

**LOCAL NAMES**

Bengali (kait,kath bel,bela); Burmese (thibin,thanatka); English (elephant apple,wood-apple,monkey fruit,curd fruit); French (pomme de bois,citron des mois,pomme d' elephant); Hindi (bilin,kait,kaitha,bhenta,katbel,kavitha,nayi bel); Indonesian (kusta,kawista); Lao (Sino-Tibetan) (ma-fit); Malay (gelinggai,belinggai); Tamil (velam,velan,vila,vilanga); Thai (ma-khwit); Vietnamese (cân thâng)

**BOTANIC DESCRIPTION**

*Feronia limonia* is a deciduous, slow-growing, erect tree with a few upward-reaching branches bending outward near the summit where they are subdivided into slender branchlets drooping at the tips. Bark ridged, fissured and scaly; spines sharp, 2-5 cm long on some of the zigzag twigs.

Leaves alternate, 7.5-12.5 cm long, dark-green, leathery, often minutely toothed, blunt or notched at the apex, dotted with oil glands and slightly lemon-scented when crushed.

Flowers dull-red or greenish, to 1.25 cm wide, borne in small, loose, terminal or lateral panicles.

Fruit round to oval, 5-12.5 cm wide, with a hard, woody, greyish-white, scurfy rind about 6 mm thick, pulp brown, mealy, odorous, resinous, astringent, acid or sweetish, with numerous small, white seeds scattered through it.

*Feronia* is a monotypic genus in the family Rutaceae. There are 2 forms, one with large, sweet fruits and the other with small, acid fruits.

**BIOLOGY**

Flowers normally bisexual. In Malaysia, leaves are shed in January, flowering occurs in February and March, and the fruits mature in October and November. In India, the fruits ripen from early October through March. Seedlings will not bear fruit until at least 15 years old.

**ECOLOGY**

The wood-apple is native and common in dry plains. It prefers a monsoon climate with a distinct dry season. The tree grows up to an elevation of 450 m in the western Himalayas.

**BIOPHYSICAL LIMITS**

Altitude: 0-450 m, Mean annual rainfall: 800-1 200 mm, Mean annual temperature: 20-29 deg. C

Soil type: Throughout its range there is a diversity of soil types, but it is best adapted to light soils.

**DOCUMENTED SPECIES DISTRIBUTION**

Native: India, Sri Lanka

Exotic: Malaysia



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

**PRODUCTS**

**Food:** The rind must be cracked with a hammer. The scooped-out sticky pulp, is eaten raw with or without sugar, or is blended with coconut milk and palm-sugar syrup and drunk as a beverage, or frozen as an ice cream. It is also used in chutneys and for making jelly and jam. The pulp represents 36% of the whole fruit. The pectin content of the pulp is 3-5% (16% yield on dry-weight basis) and has potential for multiple uses. Seeds contain bland, non-bitter, oil high in unsaturated fatty acids.

**Fodder:** The tree is lopped for fodder.

**Fuel:** The wood serves as fuel.

**Timber:** Wood is yellow-grey or whitish, hard, heavy, durable, and valued for construction, pattern-making, agricultural implements, rollers for mills, carving, rulers, and other products.

**Gum or resin:** The trunk and branches exude a white, transparent gum; especially following the rainy season utilized as a substitute for, or adulterant of gum arabic, and also 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.

**Medicine:** The fruit is used in India as a liver and cardiac tonic, and when unripe, as an astringent means of halting diarrhoea and dysentery and effective treatment for hiccough, sore throat and diseases of the gums. The pulp is poulticed onto bites and stings of venomous insects, as is the powdered rind.

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.

**Other products:** The heartwood contains ursolic acid and a flavanone glycoside, 7-methylporiol-D-xylopyranosyl-D-glucopyranoside. The unripe fruits contain 0.015% stigmaterol. Leaves contain stigmaterol (0.012%) and bergapten (0.01%). The bark contains 0.016% marmesin. Root bark contains aurapten, bergapten, isopimpinellin and other coumarins.

**SERVICES**

**Ornamental:** *F. limonia* is planted as a roadside tree near villages.

**Boundary or barrier or support:** The tree is cultivated along field boundaries.



**FURTHER READING**

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Morton J. 1987. Wood-Apple. p. 190-191. In: *Fruits of warm climates*. Julia F. Morton, Miami, FL.

Singh UV. 1996. Conservation of forest genetic resource - an ex-situ management of secondary forests. *Indian Forester*. 122(9): 787-794.

**SUGGESTED CITATION**

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