Pandanus tectorius

Parkinson

Pandanaceae

LOCAL NAMES
Bislama (pandanas); English (screw pine,pandanus); Fijian (vadra,voivoi); French (vacouet,pandanus); Hawaian (pū hala,hala); Samoan (fala,lau fala); Tongan (fa,lou'akau,kukuvalu,falahola,laufala,fafa)

BOTANIC DESCRIPTION
Pandanus tectorius is a stout, branching, often multi-stemmed, large shrub or small tree 4–14 m in height, with about the same canopy spread. Most varieties have numerous aerial and prop roots and thick, forking, often spiny trunks. Wild seedling derived plants often have a single bole or trunk for 4–8 m before forking. Maximum stem diameter is 12–25 cm.

Leaves spirally arranged in three rows and clustered at branch apices, dark green, 1–3 m long by 11–16 cm wide, V to Y-shaped in section, with spiny/prickly margins and midribs. Marginal prickles usually 0.8–2.5 mm long. When fully expanded, the leaf midrib is bent, and the upper third of the leaf hangs down, giving pandanus plants their characteristic drooping appearance.

Flowers dioecious, borne in heads at the shoot apex. Male flowers are fragrant, tiny, white, pendant, arranged in racemes or branched in clusters, with large white showy bracts; last for about a day and decay within 3–4 days. Female flowers are pineapple-like.

Fruit head may be ovoid, ellipsoid, sub-globose or globose, measuring 8–30 cm long by 4–20 cm diameter; made up of many (38–200) tightly bunched, wedge-shaped fleshy phalanges or drupes (keys). Individual phalanges, narrowly oblong to ovoid, 2.5–11 cm long by 1.5–6.7 cm wide. The endocarp is dark reddish-brown, hard/bony, 15–35 mm long. The basal mesocarp is fibrous and fleshy, about 10–30 mm long.

Seeds obovoid, ellipsoid, or oblong; 6–20 mm long; redbrown and whitish/gelatinous inside with coconut-like taste in some varieties.

Bark grayish or reddish-brown, smooth/flaky, with characteristic undulating leaf scars and rows of prickles.

Root system of pandanus plants is dominated by thick, slightly spreading prop roots originating from the lower part (1–1.5 m) of the trunk. The prop roots penetrate and are mainly concentrated in the surface soil layers. In some plants, there may be a few aerial roots hanging vertically from branches.

BIOLOGY
First flowering in seedling-derived pandanus plants starts at about 15 years, while those from cuttings flower in 3–4 years. Seasonality of flowering varies among countries/localities, and varieties. Male trees flower once a year, while female trees flower heavily every second year. However, both male and female plants may flower during the off-season any time of year. It takes fruits several months to ripen. The life span of established pandanus plants is typically about 50–80 years, with the productive fruiting life of vegetatively propagated plants being only 20–25 years.

Phalanges are widely dispersed by ocean currents and can float for many months, during which time the seeds maintain viability. The fruits are also eaten and dispersed by crabs, birds, and fruit bats.



Habit at Keanae, Maui, Hawaii. (Forest & Kim Starr (USGS))



Fruit at Maui Nui Botanical Garden, Maui, Hawaii. (Forest & Kim Starr (USGS))



Trunk at Kiphahulu HNP, Maui, Hawaii. (Forest & Kim Starr (USGS))

ECOLOGY
Pandanus tectorius is common in vegetation in littoral habitats throughout the tropical and subtropical Pacific. It naturally occurs in strandline and coastal vegetation, grassy or swampy woodlands, secondary forests, and scrub thickets. It commonly occurs on the margins of mangroves and swamps.

Other coastal thickets and forest associates include Acacia simplex, Amaroria soulameoides, Tournefortia argentea, Barringtonia asiatica, Bruguiera gymnorrhiza, Calophyllum inophyllum, Casuarina equisetifolia, Cerbera manghas, Chrysobalanus icaco, Cocos nucifera, Cordia subcordata, Excoecaria agallocha, Guettarda speciosa, Hernandia nymphaeifolia, Hibiscus tiliaceus, Intsia bijuga, Morinda citrifolia, Podocarpus neriifolius, Santalum insulare, Scaevola taccada, Schleinitzia insularum, Terminalia catappa, T. littoralis, Thespesia populnea, and Vitex trifoliata. Peat swamp associates include Sphagnum cuspidatum and various sedges.

Pandanus is tolerant of shade, moderately long droughts and frequent on thin soils of low moisture holding capacity and predominantly occurs in open, exposed sites; tolerates waterlogging and is often found in swampy localities with impeded drainage. It tolerates periodic saltwater inundation during unusually high tides and storm surges.

BIOPHYSICAL LIMITS
Altitude: 0 - 600 m
Temperature: 24 - 28°C
- Mean maximum temperature of hottest month 28 - 36°C
- Mean minimum temperature of coldest month 17 - 25°C
- Minimum temperature tolerated 12°C
Rainfall: 1500 - 4000 mm
Soil type: Adapted to a very wide range of light to heavy soil types, including brackish/saline soils (pH 6 - 10), infertile coralline atoll sands, alkaline sands, thin soils over limestone, recent basalt and peaty swamps.

DOCUMENTED SPECIES DISTRIBUTION

Native: American Samoa, Australia, Cook Islands, Fiji, French Polynesia, Guam, Indonesia, Kiribati, Marshall Islands, Micronesia, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, 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
Food: Pandanus fruits are a staple food in parts of Micronesia and provides up to 50% of energy intake. Fresh pandanus is a source of vitamin C, thiamine, riboflavin and niacin (vitamin B3). Preserved pandanus pulp mixed with coconut cream makes a tasty, sweet food item. Pandanus can also be made into flour that is consumed in several ways, usually prepared as a juice or jam.

Medicine: Pandanus leaves are used in treatments for cold/flu, hepatitis, dysuria, asthma, boils, cancer, and to alleviate vomiting, while the roots are used in a decoction to treat hemorrhoids, stomach cramps, digestive and respiratory disorders.

Timber: The stems are used in house construction and for making ladders. The wood is very strong, but brittle. Slats made from the clean, dried aerial/prop roots are used for walls of houses and food cupboards. It was used to make weapons (lances and batons). The wood was used for making items such as headrests/pillows, vases, and as an aid for string making and extracting coconut cream.

Fodder: Young leaves provide fodder for domestic animals such as pigs and horses. It is also a bird and honeybees forage, especially on female flowers and fruits.

Fuel: Dried keys, trunks and branches are burnt for fuelwood, are slow burning and therefore preferred for barbecues.

Fibre: Pandanus leaves are used to weave traditional items of attire, including mats for wearing around the waist, as well as hats and various types of baskets. The roots are made into skipping ropes, basket handles and fish traps. The fibrous inner end of dried key is used as a brush for decorating tapa, with the hard, woody outer end acting as a handle.

Tannin or dyestuff: A black dye used in weaving is prepared from the roots. Charcoal from pandanus has been used in various mixtures to dye and waterproof canoes.

Cosmetic or perfume: Flowers are used alone or in combination with other flowers to perfume coconut oil in Polynesia. An exquisite, uniquely Pacific perfume is made from the aromatic fruits of selected traditional cultivated varieties in the Cook Islands. In South and Southeast Asia, the male flowers and preparations derived from them are used to scent clothes and incorporated into cosmetics, soaps, hair oils, and incense sticks.

Gum or resin: The trunk is a source of glue or caulking for canoes.

Other products: Pandanus leaves are used to weave traditional floor mats, and as thatch for walls and roofs. A roof made from pandanus leaves lasts about 15 years, while one of coconut leaves may last only 3 years. The leaves are also used to wrap tobacco/cigarettes in Micronesia. Male pandanus flowers have been credited with aphrodisiac properties. The female trunks have been used as water pipes after removing the soft interior.

SERVICES
Boundary or barrier: Small shrubby varieties are planted along boundaries or borders as fence lines and boundary markers. Grown close together, young plants form a barrier of intertwined, prickly leaves. As the trees grow older and trunks form, the usually prickly prop roots take over as a form of physical barrier in a dense planting. Planted at close spacing on or near the crests of beach frontal dunes, pandanus plants function as a windbreak, protecting less tolerant dune plants from the damaging effects of salt laden winds. Pandanus is often planted as a windbreak in atolls to protect crops from salt spray.

Ornamental: Pandanus presents a bold image in the landscape with its spirally arranged leaves, prop roots, widely forking branches, and smooth trunk and branches. The bark is covered with leaf scars that give a ringlike pattern. Both female and male flowers are visually striking, and the male flowers are very fragrant. It striking appearance makes it suitable for planting in urban areas.

Soil improver: On atoll islands of Micronesia all parts of pandanus is used for production of compost, as well as in mulching and raising fertility and organic matter levels in sandy, coralline soils. Leaves are used for mulching in giant swamp taro pits.

Erosion control: When grown on the seaward slopes and crests of frontal dunes, pandanus helps to bind the sand and prevent wind erosion.

Reclamation: The tree is tolerant of foliar salt spray, sand blasting, exposure to strong winds, and high levels of solar radiation. It is considered to be a secondary sand dune colonizing plant and is a useful species for planting on exposed frontal dunes that have already been partly stabilized against wind erosion.

Intercropping: Pandanus is frequently planted together with other species including Artocarpus altilis, Colocasia, Citrus spp., Polyscias spp., and a host of other food crops, fruit trees, and ornamentals. Due to its size and habit, the species has good potential for inclusion in alley cropping systems, especially in nearcoastal sites.

Wildlife habitat: Pandanus provides nest sites for birds, especially in atolls. It is often used as a nesting tree for certain birds, including seabirds such as noddy terns.

Other services: Pandanus is sometimes considered to have supernatural and magical properties in parts of Micronesia and Hawai‘i.

TREE MANAGEMENT
Pandanus should either be grown in lines, especially borders, with 3 - 5 m between plants, or less commonly in block plantings at a spacing of about 5 x 5 m. Typical planting density for final crop spacing should be about 100-500 stems per ha.

Pandanus plants display a form of selfpruning. Multistemmed, shrubby individuals, propagated from cuttings, have some limited coppice regrowth ability, especially if some live stems are retained.

Although pandanus grows on nutrient poor soils, moderate fertilizer or compost applications together with surface mulching are beneficial. For larger trees with many branches, a small number of branches should be pruned off. Plantations need to be kept well weeded both for maintaining good growth and for access purposes when harvesting leaves or fruits.

GERMPLASM MANAGEMENT
Intact phalanges (keys) should be collected. To speed germination, keys should be soaked in cool tap water for 5 days, changing the water daily. Viable keys float. Seeds are recalcitrant; hence lose viability if dried, but clean keys can be stored for weeks or months.

PESTS AND DISEASES
Pandanus suffers only minor damage from pests and diseases. Common pests include sap sucking mealybugs (Pseudococcus perforatus), rats and hermit crabs that feed on green and ripe fruits; and scale insects like coconut scale (Aspidiotus destructor), oleander scale (Aspidiotus nerii) and hibiscus snow scale (Pinnaspis strachani). Other pests include coconut phasmid (Graeffea crouanii); coconut rhinoceros beetle (Oryctes rhinoceros); pandanus planthopper (Jamella australiae) which causes dieback; ants and whiteflies.

Possible fungal species on pandanus include Asteromella sp., Coniothyrium pandani, Dothidella pandani, Glomerella sp., Lembosia pandani, Macrophoma pandani, Melanconium pandani, Melanconium sp., Meliola juttingii, Microcyclus pandani, Oxydothis pandani, Phomatospora cylindrotheca, Phomatospora pandani, and Volutellaria fuliginea. Erwinia carotovora subsp. carotovora has been recorded as a bacterial disease of Pandanus.

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