

Research and development programme in underutilized fruit crops in Sri Lanka

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Existence of large number of agro ecological zones in Sri Lanka gives rise to high degree of vegetational bio-diversity. Part of species diversity in the vegetation is represented by numerous fruit species and its various germplasm. There are more than 50 fruit species scattered all over the island but only about 20 species are cultivated for economic returns. Many more wild, semi-wild or undomesticated fruit species naturally exists in home gardens, jungles and reservations are unexploited and these are collectively known as under utilized fruit crops.

Fruit crops like Jack, (*Artocarpus heterophyllus*), Beli (*Aegle marmelos*), Durian (*Durio zibethinus*), Mandarin (*Citrus reticulata*), Anona (*Anonane spp.*), Nelli (*Embllica officinalis*) are some of the fruits falling under this category whose nutrition values and income generating potential is known but are not commercially exploited fully.

The Need for Investment In Research And Development

1. These groups of fruits provide economic return to wild fruit gatherers and small hold growers.

2. These fruit trees which are important component of the natural resources endowment of country and is also important to the environment. Being perennial plants fruit trees are excellent reforestation and agro-forestry species.

3. Presence of diverse fruit germplasm have significantly contributed in maintaining high faunal diversity in the ecosystem. The nectarivorous insects such as butterflies depend on the flowers of fruit trees for nectar and the particular tree depend on butterflies for pollination. Likewise the frugivorous birds and mammals depend on these fruits for food and fruit trees in return depend on them for dispersal of seeds.

4. Most of these fruit species are rich sources of vitamins, minerals, fibre and antioxidants. Some of

these have therapeutic value and used in indigenous medicine. Some of the chemicals derived from these fruits are processed into products of modern medicine (Table 1). The nutraceutical industry is increasingly interested in research on cosmetic and medicinal uses of these crops. Also various processed products such as chutneys, jams, cordials and vines are made but also, there is great potential for making new processed products (Table 1). All of these crops are either found in wild or in home gardens and reservations are grown without use of agro-chemicals, hence these groups of crops can be exploited as organically grown fruits.

5. Many of these fruits are now becoming scarce due to the erosion of their natural habitat because they are not exploited commercially. The major constraints are low yield due to poor planting material, non-availability of recommended propagation methods and production packages and post harvest and transport losses.

Research priorities

Germplasm collection and conservation

Genetic variation within a species is a pre-requisite to the domestication and genetic improvement of the species. Since most of the fruit crops are cross pollinated there exist wide variety of genetic variation within these crops. Due to reduction in forest cover. There has been a progressive erosion of bio-diversity. Therefore, exploring, locating, collecting and conserving genetic diversity are very important.

Following activities will be carried out under the above theme.

1. Ecogeographic studies will be conducted to locate and collect genetic diversity

2. Characterization, evaluation to identify desirable clones.

3. Assessment of genetic diversity in material with communities and home gardens using indigenous knowledge

4. Conserve the desirable clones of selected under utilized fruits in ex-situ conservation sites at Gannoruwa, Horana and Girandurukotte. Selection of desirable types will be based on inter-

views with the farmers, home garden owners, field observation and fruit analysis etc. Shoots will be collected from superior plants and grafted for conservation.

Propagation methods

For most of these crops vegetative propagation techniques are not available. Also, in most of fruit crops seeds do not germinate easily. Seeds treatment methods need to be developed to speed up seed germination. Various vegetative propagation methods such as use of stem and root cuttings, grafting, budding, layering and in vitro tissue culture techniques needs to be developed.

Reproductive biology

Almost all fruit trees are angiosperm belonging to taxonomically diverse families. Information on floral and fruiting phenology, pollination biology, incompatibility and mating systems and mechanism of seed dispersal is essential for effective management of these crops both for conservation and production purposes. Many of these fruit crops can be classified as out crossing, self incompatible and hermaphrodite species. There is little information on floral and breeding biology for the vast majority of under-utilised fruit crops.

Post harvest handling and development of value added products

Post harvest processing and storage have not being subjected to any organized research and wasteful traditional methods are still being practised by rural population. The losses may be due to mechanical injury physiological damage or pathogens. The reduction of losses in a systemic way requires knowledge of post harvest physiology, its applied technical aspects, handling and the appreciation of its biological limitation represented as storage potential.

Traditionally from most of these fruit crops jams, cordials, pickles and preserve in syrups are made as value added products. Many new products are possible with some application in pharmaceutical industry.

Table 1: Nutritional, therapeutic values and value added products of some selected under utilized fruits

Crop	Ecological requirement	Nutritional, therapeutic value and value added products
Anona (Soursop)	A small tree grows in WZ* and IZ*	Rich in vitamin C. High in thiamine, potassium, calcium and dietary fibre. Used for arthritis, haematuria, hepatic disorders, immature fruits, allergy and dysentery. Cordial, cream, juice, ready to serve beverages, jelly, and Nectar syrup, Ice cream are value added products.
Beli (Aegle marmelos)	A medium size tree grows everywhere in Sri Lanka. Preferably in WZ and IZ	Good source of vitamins particularly riboflavin, minerals and carbohydrate. Most parts of the tree is used in indigenous medicine. Use for chronic dysentery conditions alternating with occasional constipation. Beli cream, juice and herbal drinks are value added products.
Wood apple (Limonia acidissima)	Mostly found in the DZ*	High in calcium and phosphorous. The pulp contains high amounts of riboflavin, one of the essential vitamins. All parts of the plant are used as medicine, dysentery, throat irritation and snake bite. Jams, pulp, fruit bars are value added products.
Veralu (Elacocarpus serratus)	A tree grows in the mid and low country	Rich source of vitamin C. The leaves and fruits are used in medicine for rheumatism and as an antidote to poison.
Nelli (Phyllanthus emblica)	Small tree grows everywhere in Sri Lanka except in the higher elevations	Very rich in vitamin C. All parts of plant are used as diuretic, laxative, and for treatment of boils and jaundice.
Jack fruit (Artocarpus heterophyllus)	Mostly in WZ, scattered in DZ and IZ	It has high calcium, phosphorous, iron, vitamin A & C. Useful for treatment of blood disorders. Candy, cordial and canned fruit syrup are value added products.
Goraka (Garcinia quaesita)	Medium size shade loving tree mostly found in WZ and IZ	Rich source of hydroxy citric acid (HCA) which reduces appetite hence used in obesity control. Studies also has shown HCA reduces fatty acid and cholesterol production. It controls histamine production in fish. Hence used in fish
"Ambulthiyal".		
Tamarind (Tamarindus indica)	A large size tree that grows well in the DZ	It has very high content of tartaric acid. The pulp is rich in minerals, high in potassium. It is used as a gentle laxative. Tamarind powder, juice, jam, and candy, syrup, chutneys, pickle, toffee are value added products.
Lovi (Flacautia intermis)	Small ornamental tree that grows well in the low country WZ	Rich source of vitamin C. Good for rheumatic disorders. Fruits are sour, eaten fresh or made into jelly.
Lansone (Baccauria motleyana) and	Found mostly in WZ	Rich source of vitamin C. Fresh table fruit with unknown medicinal value. Canned in sugar syrup candy are value added products.
Uguressa (Flacourtia indica)	Shrub to small tree found in WZ & IZ	Rich in vitamin C. Useful for treatment of rheumatic disorders. Eaten as a fresh fruit.
Mangusteen (Garcinia mangostana)	Medium size tree that grows well in Kaluthara and Kandy districts	Rich in calcium and phosphorus. Useful for treatment of diabetes.
* DZ - Dry Zone	* WZ - Wet Zone	* IZ - Intermediate Zone