



Wood Apple: An Important Fruit for Nutrition Security and the Wasteland Development

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The single member of the genus *Feronia* in the family Rutaceae is the wood apple (*Feronia limonia*). In addition to wood apple, it is also referred to in India by several other names, including elephant apple, monkey fruit, curd fruit, kaith etc. In the plains of southern Maharashtra, West Bengal, Uttar Pradesh, Chhattisgarh, and Madhya Pradesh, it is one of the hard fruit crops grown there.

It is an underutilised fruit of immense importance. It is often grown along highways, at the edges of fields, and sporadically in orchards in the arid, wild plains of India, Ceylon, northern Malaya and Southeast Asia.

A scorching summer and a pleasant winter are climatic features of the of the Bundelkhand region where wood apples can be seen in the wild and on the edges of fields. In Bundelkhand region, the south-west monsoon season lasts from mid-June until the end of September and about 902.00 mm of precipitation falls on average each year. The weather is typically subtropical, with lengthy and hot summers. The south-west monsoon is responsible for about 80% of the annual precipitation. Maximum temperatures typically reach 47.0–50.0 °C in May, and January has the coldest temperatures to 2.0 °C.

Description: Wood apple is a small to medium-sized, deciduous tree with thorny branches that can grow as high as 10 metres. The tall, slowly growing tree has a few upward-reaching branches that curve outward and ending with thin branchlets with drooping tips. Some of the zigzag twigs have sharp spines 2–5 cm long and the bark is ridged, fissured, and scaly. The deciduous, alternating leaves are studded with oil glands and have a faint lemon aroma when crushed. Leaves are dark green, leathery, frequently minutely serrated, blunt or notched at the apex. Small, loose, terminal or lateral panicles with dull-red or greenish flowers up to 1.25 cm broad can be seen. Typically, flowers are bisexual. The fruit has a hard, woody, scurfy, greyish-white, or oval shape, and is between 5 and 10 cm across. The pulp has many tiny, white seeds and is dark, mealy, odorous, resinous, astringent, acidic, or sweet-tasting.

Constituents: Excellent health benefits and various religious uses are both associated with wood apple. The majority of individuals cultivate their crops on borders as a side crop. This crop is an option for farmers in dry areas with low rainfall. It has religious significance in Indian sub-continent. The hard shell can be broken with the help of hammer. Although sticky, the pulp is scooped out and eaten raw with or without sugar. Additionally, it's used to make jelly, jam, and chutney. The jelly is purple and resembles black currant jelly in many ways.



The pulp is diluted with water, put through a pulper to remove seeds and fibre, then gets further diluted, strained, and pasteurised. By clarifying the nectar using Pectinol R-10, a clear juice suitable for combining with other fruit juices has been perfected. The pulp can be freeze-dried for future use.

Food Value Per 100 g of Edible Pulp*

Component	Pulp (ripe)	Seeds
Ash	5.0%	5.03%
Calcium	0.17%	1.58%
Carbohydrates	7.45%	35.49%
Fat	1.45%	27%
Iron	0.07%	0.03%
Moisture	74.0%	4.0%
Phosphorus	0.08%	1.43%
Protein	8.00%	26.18%
Tannins	1.03%	0.08%

Uses: Wood apple is rich source of pectin which can be utilised for variety of purposes. Wood apple pectin is reddish in colour which needs to be purified. After a rainy season, the trunk and branches ooze a white, clear gum. It is used to make gum Arabic substitutes or adulterants as well as watercolours, ink, dyes, and varnish for artists. It contains 42.7% d-galactose, 35.5% arabinose and xylose, and traces of rhamnose and glucuronic acid. The wood is prized for construction, pattern-making, agricultural equipment, mill rollers, carving, rulers, and other things because it is hard, heavy, and long-lasting. It is also a valuable fuel source.

The fruit is widely used in India as a liver and cardiac tonic, as well as an efficient cure for hiccough, sore throat, and gum disorders. When the fruit is still green, it also acts as an astringent to stop diarrhoea and dysentery. The powdered rind and pulp of venomous insect bites and stings are both poulticed. Young leaf juice is combined with milk and sugar candies and administered to youngsters who are experiencing biliousness and digestive problems. Honey is added to the powdered gum to treat children's dysentery and diarrhoea. Children are given the leaf decoction to help with digestion, and oil made from the crushed leaves is applied to itches. Fruit pulp, leaves, bark, and roots are all used to treat snakebites. As a treatment for menorrhagia, the spines are crushed along with those of other trees, and an infusion is consumed. The bark is used to poisonous wounds and eaten along with that of *Barringtonia sp.*

Varieties: There hasn't been any systematic research on variety because wood apple is a neglected and endangered plant. Two different fruit varieties are created in nature, one with larger sweeter fruits and the other with smaller acidic fruits. The best variety for the dry terrain area of the Bundelkhand region is Thar Gaurav.

Weather and Soil: It can be cultivated in arid tropical and subtropical areas. In the western Himalayas, the tree can reach a height of 1,500 feet. According to reports, it requires a monsoon environment with a clear dry season.

It may thrive in a variety of soil types, including deteriorated soil. Additionally, it has a limited tolerance for salinity. It is the perfect tree to use for growing in barren areas. Although it can tolerate a variety of soil types, including deteriorated soil, it adapts to light soils the best. Additionally, it has a limited tolerance for salinity. It is a perfect tree to use for growing in wastelands of small towns and major thoroughfares.

Propagation: Although seedlings won't start producing fruit until they're more than 10 years old, the wood-apple is typically produced from seeds. You can also promote dwarfing and precociousness via budding onto self-seedlings, air-layering, or root cuttings. Although seed propagation is the predominant practise at the moment, budding has been reported to be effective if carried out in the late summer or early monsoon. Plants that have blossomed are small and bear fruit early. in arid areas with low irrigation potential. The seedlings can be put in the field, but established seedlings must first undergo in situ budding.

Planting: Typically, wood apple is not grown in rich or fertile soils. If mass planting is to be done in a wasteland, pit lines must be made across the slope, and pits must be spaced apart by $8\text{ m} \times 8\text{ m}$ for budded plants and $10\text{ m} \times 10\text{ m}$ for seedlings with a dimension of 1 m^3 . After filling the pit with 20 kg of FYM, sand, and top soil, planting should be done at the start of monsoon. As soon as the plants are planted, basins should be created to make it easier to collect water. Light irrigation needs to be done in order to calm the pits down. The best times to plant wood apple in India are from February -March or rainy season.

Across-cultural interaction: The modified central leader method, which allows for evenly spaced branches in all directions with sufficient sunlight and air, is used for training. During initial years, intercrops can be harvested during rainy seasons. The basins can be mulched with dried leaves after the monsoon. Each year, at the start of the monsoon rains, each full grown-up tree should be given 50 kg FYM. Being a member of the citrus family, it is susceptible to attack by the citrus leaf-eating caterpillar, which causes the plant to be entirely defoliated. After manually selecting and destroying the larvae, any contact insecticide should be sprayed.

Irrigation: Although these trees use less water, However, irrigation must be provided for improved growth and fruit yield. Drip irrigation or a basin ring system may be advisable for irrigation. In the rainy season and once a month after the monsoon, these plants don't need to be watered.

Fertilizers and Manures: Manure and fertilisers, however, are advantageous for greater yield. For each plant, apply 15 kg FYM, 50 g N, 25 g P_2O_5 , and 50 g K_2O during first year. The same proportion may be increased up to 10 years, after which amount should be stabilized and be repeated every year.

Diseases and Pests: Since wood apples are a hardy crop, there are currently no significant insect pests or diseases. However, sooty mould has been spotted in a commercial wood apple orchard, and it may be controlled by spraying wettable sulphur plus methyl parathion plus gum acacia (0.2%+0.1%+0.3%).

Harvesting: In Malaya, flowering takes place in February and March, the leaves fall off in January, and the fruit ripens in October and November. The fruit ripens in India between early October and March. Plants take more than 10 years to reach maximum productivity. The fruit is allowed to drop onto a hard surface from a height of one foot to determine its maturity (30 cm). Fruits that are immature bounce, but mature fruits don't.

Yield: A healthy tree will produce 200–250 fruits per year. At the age of 12 years, seedling trees produce 200–350 fruits per tree, or 25–30 tonnes per hectare.