Alphitonia zizyphoides (Spreng.) A. Gray

Rhamnaceae

LOCAL NAMES
Fijian (doi selawa,doi damu,doi); Samoan (toi); Tongan (toi)

BOTANIC DESCRIPTION
A. zizyphoides is a fast growing, medium-sized to large tree up to 20-30 m tall at maturity with 10-15 m crown diameter.

Leaves simple, alternate, oblong-ovate to lanceolate, 5-18 cm long and 3-6.5 cm wide, shiny dark-bright green on the upper surface, and tomentose light grayish-green below. The leaves are usually rounded at the base.

Flowers in short, 3-10 cm long axillary/near-terminally positioned, flat-topped clusters. Individual flowers bisexual, small, whitish/light green, fragrant, and arranged in fives. The seapals are light green with fine, silvery hairs, while the petals are white: both sepals and petals are about 2 mm long.

Fruit globose to broadly ovoid drupe, about 6-9 mm in diameter, with a conspicuous ring-like calyx scar; it turns from green to purplish green and then to brown-black at maturity. When fully mature the spongy exocarp/mesocarp flesh dries and falls away, exposing two arillate seeds, each enclosed by a hard case.

Seeds smooth, brown, flattened, and oval, about 4 mm long, more or less enclosed by a loose, reddish brown aril.

BIOLOGY
A. zizyphoides first flowers at age 3-5 years. Flowering is between January-March, the main fruiting season being in August-September. Fruits may be collected as early as June with old fruits often persisting on the tree. The main mode of dispersal is by soft-beaked birds such as pigeons, doves, honeyeaters, silvereyes, and trillers.

ECOLOGY
Toi mainly occurs in lowland and lower montane forest associations. It is a pioneer and early secondary species regenerating following disturbance in different forest associations. It can be found in both dense and drier forest types, in scrub thickets, woodlands/savannas and on reed-covered hills.

BIOPHYSICAL LIMITS
Altitude: 0-800 m

Temperature: 23-27ºC
- Mean maximum temperature of hottest month: 29 - 32ºC
- Mean minimum temperature of coldest month: 17 - 24ºC
- Absolute minimum temperature: 9 - 16ºC

Rainfall: 1700-4000 mm

Soil type: The species has a very wide edaphic range, with best development on fertile, well-drained, medium-heavy, neutral, friable volcanic ash soils overlying limestone. It prefers acid to neutral soils (pH 4.0-7.4)

DOCUMENTED SPECIES DISTRIBUTION

Native: American Samoa, Cook Islands, Fiji, French Polynesia, New Caledonia, Niue, Tonga, Vanuatu, Wallis and Fortuna Islands

Exotic:

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
Fodder: The leaves and young shoots of Alphitonia species are consumed by cattle but have been found to have low digestibility and nutritional status.

Timber: The timber is used in house construction and for the manufacture of tools, weapons, and handicrafts and furniture with good technical properties, easy to saw, finish, and season. The wood is also used to make canoes and canoe paddles.

Fuel: Toi is one of the premier fuelwoods of the Pacific Islands; its habit of shedding dried, lateral branches provides a convenient source of high quality fuelwood. In some areas, such as on Santo in Vanuatu, the wood is collected, bundled and sold as fuelwood in local markets.

Medicine: The bark, often in combination with other species, is used for treatment of stomachaches, constipation, coughs, headaches, menstrual pain, and prolapsed rectum in postpartum women. The sap is used to treat earache, swelling, fever, and cancer. A phenolic compound in the bark, alphitol, has been shown to have anti-inflammatory activity.

Apiculture: The species is reportedly a good source of nectar for bees.

Other products: Crushed leaves foam up in water and were used as soap. The leaves and flowers, together with those of Colubrina asiatica and Citrus macroptera, were used to make shampoo in Samoa.

SERVICES
Soil improver: Toi has rapid growth, combined with a fairly quick turnover of leaves in the canopy, suggesting it has good potential to build organic matter, especially if grown together with legumes. It also has great potential in silvopastoral systems.

Shade or shelter: The tree casts an intermediate level of shade, which would be too heavy for most crop species but ideal for somewhat shade-tolerant crops such as cardamom, cocoa, coffee, Morinda, soursop, and Xanthosoma.

Intercropping: A. zizyphoides has excellent potential for planting or inclusion in improved fallow systems due to its rapid regeneration and biomass production. Its presumed deep rooting habit would help facilitate cycling of mineral nutrients from lower soil profiles.

Boundary or barrier: The species is known to be used for living fences. It has good resistance to cyclones and would be well suited for inclusion as an upper-mid-level layer of mixed-species windbreaks of wide dimensions (e.g., greater than 50 m across).

Ornamental: Toi is an attractive, fast-growing, and moderately long-lived tree with a good ornamental potential.

TREE MANAGEMENT
The species grows well in monocultures. In shaded situations and inside plantations the species has excellent self-pruning characteristics, and is likely to pollard reasonably well. For joint production of timber, fuelwood and medicine, a close initial spacing is recommended in order to encourage a straight bole form and self-pruning. Spacing should vary between 5-50 trees per hectare. In the traditional system of managed natural regeneration, the straightest and best formed saplings should be weeded to keep them free of climbers and occasionally high-pruned to produce clear boles. Weeding should be undertaken frequently in the first two years prior to canopy closure. From about age 3-6 years, the smaller trees should be thinned to provide fuelwood. Since border trees develop poor form, it is preferable to plant outside edges with a different species.

GERMPLASM MANAGEMENT
The mature dry fruits, with seeds showing, should be collected from the tree canopy. There are 8900 dry fruits per kg, with two seeds per fruit.

The seed storage behavior is orthodox and may be successfully stored for many years in hermetically sealed containers under cool, dry conditions. Seeds should be soaked in water for 12-24 hours to improve the germination rate in older seed batches (e.g., more than 10 months old).

PESTS AND DISEASES
There are no record of pests and diseases causing serious damage to plants of toi. Plants frequently suffer minor damage from leaf-eating insects, and leaf-spot fungi may attack younger plants. Recorded diseases and pests include nematodes (Ditylenchus sp., Helicotylenchus mucronatus, Meloidogyne sp., Paratylenchus tui and P. brachyurus, Radopholus similis, Xiphinema brevicolle, Xiphema ensiculiferum), arthropods (Dysmicoccus nesophilus, Icerya seychellarum), and fungi (Mycovellosiella sp.).

FURTHER READNG

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SUGGESTED CITATION

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