underutilized fruits have a distinctive past, current, or potential use value, but their use is currently limited relative to their economic potential (Gruère et al., 2006; Mayes et al., 2011). It may be useful to develop a check list of criteria for selecting UUFTS in India, so that work on them could be more focused.

The following are some such criteria (modified from von Maydell, 1989).

They should be in demand or have potential for generating demand

They should be accepted by people, often something to do with cultural identity/importance

They should have low risk or have risks that can be managed easily

They should be free from negative properties of effects

They should be adapted to local conditions, often vital in specific ecosystems

They should be easy and safe to establish, with low inputs

They should be fast growing and shorter gestation period

They should produce high yields and/or produce high quality produce

(https://finance.telangana.gov.in/downloads/SEOutlook2016.pdf)
They should be compatible with other land uses.

It is important to note here that different crops or crop categories are underutilized to very different degrees and in different aspects and suggest practical means to quantify these differences (Galluzzi and Noriega, 2014) and in different regions of a country.

**Need of explore underutilized fruit crops**

In Telangana region, there are wastelands of different kinds viz. sand dunes, ravines, acidic soils, marshy and marginal lands, which are unfit for supporting cultivation of high input demanding crops. Such lands can easily be put to use for growing low input crops in order to diversify the present day agriculture, which is so inevitable in view of the increasing population pressure and fast depletion of natural resources as well as the growing and changing human needs in the region.

The average productivity of the horticultural crops is just half of the national productivity. As grain farming is proving un-renumerative in the undulating topography of hilly tracts, which is deprived of irrigation facilities, despite government of India’s has been putting forth endeavours to uplift the region, vast potential remains unexploited.

It becomes possible to exploit the untapped potential of the region through location specific horticulture and subsequently expanding the area under horticultural crops. Production of UUHC can also be increased through adoption of scientific technologies.

Apart from nutritive value, underutilized horticultural crops are particularly more important for medicinal properties and famous for the retentive value in Ayurvedic medicine. Mostly people are familiar with the medicinal properties of locally grown horticultural crops.

**Potential uses of minor fruits**

Many underutilized fruit species are nutritionally rich and are suitable for low input agriculture as they naturally occur either in wild or can sustain adverse climatic conditions of the growing regions. They can contribute significantly to maintain rich diversity and hence more stable agro-ecosystems.

Fruits have both restorative as well as curative properties viz. aromatic, cooling, digestive, stomachic, stimulant, astringent, emollient, useful in seasoning, maturation and fermentation of culinary, processed food and drinks.

There are few other fruits which possess specific properties such as diuretic, diaphoretic, sedative or stimulant to nerves, improver of peristaltic movements of intestine and liver ailment, cardio tonic, relieving cough, cold, bronchitis, asthmatic spasm, blood pressure etc. Some minor fruits contain essential oils in their peel, foliage or roots and exhibit carminative and germicidal properties. In addition to their therapeutical values, these fruits provide nutrition, strength and vigour to our body and restore loss of minerals and amino acids, thus protecting it against many deficiencies and diseases. The study revealed reported that the level of carotinoids varied from 7071 to 1485.00 μg/100g, which was recorded in Artocarpus integrifolia followed by Spondias cythera, Spondias pinnata and Syzigium claviflorum. Some of the other minor fruits found in the regions are fairly good source of ascorbic acid viz. Artocarpus spp. Bael, wood apple and aonla were found to be rich source of calcium (Singh et al., 2003; Mazumdar, 2004; Mazumder et al., 2000).
### Table 1: Potential uses of minor fruits

| Fruit Name                        | Crude Protein g/100 | Fat g/100 | Crude Fibre g/100 | Carbohydrate g/100 | Ca mg/100 | K mg/100 | Na mg/100 | P mg/100 | Fe mg/100 | Vit C mg/100 | Vit A (IU) |
|-----------------------------------|---------------------|-----------|------------------|--------------------|-----------|----------|-----------|---------|-----------|--------------|------------|
| Aegle marmelos Correa             | 2.2                 | 0.29      | 2.9              | 29                 | 85        | -        | -         | 50      | 0.6       | 9.11         | 92         |
| Cordia myxa L                     | 1.9                 | 1         | 2                | 16                 | 20        | 26       | -         | 26      | 5         | -            | -          |
| Zizyphus mauritiana Lam           | 2                   | 1         | 2                | 93                 | 60        | 589      | 154       | 585     | 7         | 88           | -          |
| Averrhoa bilimbi L                | 1.04                | 0.33      | 2.8              | 6.73               | 4         | 133      | 2         | 12      | 0.08      | 34.4         | 61         |
| Syzygium mcinini Skeels           | 0.7                 | 1.5       | 0.6              | 15                 | 8         | -        | -         | 15      | 1.62      | -            | -          |
| Grewia asiatica Mast              | 1.3                 | 1.8       | 1.5              | 129                | 350       | 4        | 3.9       | 3.1     | 22        | 800          |            |
| Feronia limonia L                 | 7.1                 | 0.3       | -                | 17                 | 4         | -        | -         | 9       | 0.5       | 3            | 0.61       |
| Diospyrus melanoxylon Roxb. ExA   | 0.58                | 0.49      | 10.5             | -                  | -         | -        | -         | -       | 27        | 11           |            |
| Phontx sylvestris L. Roxb.        | 2.3                 | 0.51      | 1.82             | 87                 | 184       | 854      | 14        | 16      | 5.26      | 3.56         | -          |
| Zzyphyus nummularia Lam           | 2.9                 | -         | -                | -                  | -         | -        | -         | -       | -         | -            | 500        |
| Annona reticulata L               | 1.6                 | 0.4       | 2.5              | 23.5               | 17        | 250      | 4         | 47      | 0.5       | 43           | -          |
| Phyllanthus embelica L            | 0.5                 | 0.1       | 3.4              | 14                 | 0.05      | -        | 0.02      | 1.2     | 600       | -            |            |
| Artocarpus heterophyllus Lam      | 1.9                 | 0.1       | 18.9             | 50                 | 246       | -        | 97        | 500     | 11        | 540          |            |
| Averrohoe carrmoba L              | 0.75                | -         | 0.7              | 9.4                | -         | -        | -         | -       | -         | -            | 560        |
| Madhuca latifolia (Roxb.)         | -                   | -         | -                | -                  | -         | -        | -         | -       | 60        | 528          |            |

Source: USDA National Nutrient data base (http://www.nal.usda.gov/), Mitra et al., (2008) and Anupam, (2013)
Table 2: Diversification of underutilized fruit crops

| Common Indian English name of the Fruits | Scientific name and Family | Description | Yield Fruit/tree | Origin | Usage and Remark |
|----------------------------------------|----------------------------|-------------|------------------|--------|------------------|
| Usrikaya Anola                         | Phyllanthus embelica L Phyllanthaceae | Medium sized tree with small leaves, fruit matures in Jan – Feb | 1500-2000 nos | India Throughout India | Wild and domesticated, sour, rich in Vit C and Ca, fruits each weighs 30-50 g |
| Regu Ber/Indian Plum                   | Zyzphyus numbularia Lamk | Thorny tree, matures in Jan - Feb | Eaten raw, 100kg fruits | India, S-E China | Cultivated, minor, good nutritive value, eaten fresh, 15 varieties are there |
| Bilimbi/Carambola Tree Sorrel          | Averrhoa carambola L Oxilidiaceae | Big tree, elongated cucumber like fruits are in cluster, yellowish green when ripe, | 500 fruits, | Indo-China, | Wild and domesticated, sour in taste, used as chutney, high Vit C |
| Sitaphalam Custard apple               | Annona squamosa L Annonaceae | Shrub like tree, with small leaves, fruits have gritty structure with grainy pulp, matures in Sept-Oct | 100 fruits, | Tropical America | Wild and domesticated, leaves have insecticidal properties, eaten raw, good taste, |
| Gondi/ Bansa puli Lasoda               | Cordia myxa L Boraginaceae | Shrub, the fruit mature during July- August. Grow in different agroclimatic condition; It is a kind of a drupe, light pale to brown or even pink in colour. Used in Ayurveda. Tolerate arid weather | 20 kg fruit | Asia/ Africa Different parts on India | Fully ripe fruit is quite sweet in taste having mucilaginous pulp and is fully enjoyed by children. The pulp in a half ripe fruit can even be used as an alternative to paper glue in office work. |
| Ramphal Custard apple                  | Annona reticulata L Annonaceae | Medium sized tree, bigger leaves, smooth fruit with hexagonal markings, grainy pulp, matures in Mar- April | 80-100 | Tropical America | Wild and domesticated, fruits are eaten raw, preferred by children |
| Amra Hog Plum                          | Spondius cythera Sonn Anacardiaceae | Deciduous Tree, immature fruits are used in culinary art, July-Aug, immature fruits are eaten in culinary art, July Aug | 30 quintal | Polynesia | Sour, used in Chutney, Ayrvedic properties, |
| Pugoda/ Maulsari Spanish Cherry       | Minusops elengi L Sapotaceae | Tree with dense leaf canopy, used as shade tree in gardens. The orange-red fruit is hairy. Matures in April – May. Small fruits, each weighing 10-15 g. | 10 kg | South Asia | Wild and domesticated, having Ayrvedic properties. It is eaten mostly by children,. The wood is extremely hard, strong and tough, and rich deep red in color. |
| Velakkaya Wood apple/ Elephant apple   | Feronia limonea L Swingle Rutaceae | Big tree, fruits have a hard cover, matures Sept-Oct, succulent placenta and inner pericarp is eaten | 1000 nos | India/ Sri Lanka | Wild and domesticated, sweet and sour, eaten fresh Chutney, bark has insecticidal properties. |
| Bilamboo/Bael Stone apple              | Aegel marmelos L Cor. Serr Rutaceae | Big deciduous tree, takes 11 months to mature in Mar- April, having hard shell, Numerous hairy seeds are encapsulated in a slimy mucilage, yellow pulp, one big fruit | 500 nos | India | Widely used in Ayurvedic medicine, good laxative, mature and immature fruit is eaten, ripe fruit eaten fresh, Sacred tree for the Hindus. Thrives well in extreme high |
| Plant Name                  | Scientific Name                                      | Description                                                                                   | Weight | Origin/Region                                      | Other Uses                                                                                           |
|-----------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------|---------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Bilati Amra / Hog Plum      | Spondius pinnata Kurz                               | Deciduous Tree, immature fruits are used in culinary art, July-Aug, fruit is bigger than S cythera. | 40 quintal | Tropical Asia                       | Sweet and sour, eaten raw with salt, used in Chutney, immature fruits are eaten in culinary art, July-Aug   |
| Chinthapandu / Imli Tamarind| Tamarindus indica L. Leguminosae                     | Big tree, 20-25 m ht, elongated ripe fruits matures in Mar-April, provides good shade           | 5-10 qtl| India                                         | Sour taste, raw consumption is less, used in culinary art, chutney, rich in K, Ca, P and Vit C         |
| Jangli Badam / Manjiponaku  | Sterculia foetida L. Sterculiaceae                   | The branches are whorled and usually horizontal, with palm like leaves gracefully up-curved and crowded at the ends with large. Fruit is an aggregate of follicle of 1-5, scarlet, boat shaped, woody. The seeds are edible after toasting and taste like chestnuts. | 100 nos| East Africa / Tropical                 | The seed contain oil used as medicine; the timber is used for making furniture and the bark for rope.   |
| Seemachinrhakaya / Ganga imli | Pithecellobium dulce (Roxb.) Benth Fabaceae        | Big tree also known as Madras thorn, drought resistant, gives fruiting in April – May.           | 100 kg | Mexico / Central America | Wild, fruits are like tamarind pod with reddish coating, pulp is spongy, eaten mostly by children          |
| Ippa puvvu / Mahua          | Madhuca latifolia (Roxb.) Sapotaceae                 | Big tree, culturally associated with native people of lateritic belts, flowering stats from Feb-Mar, fallen flowers are collected by native people, fruits mature in Jun-July. | 100 kg | India                                         | Wild, ripe fruits are not popular, eaten by cattle. Seed is used for edible oil; flowers are used in various ways. Mostly the dried flowers are used for distillation of “Mahua Liquor” |
| Tendu / Kenda               | Diospyrus melanoxylon Roxb. Ex. A Ebenaceae         | Medium sized tree, round shaped yellow fruits mature in April-May                               | 2-15 kg | India                                         | Wild, eaten fresh, sold in the local market, leaves are use in wrapping BIDI (a kind of local cigar) |
| Neredu pandu / Jamun Wild Jumun | Syzygium cumini L. Skeels Myrtaceae                 | Big tree with dense foliage proving shade along the road side, soft black fruit with skin and pulp not separable. | 50 kg  | India                                         | Highly perishable, eaten fresh, rich in Iodine, seed is used to cure diabetes, leaves used as fodder, one of sacred fruits of the Hindus. |
| Kharjura / Khejur Wild Date | Phonix sylvestris L. Roxb. Arecaaceae                | Date palm tree, thrives well in drought condition, fruits matures in May- June, small brown cloured fruit having less flesh, | 50 kg  | India                                         | Wild cultivated and domesticated. sweet xylem sap is collected during winter months for making molasses and alcoholic drink |
| Konda Usiri / Hariphal Star Gooseberry | Phyllanthus acidus L. Skeels Phyllanthaceae | Medium sized tree, small pendulous ribbed fruits grow in clusters from branches, like grapes. Fruits appear simultaneously with the flowers and produce fruit twice a year. | 15-50 kg| Malay / Madagascar | Wild and domesticated, Eaten raw with salt, rich in vit C, used as pickles.                           |
| Busarakaya / Rasbhari Cape Gooseberry | Physalis peruviana L. Solanaceae                 | Herb, small seedy berries with papery calyx, resembling a miniature spherical yellow tomato. it is about the size of a marble about 1-2 cm in diameter. Like a | 1-2 kg | Peru / Columbia | Recently introduced and cultivated in small pockets, rich in Vit C, used in folk medicine, used as jam |
| Common Name      | Scientific Name | Description                                                                 | Quantity | Country/Region              |
|------------------|-----------------|------------------------------------------------------------------------------|----------|-----------------------------|
| Tati chettu      | *Borassus flabellifer* L | Branch less palm, matures in July-Aug, the ripened fibrous outer layer of the palm fruits can also be eaten raw, boiled, or roasted. Immature fruit is cut and three jelly like seeds are eaten after removing the thin layer. The white kernel of the germinated seed is also eaten. | 200 fruits, | Indian subcontinent          |
| Asian Palmyra palm/Toddy palm | *Diospyros blancoi* A.DC Ebenaceae | Dioecious tropical tree, grows well from the sea level to the 2,400 feet above the sea level, Sapota like fruits with reddish velvety layer, medium sized | 80-100 nos | Philippines                  |
| Bilati Gaab      | *Artocarpus lakoocha* Roxb Moraceae | Big tree. The orange-yellow male flowers and reddish female flowers grow separately on the same trees. Velvety, dull yellow syncarp fruits are nearly round or irregular | 70 kg / 250 fruits | India                        |
| Deoa Monkey Jack | *Syzygium samarengense* (Blume) Merrill & Perry Myrtaceae | Evergreen tree with big leaves, berry bell shaped fruit matures in June-July (rainy) and in Jan – Feb (winter) for second flush, winter fruits are sweeter than rainy season size varies | 40 kg, one big fruit weigh 60 g | Malay, Andaman Island         |
| Jamral/Jaman Star Apple/Wax apple | *Buchanania lanzan* Sperg. Anacardiaceae | Medium size tree, upto 40-50 ft. high with a straight trunk | 5-10 | India                        |
| Caddapah almond, Chironji, | *Artocarpus heterophyllus* Lam Moraceae | Big tree. The orange-yellow male flowers and reddish female flowers grow separately on the same trees. | 100 Kg/ 200 fruits | India                        |

Source: Roy *et al.*, (1998), Chadha (2001), Peter (2007) and Malik *et al.*, (2010).
Fig. 1 Need of explore underutilized fruit crops
Feronia limonea

Grevia asiatica

Cordia myxa

Zyzyphus nummularia

Mimusops elengi

Syzygium cuminii
Diversification of underutilized fruit crops

Telangana is being rich in plant diversity, has a very large number of non-traditional or underutilized fruit crops. Different agro-ecological/phyto-geographical regions hold rich diversity in both the cultivated and the wild horticultural crops. Diversity among UUFs in the Telangana region is discussed below in table 1. This table includes only species that are native to South Asia or those that were introduced long ago and have naturalised in India (Table 2).

Constraints in utilization and marketing of UUF’s

Overall, the slow progress and poor popularity in the effective development and utilization of underutilized crops results from a number of constraints which are summarized below:

Lack of information on production, nutritional quality, consumption and utilization of many of the underutilized plant products which are unpopular compared to major fruits.
Lack of awareness on economic benefits and market opportunities.
Lack of technology for value addition through village level food processing.
Lack of improved quality planting material.
Lack of technology to reduce the gestation period and enhance the fruit production.
Lack of interest by researchers, agriculturists and extension workers.
Lack of producer interest.
Low yield.
Post-harvest and transport losses.
Non-existence of marketing network and infrastructure facility for underutilized fruits.
Lack of national policy.
Lack of credit and investment.
Non-availability of scientific resources for testing, valuation and post-harvest management of different underutilized fruits.
Disorganized communities.
The wise and proper utilization of underutilized horticultural crops can prove to
be a promising solution after realizing their health and employment potential. The underutilized crops can be a rich and easily available source of major and minor nutrients in sufficient amounts to prevent and cure deficiency disorders. They are the source of ayurvedic medicine because of having therapeutic properties. It is also established fact that seasonal, locally available, and cheap fruits and vegetables can also keep the population healthy and nutritionally secure rather than costly off season ones. They can fetch self-employment opportunities through marketing of raw fruits. Along with it, employment can be generated by value added product preparation through processing. Hence, it can be concluded that exploitation of underutilized fruit crops can provide a way to nutrient and economic security of tribals. Also, tribals can earn their livelihood through use of underutilized fruit crops.

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