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Wood-Apple : An Immunity Booster

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The wood-apple, *Feronia limonia* Swingle (syns. *F. elephantum* Correa; *Limonia acidissima* L.; *Schinus limonia* L.) is the only species of its genus, in the family Rutaceae. Besides wood-apple, it may be called elephant apple, monkey fruit, curd fruit, *kath bel* and other dialectal names in India.

Origin and Distribution

The wood-apple is native and common in the wild in dry plains of India and Ceylon and cultivated along roads and edges of fields and occasionally in orchards. It is also frequently grown throughout Southeast Asia, in northern Malaya and on Penang Island. In India, the fruit was traditionally a "poor man's food" until processing techniques were developed in the mid-1950's, it is said to be the hill regions of northern India. The exact area and annual fruit production of wood apple is not known, it is mostly grown as stray plant and that too on waste lands. But recently, it had gained importance as a suitable horticultural plant for soil reclamation as ell as most hard plant in both arid and semi arid zones.

Description

The slow-growing tree is erect, with a few upward-reaching branches bending outward near the summit where they are subdivided into slender branchlets drooping at the tips. The bark is ridged, fissured and scaly and there are sharp spines :3/4 to 2 in (2-5 cm) long on some of the zigzag twigs. The deciduous, alternate leaves, 3 to 5 in (7.5-12.5 cm) long, dark-green, leathery, often minutely toothed, blunt or notched at the apex, are dotted with oil glands and slightly lemon-scented when crushed. Dull-red or greenish flowers to 1/2 in (1.25 cm) wide are borne in small, loose, terminal or lateral panicles. They are usually bisexual. The fruit is round to oval, 2 to 5 in (5-12.5 cm) wide, with a hard, woody, grayish-white, scurfy rind about 1/4 in (6 mm) thick. The pulp is brown, mealy, odorous, resinous, astringent, acid or sweetish, with numerous small, white seeds scattered through it.

Food Uses

The rind must be cracked with a hammer. The scooped-out pulp, though sticky, is eaten raw with or without sugar, or is blended with coconut milk and palm-sugar sirup and drunk as a beverage, or frozen as an ice cream. It is also used in chutneys and for making jelly and jam. The jelly is purple and much like that made from black currants.

A bottled nectar is made by diluting the pulp with water, passing through a pulper to remove seeds and fiber, further diluting, straining, and pasteurizing. A clear juice for blending with other fruit juices, has been obtained by clarifying the nectar with Pectinol R-

10. Pulp sweetened with sirup of cane or palm sugar, has been canned and sterilized. The pulp can be freeze-dried for future use but it has not been satisfactorily dried by other methods.

Food Value Per 100 g of Edible Pulp*		
	Pulp (ripe)	*Seeds*
Moisture	74.0%	4.0%
Protein	8.00%	26.18%
Fat	1.45%	27%
Carbohydrates	7.45%	35.49%
Ash	5.0%	5.03%
Calcium	0.17%	1.58%
Phosphorus	0.08%	1.43%
Iron	0.07%	0.03%
Tannins	1.03%	0.08%

*According to analyses made in India.

The pulp represents 36% of the whole fruit. The pectin content of the pulp is 3 to 5% (16% yield on dry-weight basis). The seeds contain a bland, non-bitter, oil high in unsaturated fatty acids.

Other Uses

- ✓ **Pectin:** The pectin has potential for multiple uses in pectin-short India, but it is reddish and requires purification.
- ✓ **Rind:** The fruit shell is fashioned into snuffboxes and other small containers.
- ✓ **Gum:** The trunk and branches exude a white, transparent gum especially following the rainy season. It is utilized as a substitute for, or adulterant of, gum arabic, and is also used in making artists' watercolors, ink, dyes and varnish. It consists of 35.5% arabinose and xylose, 42.7% *d*-galactose, and traces of rhamnose and glucuronic acid.
- ✓ **Wood:** The wood is yellow-gray or whitish, hard, heavy, durable, and valued for construction, pattern-making, agricultural implements, rollers for mills, carving, rulers, and other products. It also serves as fuel.
- ✓ The heartwood contains ursolic acid and a flavanone glycoside, 7-methylporiol-□-D-xylopyranosyl-D-glucopyranoside.

Medicinal Uses:

- The fruit is much used in India as a liver and cardiac tonic. when unripe, as an astringent means of halting diarrhea and dysentery and effective treatment for hiccough, sore throat and diseases of the gums.

- Juice of young leaves is mixed with milk and sugar candy and given as a remedy for biliousness and intestinal troubles of children. The powdered gum, mixed with honey, is given to overcome dysentery and diarrhea in children.
- Oil derived from the crushed leaves is applied on itch and the leaf decoction is given to children as an aid to digestion. Leaves, bark, roots and fruit pulp are all used against snakebite. The spines are crushed with those of other trees and an infusion taken as a remedy for menorrhagia. The bark is chewed with that of *Barringtonia* and applied on venomous wounds.
- The unripe fruits contain 0.015% stigmasterol. Leaves contain stigmasterol (0.012%) and bergapten (0.01%). The bark contains 0.016% marmesin. Root bark contains aurapten, bergapten, isopimpinellin and other coumarins.

Soil and climatic requirements

Throughout its range there is a diversity of soil types, but it is best adapted to light soils. It can be grow well on sandy as well as clayey soils also. But it never stands low lying areas, marshy soil, water stagnation. Soil fertility is not a limiting factor for growing wood apple rather it can be grown on poor soils with regard to fertility level, that is why it is suitable for reclamation of waste land.

The tree grows up to an elevation of 1,500 ft (450 m) in the western Himalayas. It is said to require a monsoon climate with a distinct dry season . Wood apple can be grown in dry tracts of tropical and sub-tropical regions right from sea level, upto 1400 m above MSL. It is adapted to a wide range of soil conditions including degraded soil. It can also tolerate salinity to certain extent. It is an ideal tree to be exploited for growing in wasteland. It is seen to grow appreciably within a temperature range of 0 °C to 48°C (optimum 25-30°C) with a low rainfall . the plant does not prefer shade rather it likes full sunlight.

Cultivars and propagation:

No named cultivars are available. It is being neglected and endangered plant, no systematic work on variety has been done. However sour and sweet types, high yielders with big fruit size exist in the variable seedling progenies in nature. There are 2 forms, one with large, sweetish fruits; one with small, acid fruits. Moreover, it being a minor crop and grown on stay condition, sufficient importance was given for enlisting varieties, evbaluating carietal performance or improvement.

Wood apple is generally propagated by seed. Although seeds do not have any dormancy and can be sown in lines 25 mm apart at a spacing of 10-15 cm in seedbed immediately after extraction. High yielders with big sized and sweet tasting fruits should be selected for propagation through vegetative means. Vegetative propogation by grafting and budding is possible in wood apple. Budded plants are dwarf and precocious in bearing. In dry regions where irrigation potential is limited. The wood apple seedlings can be successfully utilized as rootstock for citrus species which is used to induce precocity if desired for hybridization, further the budded plants in the field and in situ budding has to be done on established seedling.

Flowering and fruiting Season

In India, the leaves are shed in January, flowering occurs in February and March, and the fruit matures in October and November. The fruit ripens from early October through March. It appears that it flowers at the end of winter season and fruit development takes a year to complete.

Field preparation ands planting:

Normally wood apple is not planted in fertile or rich soils. In wasteland, if mass planting is to be done, then pit lines are drawn across the slope and pits can be dug at a spacing of 8Mx8M each pit with a size of 1 Mx1Mx1M. Planting should be done at the onset of monsoon after filling the pit with 20 kg FYM, sand and top soil. The basins should be formed immediately after planting in such a way that water harvesting is facilitated.

Interculture:

Training is done by Central leader method allowing well spaced branches in all directions. Intercrops can be taken during rainy seasons for the first 5 years. In the post monsoon season, the basins can be mulched with dry leaves. Every year 25 kg of FYM is to be applied for each tree at the beginning of the monsoon rains. This will help in increasing fruit- size and quality. During early stages of crop growth, if pot watering is done during summer it will be beneficial. Being a member of citrus family it is attacked by the leaf-eating caterpillar of citrus which completely defoliate the plant. Spraying of any contact insecticide should be done after hand picking and destruction of larvae.

Harvesting

The fruit is tested for maturity by dropping onto a hard surface from a height of 1 ft (30 cm). Immature fruits bounce, while mature fruits do not. After harvest, the fruit is kept in the sun for 2 weeks to fully ripen. Budded plants come to bearing 3-4 years after planting. But to reach optimum productivity it will take about 10 years. However, bearing of fruits may start at the age of three years in case of budded plant which is six year in case of seed plants. The crop flowers in February to May depending on the climatic conditions of a locality and fruits will be available from July to December depending on the flowering month. A well grown tree will give 200-250 fruits/year.