

Ficus carica

Edible fig

Moraceae

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OVERVIEW

There are no *Ficus* species native to Hawai'i. *F. carica* is one of about 60 species of *Ficus* that is cultivated in Hawai'i (Wagner et al. 1999). Each *Ficus* species needs a specific pollinating wasp in order to reproduce and spread (Ramirez 1970). The pollinator wasp for *F. carica*, *Blastophaga psenses* (L.), was introduced to Hawai'i in 1909 (Wagner et al. 1999). Due to several factors at that time, such as a limited number of host trees, dioeciousness, and lengthy overseas transport of the wasp by boat, the associated pollinator wasp did not successfully establish. Currently, there are no records of collections of *B. psenses* from the state of Hawai'i (Nishida 1997). As a result, *F. carica* is not reproducing sexually in Hawai'i today. Some of these factors have since changed and if the wasp were introduced today it would likely establish which would facilitate the naturalization of *F. carica*. Other *Ficus* species that have had their wasps introduced are spreading on Maui. These include *F. microcarpa*, *F. macrophylla*, and *F. cf. platypoda* (Wagner et al. 1999, Oppenheimer and Bartlett 2000). These three species are currently invading both disturbed and native ecosystems where they are capable of germinating in native host trees, such as koa (*Acacia koa*) and ohia (*Metrosideros polymorpha*), growing as epiphytes, and eventually destroying their hosts. *F. carica* is widely cultivated worldwide and in Hawai'i for its edible fruits. It is currently reported as a weed in Australia and California (Randall 1998, CalEPPC 1999). The pollinator wasp for *F. carica* should be prohibited from introduction to Hawai'i to minimize the chance for this species to spread by placing it on the injurious species list.

TAXONOMY

Family: Moraceae (Mulberry family) (Wagner et al. 1999).

Latin name: *Ficus carica* L. (Bailey and Bailey 1976).

Synonyms: None.

Common names: Common fig, edible fig, fig tree (Bailey and Bailey 1976, Neal 1965).

Taxonomic notes: The genus *Ficus* is made up of about 1,000 species from pantropical and subtropical origins (Wagner et al. 1999). Plants in the genus are all woody, ranging from trees and shrubs to climbers (Neal 1965).

Nomenclature: The latin name, *carica*, is named for the location Caria in Asia Minor which is supposedly the home of the fig (Neal 1965, Dehgan 1998).

Related species in Hawai'i: Several varieties of *F. carica* are grown in Hawai'i, including the Smyrna fig, the brown or Turkey fig, and the white and golden fig (Neal 1965). About 60 species of *Ficus* have been introduced to Hawai'i for cultivation and reforestation (Wagner et al. 1999).

DESCRIPTION

"Shrubs or small trees, deciduous, to 5 m. Roots not adventitious. Bark grayish, slightly roughened. Branchlets pubescent. Leaves: stipules 1-1.2 cm; petiole 8-20 cm. Leaf blade obovate, nearly orbiculate, or ovate, palmately 3-5-lobed, 15-30 x 15-30 cm, base cordate, margins undulate or irregularly dentate, apex acute to obtuse; surfaces abaxially and adaxially scabrous-pubescent; basal veins 5 pairs; lateral veins irregularly spaced. Syconia solitary, sessile, green, yellow, or red-purple, pyriform, 5-8 cm, pubescent; peduncle ca. 1 cm; subtending bracts ovate, 1-2 mm; ostiole with 3 subtending bracts, umbonate" (Flora of North America 2000).

BIOLOGY & ECOLOGY

Cultivation: *F. carica* has been cultivated for a long time in various places worldwide for its edible fruit. Remnants of figs have been found in excavations of sites dating as far back as at least 5,000 B.C. (California Rare Fruit Growers, Inc. 1996). *F. carica* is presumed to originate from Western Asia and spread to the Mediterranean by humans (California Rare Fruit Growers, Inc. 1996). It is an important world crop today. Major producers of edible figs include Turkey, Egypt, Morocco, Spain, Greece, California, Italy, Brazil and other places with typically mild winters and hot dry summers (Tous and Ferguson 1996). Fruits can be eaten raw, dried, canned, or in other preserved forms (Neal 1965).

Invasiveness: Though *F. carica* is not invasive in Hawai'i today due to the unsuccessful introduction of its associated pollinator wasp (*Blastophaga psenses*) in 1909 (Wagner et al. 1999), it is considered invasive in Australia and California (Randall 1998, CalEPPC 1999). *F. carica* is currently widely planted on Maui. There are very likely enough trees to support a population of wasps. Should the associated wasp be reintroduced today in Hawai'i, there would be the potential for *F. carica* to begin to spread on its own. *Ficus* species that are known to naturalize in Hawai'i include *F. microcarpa*, *F. macrophylla*, and *F. cf. platypoda* (Wagner et al. 1999, Oppenheimer and Bartlett 2000). These species commonly germinate in other trees, fenceposts, rocks, bridges, buildings, and other structures, eventually engulfing their hosts. *Ficus* species threaten many natural areas on Maui, including both wet and dry habitat, by germinating on many native host trees such as koa (*Acacia koa*), ohia (*Metrosideros polymorpha*), wiliwili (*Erythrina sandwicensis*), and others, and eventually killing them as they grow. Invasive characteristics include a widespread distribution due to popularity among the public who use the plant in landscaping, large seed set, the presence of non-native fruit eating birds that spread the seeds, and difficulty in controlling epiphytic plants on native hosts and sheer cliffs. Should *F. carica* begin to spread on Maui, invasive characteristics would probably be similar to those of other invasive *Ficus* species listed above.

Pollination: The fruit (syconium or fig) and reproduction systems of species in the genus *Ficus* are unique. Each species of *Ficus* has an associated species of agaonid wasp (Hymenoptera: Chalcoidea: Agaonidae). *Ficus* species can only be pollinated by their associated agaonid wasps and in turn, the wasps can only lay eggs within their associated *Ficus* fruit. For successful pollination and reproduction of *Ficus* species to occur, its

associated pollinator wasp must be present. Conversely, for successful reproduction of agaonid wasps to occur, their associated *Ficus* species must be present (Janzen 1979). The pollinator wasp for *F. carica* is *Blastophaga psenses* (L.) (Wagner et al. 1999).

Propagation: *F. carica* are usually propagated from cuttings (California Rare Fruit Growers, Inc. 1996).

Dispersal: Plants are initially spread by humans who grow the plant for ornament, edible fruit, and reforestation. Because the pollinator wasp is not yet present in Hawai'i, *F. carica* seeds are not viable. Other species of *Ficus* that do have wasps present and therefore viable seeds are spread by fruit eating birds and often germinate on fence posts, trees, and other frequent perches.

Pests and diseases: California Rare Fruit Growers, Inc. (1996) report the following pests and diseases for *F. carica*. "Fig tree roots are a favorite food of gophers, who can easily kill a large plant. Birds can cause a lot of damage to the fruit. Nematodes, particularly in sandy soils, attack roots, forming galls and stunting the trees. Dried fruit beetles can enter ripening fruit through the eye and cause damage by introducing fungi and rots. Euryphid mites are carriers of mosaic virus from infected to clean trees. Other pests include fig canker, *Rhizopus* smut, and *Aspergillus* rot."

DISTRIBUTION

Native range: *F. carica* is thought to be native to Western Asia (California Rare Fruit Growers, Inc. 1996).

Global distribution: *F. carica* is cultivated for its fruits in warm and temperate parts of Europe, the Mediterranean countries, and the United States of America. According to Dehgan (1998), *F. carica* prefers full sun and various well-drained soils. It is slightly salt tolerant, though is not adapted to wet sites or compacted soils, and it is moderately drought tolerant. In most Mediterranean countries today it grows wild (Grieve 2002). In the United States, *F. carica* is considered an invasive pest plant species by the California Exotic Pest Plant Council (1999). They place this species on the "A-2" list which are pest species that are considered the most invasive wildland pest plants that are regionally distributed (3 or fewer Jepson regions). Habitat of concern includes the following areas: Central Valley, foothill, South Coast, and Channel Is. riparian woodlands. At the Cosumnes River Preserve in Central California, *F. carica* is one of the woody invaders that threatens to transform the forest community from a native floodplain forest into a woodland dominated by non-native trees which would provide little food for native insects or for many native birds and mammals (Meyers-Rice 2001). The river habitat stretches from sea level to 7,500 ft (2,300 m) in the Sierra Nevada Mountains. *F. carica* is also reported to escape cultivation in Alabama, Louisiana, Texas, Virginia, and West Virginia (Flora of North America 2000). In Australia, Randall (1998) reports that *F. carica* has spread to river banks and creek lines around Perth, and also persists at old settlement sites throughout the south-west.

State of Hawai'i distribution: *F. carica* is cultivated in Hawai'i (Wagner et al. 1999, Neal 1965). The state wide distribution is not certain.

Island of Maui distribution: *F. carica* is widely cultivated on Maui in urban and rural areas from warm lowlands such as Lahaina and Kihei to upper dry elevations of Kula and Keokea. Most specimens are small trees that are grown singly or in groves. *F. carica* was not observed in wet areas such as Hana and probably does not grow well there.

CONTROL METHODS

Physical control: The control of *F. carica* in the Cosumnes River Preserve in Central California was reported as successful by Meyers-Rice (2001). Though exactly how they did it was not reported, they did mention chainsaws, herbicide, and "hundreds of hours of monitoring and difficult control work...have eliminated all known invading fig trees."

It is uncertain if small seedlings on the ground or as epiphytes can be hand pulled. Control of *Ficus* species seems daunting. Often, trees will germinate on and grow as epiphytes on other desirable trees, concrete structures, and fenceposts. These are sometimes out of reach or on steep dangerous terrain. Care will need to be taken in order to successfully kill the unwanted *Ficus* while preserving the host. Without control, the host tree or structure is in danger of destruction through strangulation. Control of spreading *Ficus* trees in Hawai'i is just beginning to be explored.

Chemical control: "Fig trees are particularly sensitive to triclopyr herbicides as a basal or cut-stump treatment. Trees found growing on concrete or rock structures should be treated with herbicide while young to avoid costly structural damage. Use extreme caution when applying herbicide to figs growing as epiphytes to ensure that the poison does not contact the host tree. When exotic figs germinate high in the branches of large trees in natural forest communities, it may be extraordinarily difficult to get close enough to the fig to treat it." (Hammer 1996).

Biological control: Nadel et al. (1991) report that there is no current effort to control *Ficus* species with biological controls.

Cultural control: The pollinator wasps should be prevented from entering Hawai'i in order to prevent spread of *F. carica*.

Noxious weed acts: None.

MANAGEMENT RECOMMENDATIONS

F. carica is currently not spreading in Hawai'i because previous attempts in 1909 to introduce the pollinator wasp failed probably due to small population size of host trees and poor transportation methods. Today, there are many trees present on Maui and the importation of insects is no longer as difficult. The conditions would be ripe to support a population of wasps should they be introduced. *F. carica* is invasive elsewhere in California and Australia in mild, warm, temperate climates along river corridors. For now, *F. carica* is not spreading in Hawai'i and the best way to keep it that way is to

prevent the arrival of its associated pollinator wasp by placing them on the injurious species list.

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