Taxon: Ficus microcarpa L. f.

Family: Moraceae

Common Name(s): Chinese banyan
Ficus 'Green Mound'
Indian laurel
Malayan banyan
wax fig

Synonym(s): Ficus microcarpa L. f. var. microcarpa
Ficus microcarpa var. crassifolia
Ficus nitida (Misapplied)
Ficus retusa (Misapplied)

Assessor: Chuck Chimera **Status:** Approved **End Date:**

WRA Score: 14.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Strangling Tree, Landscaping Nuisance, Environmental Weed, Bird-Dispersed, Ant-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y = -3, n = 0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	0 = low, 1 = intermediate, 2 = high (see Appendix 2)	High
202	Quality of climate match data	0 = low, 1 = intermediate, 2 = high (see Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y = 1, n = 0	y
204	Native or naturalized in regions with tropical or subtropical climates	y = 1, n = 0	y
205	Does the species have a history of repeated introductions outside its natural range?	y= -2, ? = -1, n = 0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n = question 205	y
302	Garden/amenity/disturbance weed	y = 1*multiplier (see Appendix 2), n = 0	y
303	Agricultural/forestry/horticultural weed	y = 2*multiplier (see Appendix 2), n = 0	n
304	Environmental weed	y = 2*multiplier (see Appendix 2), n = 0	y
305	Congeneric weed	y = 1*multiplier (see Appendix 2), n = 0	y
401	Produces spines, thorns or burrs	y = 1, n = 0	n
402	Allelopathic		
403	Parasitic	y = 1, n = 0	n
404	Unpalatable to grazing animals	y = 1, n = -1	n
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y = 1, n = 0	n
408	Creates a fire hazard in natural ecosystems	y = 1, n = 0	n

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y = 1, n = 0	y
411	Climbing or smothering growth habit	y = 1, n = 0	y
412	Forms dense thickets	y = 1, n = 0	y
501	Aquatic	y = 5, n = 0	n
502	Grass	y = 1, n = 0	n
503	Nitrogen fixing woody plant	y = 1, n = 0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y = 1, n = 0	n
601	Evidence of substantial reproductive failure in native habitat	y = 1, n = 0	n
602	Produces viable seed	y = 1, n = -1	y
603	Hybridizes naturally	y = 1, n = -1	n
604	Self-compatible or apomictic		
605	Requires specialist pollinators		
606	Reproduction by vegetative fragmentation	y = 1, n = -1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y = 1, n = -1	n
702	Propagules dispersed intentionally by people	y = 1, n = -1	y
703	Propagules likely to disperse as a produce contaminant	y = 1, n = -1	n
704	Propagules adapted to wind dispersal	y = 1, n = -1	n
705	Propagules water dispersed	y = 1, n = -1	n
706	Propagules bird dispersed	y = 1, n = -1	y
707	Propagules dispersed by other animals (externally)	y = 1, n = -1	y
708	Propagules survive passage through the gut	y = 1, n = -1	y
801	Prolific seed production (>1000/m2)	y = 1, n = -1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y = -1, n = 1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y = 1, n = -1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In the late 1980s, Taiwan Ficus or Wax Ficus reached the Islands and soon became popular with landscapers. It was later identified as F microcarpa var. crassifolia (W. C. Shieh) J. C. Liao [Syn.: F crassifolia W. C. Shieh, F taiwaniana invalid], a native of coastal areas on limestone soils in southern Taiwan."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Native from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia; in Hawai'i cultivated and now naturalized primarily in urban areas and highly disturbed, low elevation habitats, at least on O'ahu, Maui, and Hawai'i, but probably on all of the main islands"

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2024). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2024). Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In the late 1980s, TAIWAN FICUS or WAX FICUS reached the Islands and soon became popular with landscapers. It was later identified as F microcarpa var. crassifolia (W. C. Shieh) J. C. Liao [Syn.: F crassifolia W. C. Shieh, F taiwaniana invalid], a native of coastal areas on limestone soils in southern Taiwan."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia; in Hawai'i cultivated and now naturalized primarily in urban areas and highly disturbed, low elevation habitats, at least on O'ahu, Maui, and Hawai'i, but probably on all of the main islands."

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Chew, W.-L., Du Puy, D.J., Kodela, P.G. (2024). Ficus microcarpa, in P.G. Kodela (ed.). Flora of Australia. Australian Biological Resources Study, Department of Climate Change, Energy, the Environment and Water: Canberra. https://profiles.ala.org.au/opus/foa/profile/Ficus%20microcarpa. [Accessed 2 Jan 2024]	"Habitat - Rainforest, drier and seasonal rainforest, littoral rainforest, strand/beach forest, riverine forest. On Christmas Island, common in primary forest on the Plateau, or against rocks in exposed situations."
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In the late 1980s, TAIWAN FICUS or WAX FICUS reached the Islands and soon became popular with landscapers. It was later identified as F microcarpa var. crassifolia (W. C. Shieh) J. C. Liao [Syn.: F crassifolia W. C. Shieh, F taiwaniana invalid], a native of coastal areas on limestone soils in southern Taiwan." ... "Coming from a seacoast environment, wax ficus is ideally suited for oceanfront gardens and has been used successfully in xeriscape designs." ... "Like its larger relatives, it needs no special care in our climate, though it benefits from fertilizer applications on nutrient-poor soils."
	Kartuz Greenhouses. (2024). Ficus microcarpa var. crassifolia 'Green Mound'. https://www.kartuz.com/p/90455/Ficus+microcarpa+var.+crassifolia+Green+Mound.html. [Accessed 2 Jan 2024]	"It should be protected from frost as very cold temperatures may cause some leaf spotting, but it should survive down to an occasional 30F. It is native to Asia. USDA zones 9 - 11. "
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2003). Flora of China. Vol. 5 (Ulmaceae through Basellaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Mountains, plains; below 1900 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan, S Zhejiang [Bhutan, India, Malaysia, Myanmar, Nepal, New Guinea, Sikkim, Sri Lanka, Thailand, Vietnam; N Australia]."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia; in Hawai'i cultivated and now naturalized primarily in urban areas and highly disturbed, low elevation habitats, at least on O'ahu, Maui, and Hawai'i, but probably on all of the main islands."
	Smith, C.W. (1985). Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This species grows in all but the wettest and driest habitats on all of the major islands, most commonly on cliffs and rocky outcrops. It has the potential to grow up to 1,500 m but rarely grows much above 700 m. There are some particularly large trees along the Hana coastline, Maui."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Lorence, D.H., Flynn, T.W. & Wagner, W.L. (1995). Contributions to the flora of Hawai'i. III. New additions, range extensions, and rediscoveries of flowering plants. Bishop Museum Occasional Papers 41: 19-58	[Kauai] "Ficus microcarpa L. f. The Chinese or Malayan banyan is native from Ceylon and India through southern China, Australia, and New Caledonia. Widely cultivated in the Hawaiian Islands, Wagner et al. (1990: 926) noted that this species is probably naturalized on all of the main islands, but has been recorded only from Oahu, Maui, and Hawaii. Nevertheless, Ficus microcarpa is widespread and abundantly naturalized on Kauai. At the Lawai Valley site, large trees are abundant in secondary forest of Leucaena leucocephala and Syzygium cumini (L.) Skeels on rocky slopes. Material examined. KAUAI: Koloa District, Lawai Valley, National Tropical Botanical Garden, E of Bamboo Bridge crossover, 25-30 m, 9 Dec 1994, D. Lorence 7613 (BISH, PTBG, US)."
	Oppenheimer, H. (2007). New plant records from Moloka'i, Lāna'i, Maui, and Hawai'i for 2006. Bishop Museum Occasional Papers 96:17-34	[Lanai] "Ficus microcarpa L. f. New island record Chinese banyan is naturalized on O'ahu, Maui, and Hawai'i, but probably on all of the main islands (Wagner et al. 1999: 926). Subsequently it was reported from Kaua'i (Lorence & Wagner 1995: 41), Moloka'i (Hughes 1995: 7), and Kaho'olawe (Warren & Herbst 1994: 2). Smith (1985: 190) reported it from all the major islands on cliffs and rocky outcrops, in all but the wettest and driest habitats. The following collection documents its occurrence on Lāna'i, where it is growing in a very dry area. Material examined. LĀNA'I: Kaumälapa'u, 20 m, trees occasional on rock faces and in gulches, Oppenheimer H100623."

Qsn #	Question	Answer
	Hughes, G. D. (1995). New Hawaiian plant records II. Bishop Museum Occasional Papers. 42: 1-10	[Molokai] "Ficus microcarpa L. f. Previous knowledge: Cultivated at least since the early 1900s, but it could not have become naturalized prior to 1938 when its pollinating wasp was introduced. Hawaiian Archipelago distribution Oahu, Maui, and Hawaii, but probably on all of the main islands. Native from Sri Lanka to India, southern China, Ryukyu Islands, Australia, and New Caledonia (Wagner et al. 1990:926). Significance: New island record for Molokai in Kalamaula Game Management Area, 310 m, in 1992 (Hughes 62, BISH). Naturalized in gulches in disturbed lowland areas of Molokai. Identification confirmed by W.L. Wagner."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Oahu, Maui & Hawaii] "Native from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia; in Hawai'i cultivated and now naturalized primarily in urban areas and highly disturbed, low elevation habitats, at least on O'ahu, Maui, and Hawai'i, but probably on all of the main islands. Cultivated at least since the early 1900s, but it could not have become naturalized prior to 1938 when the pollinating wasp was introduced."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Riefner, R. E. (2016). Ficus microcarpa (Moraceae) naturalized in Southern California, USA: Linking plant, pollinator, and suitable microhabitats to document the invasion process. Phytologia, 98, 42-75	"Ficus microcarpa is native to temperate and tropical Asia, Australasia, and Pacific regions. It is a popular ornamental tree grown in many warm temperate, subtropical, and tropical regions of the world, where it is widely known to escape from cultivation."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia; in Hawai'i cultivated and now naturalized primarily in urban areas and highly disturbed, low elevation habitats, at least on O'ahu, Maui, and Hawai'i, but probably on all of the main islands."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Riefner, R. E. (2016). Ficus microcarpa (Moraceae) naturalized in Southern California, USA: Linking plant, pollinator, and suitable microhabitats to document the invasion process. Phytologia, 98, 42-75	"Ficus microcarpa is native to temperate and tropical Asia, Australasia, and Pacific regions. It is a popular ornamental tree grown in many warm temperate, subtropical, and tropical regions of the world, where it is widely known to escape from cultivation. It is reported here as being naturalized in Los Angeles, Orange, Riverside, San Diego, and Ventura counties, southern California. The invasive spread of F. microcarpa follows the introduction of its host-specific pollinating wasp, Eupristina verticillata; E. verticillata was first reported for California in 1994 from Arcadia, Los Angeles County. The wasp introduction reunited the F. microcarpa host plant-E. verticillata obligate pollinator mutualism thereby enabling the reproduction and naturalization of both organisms in California. A map showing the current distribution of F. microcarpa, citation of voucher specimens, and photographic documentation are provided."
	Gallaher, T.J., Brock, K., Kennedy, B.H., Imada, C.T., Imada, K., & Walvoord, N. (2024). Plants of Hawai'i. http://www.plantsofhawaii.org. [Accessed 4 Jan 2024]	"Kuaihelani (Midway Atoll) Naturalized Kaua'i Naturalized O'ahu Naturalized Molokai Naturalized Lana'i Naturalized Kaho'olawe Naturalized Lalo (French Frigate Shoals) Only found in cultivation Maui Naturalized Hawai'i Naturalized"

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2024). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch. [Accessed 4 Jan 2024]	"Naturalized Northern America REGION: United States (s.e.) Pacific NORTH-CENTRAL PACIFIC: United States [Hawaii] Southern America CARIBBEAN: West Indies CENTRAL AMERICA: Central America REGION: South America"
	Lorence, D.H., Flynn, T.W. & Wagner, W.L. (1995). Contributions to the flora of Hawai'i. III. New additions, range extensions, and rediscoveries of flowering plants. Bishop Museum Occasional Papers 41: 19-58	[Kauai] "Ficus microcarpa L. f. The Chinese or Malayan banyan is native from Ceylon and India through southern China, Australia, and New Caledonia. Widely cultivated in the Hawaiian Islands, Wagner et al. (1990: 926) noted that this species is probably naturalized on all of the main islands, but has been recorded only from Oahu, Maui, and Hawaii. Nevertheless, Ficus microcarpa is widespread and abundantly naturalized on Kauai. At the Lawai Valley site, large trees are abundant in secondary forest of Leucaena leucocephala and Syzygium cumini (L.) Skeels on rocky slopes. Material examined. KAUAI: Koloa District, Lawai Valley, National Tropical Botanical Garden, E of Bamboo Bridge crossover, 25–30 m, 9 Dec 1994, D. Lorence 7613 (BISH, PTBG, US)."
	Oppenheimer, H. (2007). New plant records from Moloka'i, Lāna'i, Maui, and Hawai'i for 2006. Bishop Museum Occasional Papers 96:17-34	[Lanai] "Ficus microcarpa L. f. New island record Chinese banyan is naturalized on O'ahu, Maui, and Hawai'i, but probably on all of the main islands (Wagner et al. 1999: 926). Subsequently it was reported from Kaua'i (Lorence & Wagner 1995: 41), Moloka'i (Hughes 1995: 7), and Kaho'olawe (Warren & Herbst 1994: 2). Smith (1985: 190) reported it from all the major islands on cliffs and rocky outcrops, in all but the wettest and driest habitats. The following collection documents its occurrence on Lāna'i, where it is growing in a very dry area. Material examined. LĀNA'I: Kaumälapa'u, 20 m, trees occasional on rock faces and in gulches, Oppenheimer H100623."
	Hughes, G. D. (1995). New Hawaiian plant records II. Bishop Museum Occasional Papers. 42: 1-10	[Molokai] "Ficus microcarpa L. f. Previous knowledge: Cultivated at least since the early 1900s, but it could not have become naturalized prior to 1938 when its pollinating wasp was introduced. Hawaiian Archipelago distribution Oahu, Maui, and Hawaii, but probably on all of the main islands. Native from Sri Lanka to India, southern China, Ryukyu Islands, Australia, and New Caledonia (Wagner et al. 1990:926). Significance: New island record for Molokai in Kalamaula Game Management Area, 310 m, in 1992 (Hughes 62, BISH). Naturalized in gulches in disturbed lowland areas of Molokai. Identification confirmed by W.L. Wagner."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Oahu, Maui & Hawaii] "Native from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia; in Hawai'i cultivated and now naturalized primarily in urban areas and highly disturbed, low elevation habitats, at least on O'ahu, Maui, and Hawai'i, but probably on all of the main islands. Cultivated at least since the early 1900s, but it could not have become naturalized prior to 1938 when the pollinating wasp was introduced."

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Chace, T.D. (2013). How to Eradicate Invasive Plants. Timber Press, Portland, OR	"A strong, fast-growing plant, it can survive on little or no soil when young. It overtakes other trees, shades out native and desirable plants, and can insinuate into and damage sidewalks, buildings, rain gutters, culverts, and bridges."
	Kaufman, S.R. & Kaufman, W. (2023). Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Third Edition, Revised and Updated. Stackpole Books, Essex, Connecticut	"Laurel fig can cause structural damage if it grows too close to cement or rock structures."

Qsn #	Question	Answer
	Datiles,.M. J., & Acevedo-Rodríguez, P. (2024). Ficus microcarpa (Indian laurel tree). CABI Compendium. https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.24130. [Accessed 4 Jan 2024]	[Damages buildings and other structures in the urban landscape] "Seedlings of F. microcarpa can sprout almost anywhere that a seed lands, including walls, roofs and gutters of buildings. The root systems can be very damaging to buildings and stonework. In Bermuda, the plant is therefore considered a threat to historic buildings as well as to the natural environment (Bermuda Department of Conservation Services, 2014). In Hawaii, it damages concrete ditches which transport water (Starr et al., 2003)."
	Loope, L.L., Nagata, R.J. & Medeiros, A.C. (1992). Alien plants in Haleakala National Park Pp. 551-576 in Stone et al (eds) Alien plant invasions in native ecosystems of Hawaii. Coop. Nat. Park Resources Studies Unit, University of Hawaii, Honolulu, HI	[Impacts rock walls and other archeological features such as heiau] "Chinese banyan is a strangling, aggressive invader on rocky walls of low-elevation stream courses and sea cliffs in lower Kipahulu. The several dozen known established plants present in the Park should be removed as soon as possible in order to prevent this species from taking over these habitats."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Landscaping nuisance] "The syconia are bird dispersed, and small shrubby plants of this species are extremely common in cracks of walls or similar places as epiphytes."

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. (2003). Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Environmental impact: Besides shading with its broad canopy, it is a threat to host plants. Banyan roots are very destructive to infrastructures: pavement, home foundations, irrigation ditches." [Not reported to impact agriculture]
	Datiles,.M. J., & Acevedo-Rodríguez, P. (2024). Ficus microcarpa (Indian laurel tree). CABI Compendium. https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.24130. [Accessed 4 Jan 2024]	"Impact: Economic F. microcarpa is known to negatively impact native flora and ecosystems by not only strangling and replacing host trees during its early life as an epiphyte, but by forming dense canopies that shade out native flora. The extensive root systemst can damage infrastructure and anything else in the ground surrounding the tree. Impact: Social Seedlings of F. microcarpa can sprout almost anywhere that a seed lands, including walls, roofs and gutters of buildings. The root systems can be very damaging to buildings and stonework. In Bermuda, the plant is therefore considered a threat to historic buildings as well as to the natural environment (Bermuda Department of Conservation Services, 2014). In Hawaii, it damages concrete ditches which transport water (Starr et al., 2003)."

304	Environmental weed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Medeiros, A.C., Chimera, C.G. & Loope, L.L. (1996). Ka'uhako Crater botanical resource and threat monitoring, Kalaupapa National Historical Park, Island of Moloka'i, Hawai'i. Technical Report 110. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, HI	"Chinese banyan (Moraceae), native throughout Asia from China to Australia, is an often epiphytic shrub to spreading evergreen tree (Wagner et al. 1990). Because of its invasive, strangling root network and its tendency to overtop and shade out host trees, Chinese banyan has the serious potential to hasten the demise of many senescent native trees growing in the crater, especially the large Wiliwili trees of the crater floor. Linney (1987) ranks Ficus microcarpa as the second most serious weed threat in Ka'uhako Crater. In the monitoring of individual trees conducted during the 1995 survey, three of 30 (10%) tagged Wiliwili trees had Ficus plants growing upon them. In one instance, the Chinese banyan's roots were penetrating the trunk of the host Wiliwili and were obviously contributing to and possibly hastening the trunk rot observed in that tree (Table 6). Only one Chinese banyan was recorded growing on 50 tagged Hula pepe trees, and none were recorded on the 40 tagged 'Ohe makai trees (Tables 8 and 10). Nevertheless, several smaller individuals were observed growing upon other trees and rock formations of Ka'uhako Crater, and larger fruiting trees are located along the inner northeastern slopes as well as beyond the crater's environs. As the syconia (fruits) of this Ficus are readily bird dispersed (Wagner et al. 1990), and as the wasp pollinator, Euprestina verticillata, has been present in Hawai'i since 1938 (information from Hawai'i State Department of Agriculture, G. Funasaki pers. comm. in Wagner a d. 1990), allowing for fertile fruit and seed set, Chinese banyans will only increase in size and abundance unless some form of control is initiated. Larger fruiting trees should be cut down and treated with an appropriate herbicide to prevent regrowth, while smaller individuals should be pulled up if possible, or also cut and treated with an herbicide such as Garlon 3A or Garlon 4. For Ficus that cannot be reached due to their location high in the boughs of other trees, but which have their roots wrapped around the host and extending to the ground, it may be possible to inject an herbicide into the root network to kill the parent Ficus with minimal disturbance to the host tree."
	Kaufman, S.R. & Kaufman, W. (2023). Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Third Edition, Revised and Updated. Stackpole Books, Essex, Connecticut	"Laurel fig grows over other trees, eventually killing them through its constricting roots, shade, and competition for nutrients."
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Little is known about direct ecological effects of colonized host trees or invaded communities. The tree forms impenetrable thickets due to the numerous hanging aerial roots that likely shade out other plants. If laurel fig seedlings grow as epiphytes on trees they send aerial roots to the ground. This may affect the host tree by competing for light and nutrients and because of the constricting roots."
	Smith, C.W. (1985). Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This evergreen tree produces a very dense shade excluding all other species. It does not invade undisturbed forest but once established it will displace all other trees in its shade. The fruit are dispersed by alien frugivorous birds."

305	Congeneric weed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Ficus carica] "The fast-growing tree has often escaped cultivation and has become invasive in several regions. The tree forms dense thickets crowding out native trees and understorey shrubs in river accompanying forests (Bossard et al., 2000). The dense foliage casts heavy shade, reducing growth of native plants under the crown. Common fig in the introduced range spreads by seeds and by vegetative growth. Seed formation requires pollination of flowers by the specific fig wasp Blastophaga psenes (Hymenoptera: Agaonidae); the wasp is present in the introduced ranges due to the widespread cultivation of fig trees. Seeds germinate only upon removal of the fleshy synconium tissue, which may be achieved by birds and mammals feeding on the fruits. Vegetative spread is by root sprouts. In addition, limbs cut or broken and fallen to the ground can take root, as do branches broken off during storms and floods (Bossard et al., 2000)."
	WRA Specialist. (2024). Personal Communication	Native Metrosideros polymorpha trees are being colonized and strangled by Ficus macrophylla in the Kalopa State Recreation Area, Hawaii Island. In particular, large, old growth ohia trees along the Kalopa Nature Trail are being affected by both the Ficus macrophylla invasion, as well as by the fungal disease known as Rapid Ohia Death. A local volunteer group affiliated with the Pauilo Mauka Kalopa Community Association, and with assistance from the Big Island Invasive Species Committee, has treated F. macrophylla trees with 100% Garlon 4 applied to the strangling roots. The goal was to control this invasive tree and to prevent further damage to the native ohia trees and the associated native forests. Initial results of herbicide applications appeared promising, with >75% defoliation to most trees after 2-3 months. Larger trees may require repeated application to achieve 100% mortality.

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Variable in habit, often epiphytic, subscandent shrubs when young, in maturity spreading evergreen trees with large branches and numerous aerial roots hanging from the trunk and branches, these sometimes reaching the soil to form pillar-like roots. Leaves variable, coriaceous, oblong, elliptic to broadly elliptic or obovate, usually 5-8 cm long, 3-5 cm wide, glabrous, margins entire, petioles 0.6-2 cm long. Synconia sessile, arising among or just below the leaves, depressed-globose, 6-10 mm in diameter, subtended by 3 broadly ovate, more or less persistent bracts"

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Asis, J., Yusoff, N., & Nashriyah, M. (2018). Allelopathic Assesments of Ficus deltoidea Jack Varieties and Ficus microcarpa Lf (Moraceae) on Lactuca sativa L. Seed. Journal Of Agrobiotechnology, 9(15), 214-221	[Possibly. Demonstrates allelopathic effects in lab assays] "This study described allelopathic potential of two medicinal plant species, Ficus deltoidea varieties in comparison with Ficus microcarpa, by using testing the leaf-litter leachate through sandwich method and the leaf extracts through methanolic extraction method, with three replications for each donor species by using the complete randomized design (CRD). The sandwich method was carried out by using 5 mg, 10 mg and 50 mg dry weight of the donor plants leaf. Among the eight donor plant tested, results showed that var. kunstleri had the highest growth inhibition on lettuce radicle elongation (57.51%) as compared to control, followed by var. trengganuensis (45.50%) and Ficus microcarpa (39.95%), respectively. Meanwhile, the methanolic extraction was done by using different concentrations of leaf extract (0.1 ppm, 1 ppm, 10 ppm and 100 ppm). In the methanolic extraction bioassay, the var. kunstleri and var. trengganuensis that have the highest inhibition on lettuce growth were further selected to be tested by using this method and was observed to have a high inhibition on lettuce radicle elongation at 66.63% and 64.95%, respectively, as the concentration increases. Further studies can be conducted on the identification and isolation of allelochemical by using this finding as the background information towards the development of bioactive compound as natural botanical herbicide for weed management."

403	Parasitic	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	""Variable in habit, often epiphytic, subscandent shrubs when young, in maturity spreading evergreen trees with large branches and numerous aerial roots hanging from the trunk and branches, these sometimes reaching the soil to form pillar-like roots." [Moraceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Chan, E. W. C. et al. (2017). Botany, uses, chemistry and pharmacology of Ficus microcarpa: a short review. Systematic Reviews in Pharmacy, 8(1), 03-111	"Fruits and leaves of Ficus species are an important source of food and medicine in South China. The foliage is harvested as fodder for livestock in Nepal."
	Sikarwar, R. L. S., Tiwari, A. P., Garg, A., Sikarwar, P. S., Guruprasad, N. M., & Dubey, P. C. (2020). Tree Species used as Fodder in Madhya Pradesh, India. Journal of Non-Timber Forest Products, 27(3), 178-186	"Table 2. Enumeration of fodder trees in Madhya Pradesh" [Ficus microcarpa - Preference by the livestock group = Cattle; Uses = Tree is lopped for fodder.]

405	Toxic to animals	
	Source(s)	**Notes**
	Tropical Plants Database, Ken Fern. (2024). Ficus microcarpa. https://tropical.theferns.info/viewtropical.php?id=Ficus+microcarpa. [Accessed 4 Jan 2024]	"Known Hazards None known"
	Sikarwar, R. L. S., Tiwari, A. P., Garg, A., Sikarwar, P. S., Guruprasad, N. M., & Dubey, P. C. (2020). Tree Species used as Fodder in Madhya Pradesh, India. Journal of Non-Timber Forest Products, 27(3), 178-186	"Table 2. Enumeration of fodder trees in Madhya Pradesh" [Ficus microcarpa - Preference by the livestock group = Cattle; Uses = Tree is lopped for fodder.]
	Housing.com (2024). Ficus Microcarpa: How to grow and care for it? https://housing.com/news/ficus-microcarpa/. [Accessed 4 Jan 2024]	"Though, a popular houseplant Ficus Microcarpa can be toxic to dogs and cats. The sap on leaves can be irritating to dogs when ingested or applied on skin. So, it's advisable to keep this plant out of reach of your pets. " [This and other websites report some potential toxic properties that may sicken cats and dogs, but but the risk and severity appear to be low]

Qsn #	Question	Answer
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "Used in Ayurveda. Plant latex applied on joints to relieve pain, rheumatism, rheumatoid arthritis. Fruits boiled and applied to cure toothache and dental caries. Root powder and latex taken for the treatment of dental caries and pyorrhea. Root, bark and leaf latex used to treat wounds, headache and toothache; bark and leaf latex taken internally to treat colic and liver trouble. New leaves boiled and a patient with fever or headache is allowed to inhale the steam."

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Russo, M., Kellar, M., & Cheng, Z. (2023). The implementation of systemic insecticides and increased irrigation against gall wasp and scale insect pests attacking Ficus trees in Hawaii. Florida Entomologist, 106(4), 244-247	"Chinese banyan, Ficus microcarpa (Rosales: Moraceae), and weeping banyan, F. benjamina (Rosales: Moraceae), are commonly planted landscape trees throughout the Hawaiian Islands. They are popular landscape trees due to their large canopy, incremental leaf drop, and minimal need for management. The unintentional introduction of invasive species including a stem gall wasp, Josephiella sp. (Hymenoptera: Agaonidae), a leaf gall wasp, Josephiella microcarpae Beardsley and Rasplus (Hymenoptera: Agaonidae), and the lobate lac scale Paratachardina pseudolobata Kondo and Gullan (Hemiptera: Kerriidae); are causing negative impacts on rural and urban landscape banyan trees throughout Oahu. The deleterious impact of feeding between these 3 pests can cause moderate to severe branch dieback, canopy reduction, early leaf drop, with severe infestations causing the death or removal of landscape trees. In 2 separate studies, the use of systemic insecticides applied via soil drench or trunk injection with or without amended irrigation was examined to determine if there was a reduction of these pests over 24 mos. In the first study, emamectin benzoate was applied to F. microcarpa targeting Josephiella spp. gall wasps and a second concurrent study assessed the impact of imidacloprid on P. pseudolobata infestations of F. benjamina. The results of these trials indicated that effective treatments can be utilized as a management tactic for reducing infestations of these invasive pests in the urban landscape ecosystems of Oahu."
	Dreistadt, S.H. (2004). Pests of Landscape Trees and Shrubs: An Integrated Pest Management Guide. UCANR Publications, Oakland, CA	"Gynaikothrips ficorum, introduced from southern Asia , is found in southern California on Ficus spp., especially Indian laurel fig. All thrips stages occur year-round in leaf terminals, which become tightly rolled and podlike due to thrips' feeding. Adults are black, nymphs are yellow, and eggs are beige and laid on the leaf surface, commonly within the gall. Populations are highest from about October through December, and galled foliage is formed from midsummer through fall. Cuban laurel thrips do not seriously harm ficus, so no control is needed if distorted foliage can be tolerated."
	Matsunaga, J. N. (2018). Macrohomotoma gladiata Kuwayama, 1908 (Hemiptera: Psylloidea: Homotomidae). New Pest Advisory No. 22-01. Plant Pest Control Branch, Hawaii Department of Agriculture, Honolulu. https://hdoa.hawaii.gov. [Accessed 8 Jan 2024]	[Psyllid only known to attack F. microcarpa] "In November 2022, Hawai'i Department of Agriculture, Plant Pest Control Branch (HDOA-PPC) was contacted by a business in the Māpunapuna industrial area about a tree fully covered in a “snow-like” white substance (Fig. 1). Upon a site visit, a single Ficus microcarpa (Chinese banyan) tree was found to be heavily infested with psyllids. Immediate surveys in the surrounding areas found additional infested trees (Fig. 2)." ... "Ficus microcarpa L. (Moraceae) is the primary host plant and the only species M. gladiata has been confirmed from to date. According to Hollis and Broomfield (1989), previous records in literature of this species attacking other Ficus spp. are questionable." ... "Colonies of immature psyllids feed on new shoots (Figs. 1, 9-11), which cause young leaves to curl, protecting them within these leaf layers. The infestation causes stunted growing tips and may cause tip dieback (Fig 10). Immatures produce white woolly wax secretions which cover shoot tips and leaves like “snow.” Excessive sooty mold grows on the copious amounts of honeydew near the feeding colonies (Fig. 1)."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Tropical Plants Database, Ken Fern. (2024). Ficus microcarpa. https://tropical.theferns.info/viewtropical.php?id=Ficus+microcarpa. [Accessed 4 Jan 2024]	"Known Hazards None known"

Qsn #	Question	Answer
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "Used in Ayurveda. Plant latex applied on joints to relieve pain, rheumatism, rheumatoid arthritis. Fruits boiled and applied to cure toothache and dental caries. Root powder and latex taken for the treatment of dental caries and pyorrhea. Root, bark and leaf latex used to treat wounds, headache and toothache; bark and leaf latex taken internally to treat colic and liver trouble. New leaves boiled and a patient with fever or headache is allowed to inhale the steam."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	Smith, C.W. (1985). Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"Although it is susceptible to fire, it is only marginally affected because fire will not carry under the tree for lack of fuel."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Dehgan, B. (1998) Landscape Plants for Subtropical Climates. University Press of Florida, Gainesville, FL	"Grows in full sun to partial shade on various well-drained soil"
	Rauch, F.D. & Weissich, P.R. (2009). Small Trees for the Tropical Landscape. University of Hawaii Press, Honolulu, HI	"It is not particular to soil as long as it has good drainage. Although preferring full sun, it will grow in shady areas."
	Kuo, Y. L., & Yeh, C. L. (2015). Photosynthetic capacity and shade tolerance of 180 native broadleaf tree species in Taiwan. Taiwan Journal of Forest Science, 30(4), 229-243	"With reference to the experts' opinions, we divided Amax into 5 levels: ▯ 26.0, 25.9~21.0, 20.9~15.0, 14.9~12.5, and < 12.5 μmol CO2 m-2 s-1, corresponding to shade-tolerance levels 1, 2, 3, 4, and 5 (namely very intolerant, intolerant, moderately tolerant, tolerant, and very tolerant)." ... "Table 1. Shade-tolerance level of 180 subtropical broadleaf tree species in Taiwan" [Ficus microcarpa - ST level = 2 (intolerant)]
	Rauch, F.D. & Weissich, P.R. (2000). Plants for Tropical Landscapes: A Gardener's Guide. University of Hawaii Press, Honolulu, HI	[Ficus microcarpa var. crassifolia] "It can be grown in any soil, in sun or shade, and has good salt, drought, and wind tolerance."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Riefner, R. E. (2016). Ficus microcarpa (Moraceae) naturalized in Southern California, USA: Linking plant, pollinator, and suitable microhabitats to document the invasion process. Phytologia, 98, 42-75	"In California, F. microcarpa is frequently cultivated along streets in coastal regions because it tolerates salt, wind, drought, and various types of soils, and it is often used for hedges (Brenzel 2007; Hatch 2007; Perry 2010)."
	Kaufman, S.R. & Kaufman, W. (2023). Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Third Edition, Revised and Updated. Stackpole Books, Essex, Connecticut	"It prefers calcareous, well-drained soils."
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Like its larger relatives, it needs no special care in our climate, though it benefits from fertilizer applications on nutrient-poor soils."
	Rauch, F.D. & Weissich, P.R. (2000). Plants for Tropical Landscapes: A Gardener's Guide. University of Hawaii Press, Honolulu, HI	[Ficus microcarpa var. crassifolia] "It can be grown in any soil, in sun or shade, and has good salt, drought, and wind tolerance."

411	Climbing or smothering growth habit	y

Qsn #	Question	Answer
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. (2023). Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Third Edition, Revised and Updated. Stackpole Books, Essex, Connecticut	"Laurel fig grows over other trees, eventually killing them through its constricting roots, shade, and competition for nutrients. Birds disperse seeds when they eat the fruits, and seeds are also dispersed by ants when fruits fall to the ground. Laurel fig can cause structural damage if it grows too close to cement or rock structures."
	Medeiros, A.C., Chimera, C.G. & Loope, L.L. (1996). Ka'uhako Crater botanical resource and threat monitoring, Kalaupapa National Historical Park, Island of Moloka'i, Hawai'i. Technical Report 110. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, HI	[Strangling host trees such as Wiliwili] "Chinese banyan (Moraceae), native throughout Asia from China to Australia, is an often epiphytic shrub to spreading evergreen tree (Wagner gt 4. 1990). Because of its invasive, strangling root network and its tendency to overtop and shade out host trees, Chinese banyan has the serious potential to hasten the demise of many senescent native trees growing in the crater, especially the large Wiliwili trees of the crater floor. Linney (1987) ranks Ficus microcarpa as the second most serious weed threat in Ka'uhako Crater. In the monitoring of individual trees conducted during the 1995 survey, three of 30 (10%) tagged Wiliwili trees had Ficus plants growing upon them. In one instance, the Chinese banyan's roots were penetrating the trunk of the host Wiliwili and were obviously contributing to and possibly hastening the trunk rot observed in that tree"

412	Forms dense thickets	y
	Source(s)	Notes
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Little is known about direct ecological effects of colonized host trees or invaded communities. The tree forms impenetrable thickets due to the numerous hanging aerial roots that likely shade out other plants."

501	Aquatic	n
	Source(s)	Notes
	Riefner, R. E. (2016). Ficus microcarpa (Moraceae) naturalized in Southern California, USA: Linking plant, pollinator, and suitable microhabitats to document the invasion process. Phytologia, 98, 42-75	"Outside of cultivation, F. microcarpa grows on rocks, cliffs and hills, particularly on limestone, along rocky coasts, in beach forests, on floodplains and banks of tidal rivers, along the edge of swamps and mangroves, in rain forests, and frequently as an epiphyte on other trees (Chew 1989; Keng et al. 1990; Corner 1997; Weber 2003; Berg & Corner 2005)."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "in urban areas and highly disturbed, low elevation habitats"

502	Grass	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Moraceae

Qsn #	Question	Answer
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Moraceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2003). Flora of China. Vol. 5 (Ulmaceae through Basellaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Trees, 15-25 m tall, crown wide, d.b.h. to 50 cm. Bark dark gray. Branches producing rust-colored aerial roots when old. Stipules lanceolate, ca. 0.8 cm."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Riefner, R. E. (2016). Ficus microcarpa (Moraceae) naturalized in Southern California, USA: Linking plant, pollinator, and suitable microhabitats to document the invasion process. Phytologia, 98, 42-75	[No evidence. WIde native and introduced range] "Ficus microcarpa L.f. (subgenus Urostigma, section Conosycea) is an evergreen, monoecious tree native from Sri Lanka through India to southern China, Singapore, Taiwan, Japan, the Ryukyu Islands, northern Australia, New Caledonia, and many Pacific Islands, where it grows from sea level to about 1,800 m elevation (Wagner et al. 1999; Berg & Corner 2005; Tan et al. 2009; van Noort & Rasplus 2015; USDA GRIN 2015). Ficus microcarpa is a widely planted and popular ornamental tree, even within its native range, that has been introduced to many tropical, subtropical, and warm temperate regions around the world (Dehgan 1998; Rauch & Weissich 2000; Burrows & Burrows 2003; van Noort & Rasplus 2015)."

602	Produces viable seed	y
	Source(s)	Notes
	Kaufmann, S., McKey, D. B., Hossaert-McKey, M., & Horvitz, C. C. (1991). Adaptations for a two-phase seed dispersal system involving vertebrates and ants in a hemiepiphytic fig (Ficus microcarpa: Moraceae). American Journal of Botany, 78(7), 971-977	"Figs (Ficus spp., Moraceae) are considered a classic example of plants with fleshy fruits adapted for seed dispersal by vertebrates, usually mammals or birds. Partially covering the endocarp of each individual drupelet of F. microcarpa is a fleshy, discrete lipid-containing exocarp that suggests adaptation for seed dispersal by ants. This structure is highly attractive to ants. F. microcarpa drupelets from which the fleshy exocarp was experimentally removed were much less likely to be transported by ants than those with this structure intact. The exocarps retained their attractiveness to ants and were not visibly altered following passage of the entire fruit through the gut ofa frugivorous bird, the Indian Hill Mynah (Gracula religiosa). Germination percentage was not significantly affected by gut passage or exocarp removal. These results suggest that F. microcarpa has a two-stage seed dispersal system, in which primary dispersal by vertebrates is followed by secondary dispersal by ants. Dispersal aided by ants may be of significance in the biology of this exotic hemiepiphyte in southern Florida, where it is naturalized and appears to be spreading."

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"In Hawai'i about 60 Ficus species are cultivated; however, only 4 fig wasps have been introduced, Blastophaga psenses (L.) for Ficus carica L., Pleistodontes jroggatti Mayr for F. macrophyl/a Desf., Pleistodontes imperialis Saund. for F. rubiginosa Desf., and Euprestina verticil/ata Waterst. for F. microcarpa. These wasps were introduced in 1909, 1921, 1922, and 1938, respectively (information from Hawaii State Department of Agriculture, G. Funasaki, pers. comm.)." ... "The syconia are bird dispersed, and small shrubby plants of this species are extremely common in cracks of walls or similar places as epiphytes."

603	Hybridizes naturally	n
	Source(s)	**Notes**
	Ramírez, W. (1988). Ficus microcarpa L., F. benjamina L. and other species introduced in the New World, their pollinators (Agaonidae) and other tig wasps. Revista de Biologia Tropical, 36(2B), 441-446	[No evidence, but hybridization suspected in other members of genus] "The syconia of Old World F. benjamina L. (section Conosycea) in Costa Rica, were found pollinated by the New World Pegoscapus tristani. the pollinator of F. padifolia H.B.K. (section Americana). The syconia of Old World F. religiosa L. (section Urostigma) in Miami, Florida, were found to be pollinated by the symbiotic agaonid of the native F. aurea Nutt. Hybrid seedings were found growing naturally."

604	Self-compatible or apomictic	
	Source(s)	**Notes**
	Berg, C. C., & Corner, E. J. H. (2005). Moraceae: Ficeae. Flora Malesiana-Series 1, Spermatophyta, 17(2), 1-702	"If figs in various phases of development occur in monoecious species of this group, then (geitonogamous) selfing may occur; there can be seasonal fluctuations in fig production or transition to separate subsequent fig crops in this group. Artifical self-fertilisation may yield viable seeds (Ramirez 1986)."
	Anstett, M. C. (2001). Unbeatable strategy, constraint and coevolution, or how to resolve evolutionary conflicts: the case of the fig/wasp mutualism. Oikos, 95(3), 476-484	"Monoecious fig species and their specific pollinators are in conflict on the use of fig ovaries, which can either produce one seed or host one pollinator larva. Here, new data showing that, probably because of space constraints during the development of both seeds and wasps (Eupristina verticillata), ovaries vary in their quality as a substrate for pollinator development depending on their location within the fig (Ficus microcarpa) inflorescence."

605	Requires specialist pollinators	
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	In Hawai'i about 60 [Yes, but pollinator has been introduce to Hawaii] "Ficus species are cultivated; however, only 4 fig wasps have been introduced, Blastophaga psenses (L.) for Ficus carica L., Pleistodontes jroggatti Mayr for F. macrophylla Desf., Pleistodontes imperialis Saund. for F. rubiginosa Desf., and Euprestina verticillata Waterst. for F. microcarpa. These wasps were introduced in 1909, 1921, 1922, and 1938, respectively (information from Hawaii State Department of Agriculture, G. Funasaki, pers. comm.). While all 4 Ficus species may eventually become naturalized, apparently only F. microcarpa has done so thus far."

Qsn #	Question	Answer
606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Spreads by bird-dispersed seeds] "The syconia are bird dispersed, and small shrubby plants of this species are extremely common in cracks of walls or similar places as epiphytes."

607	Minimum generative time (years)	3
	Source(s)	Notes
	Criley, R. (2002). University of Hawaii at Manoa. Department of Tropical Plant and Soil Sciences. Pers. Comm.	Three years

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"The syconia are bird dispersed, and small shrubby plants of this species are extremely common in cracks of walls or similar places as epiphytes."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Riefner, R. E. (2016). Ficus microcarpa (Moraceae) naturalized in Southern California, USA: Linking plant, pollinator, and suitable microhabitats to document the invasion process. Phytologia, 98, 42-75	"Ficus microcarpa is a widely planted and popular ornamental tree, even within its native range, that has been introduced to many tropical, subtropical, and warm temperate regions around the world (Dehgan 1998; Rauch & Weissich 2000; Burrows & Burrows 2003; van Noort & Rasplus 2015)."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i cultivated and now naturalized primarily in urban areas and highly disturbed, low elevation habitats, at least on O'ahu, Maui, and Hawai'i, but probably on all of the main islands."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Crop, Herbal, Ornamental Dispersed by: Humans, Animals, Flyers, Escapee"

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"The syconia are bird dispersed, and small shrubby plants of this species are extremely common in cracks of walls or similar places as epiphytes."

705	Propagules water dispersed	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Datiles,.M. J., & Acevedo-Rodríguez, P. (2024). Ficus microcarpa (Indian laurel tree). CABI Compendium. https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.24130. [Accessed 10 Jan 2024]	"F. microcarpa is dispersed by several different vectors. Seeds are spread both locally and long distance by over 200 vertebrate species that reportedly consume the synconia figs, mainly birds and some fruit bats, as well as dispersal by ants (Shanahan et al., 2001; Starr et al., 2003). In Florida, seeds are dispersed by ants attracted to an oily tissue coating the seed (Nadel et al., 1991)."

706	Propagules bird dispersed	y
	Source(s)	**Notes**
	Hasui, E., & Hofling, E. (1998). Food Preference Of The Frugivorous Birds In A Fragment Of Semideciduous Forest, Sao Paulo. Iheringia. Série Zoologia , 84, 43-64	"In a survey carried out from August 1991 to July 1993, in a 102110 m2 fragment of semideciduous forest at the Cidade Universitária Armando de Salles Oliveira, São Paulo, 69 species of ornithochoric [bird dispersed] plants were found of which 46 were eaten by birds, according to field observations and faecal analyses. Visits were more frequent to Ficus microcarpa , Alchornea sidifolia , Schinus terebinthifolius , Guettarda viburnoides and Prunus sellowii . Fruit selection by birds was not related to the degree of importance of these plant species in the community, but to feeding preference of the birds, which was influenced by the time of fruiting and also by structural and morphological features of the fruit, such as horizontal distribution and stratification, morphological type, colour and size of the fruit and the seed. The pattern of fruit selection varied according to the species of fruit-eating birds, so that the main potential fruit eating dispersers for each plant could be identified. "
	Athreya, V. R. (1997). Temporal patterns of visitation among avian frugivores at fruiting strangler figs in a tropical evergreen forest in the Western Ghats, southern India. Current Science, 72(6), 405-408	"Observations on avian frugivory were conducted at fruiting strangler figs in the Karian Shola National Park in the Anaimalai hills, Tamil Nadu, from January to March 1993. A total of 123 hours of fruit use by frugivores was observed at fruiting trees of 3 species of Ficus (F. drupacea, F. microcarpa, F. amplissima). Frugivore activity was seen throughout the day with a major peak in visitation between 07.00 and 09.30 and a minor one at 14.30. The common frugivore species exhibited preferences for different species of fruiting strangler figs, occurring in larger numbers at these trees. Of the seven common species of avian frugivores, only two pairs exhibited similar temporal patterns of visitation to the fruiting strangler figs, the small green barbet (Megalaima viridis)-crimson throated barbet (M. rubricapilla) pair at F. drupacea , and the bulbul species (Pycnonotus melanicterus gularis, P. jocosus, Hypsipetes indicus [Iole indica])-golden oriole (Oriolus oriolus) pair at F. microcarpa . The other frugivores included in the study were the Malabar grey hornbill (Tockus griseus [Ocyceros griseus]), the greyfronted green pigeon (Treron pompadora) and the fairy bluebird (Irena puella). The pressures of competition, past or contemporary, may be the reason behind the difference in the temporal patterns of visitation. However, it is unlikely that active competition is the cause since very few inter-specific aggressive interactions were noted. What is unclear is the similar temporal pattern of visitation in the case of the bulbul-golden oriole pair at F. microcarpa (their preferred tree) and the barbet pair at F. drupacea (not their preferred tree). "
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"The syconia are bird dispersed, and small shrubby plants of this species are extremely common in cracks of walls or similar places as epiphytes."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Kaufmann, S., McKey, D. B., Hossaert-McKey, M., & Horvitz, C. C. (1991). Adaptations for a two-phase seed dispersal system involving vertebrates and ants in a hemiepiphytic fig (Ficus microcarpa: Moraceae). American Journal of Botany, 78(7), 971-977	[Secondary dispersal by ants] "Figs (Ficus spp., Moraceae) are considered a classic example of plants with fleshy fruits adapted for seed dispersal by vertebrates, usually mammals or birds. Partially covering the endocarp of each individual drupelet of F. microcarpa is a fleshy, discrete lipid-containing exocarp that suggests adaptation for seed dispersal by ants. This structure is highly attractive to ants. F. microcarpa drupelets from which the fleshy exocarp was experimentally removed were much less likely to be transported by ants than those with this structure intact. The exocarps retained their attractiveness to ants and were not visibly altered following passage of the entire fruit through the gut ofa frugivorous bird, the Indian Hill Mynah (Gracula religiosa). Germination percentage was not significantly affected by gut passage or exocarp removal. These results suggest that F. microcarpa has a two-stage seed dispersal system, in which primary dispersal by vertebrates is followed by secondary dispersal by ants. Dispersal aided by ants may be of significance in the biology of this exotic hemiepiphyte in southern Florida, where it is naturalized and appears to be spreading."

708	Propagules survive passage through the gut	y
	Source(s)	**Notes**
	Kaufmann, S., McKey, D. B., Hossaert-McKey, M., & Horvitz, C. C. (1991). Adaptations for a two-phase seed dispersal system involving vertebrates and ants in a hemiepiphytic fig (Ficus microcarpa: Moraceae). American Journal of Botany, 78(7), 971-977	"Figs (Ficus spp., Moraceae) are considered a classic example of plants with fleshy fruits adapted for seed dispersal by vertebrates, usually mammals or birds. Partially covering the endocarp of each individual drupelet of F. microcarpa is a fleshy, discrete lipid-containing exocarp that suggests adaptation for seed dispersal by ants. This structure is highly attractive to ants. F. microcarpa drupelets from which the fleshy exocarp was experimentally removed were much less likely to be transported by ants than those with this structure intact. The exocarps retained their attractiveness to ants and were not visibly altered following passage of the entire fruit through the gut ofa frugivorous bird, the Indian Hill Mynah (Gracula religiosa). Germination percentage was not significantly affected by gut passage or exocarp removal. These results suggest that F. microcarpa has a two-stage seed dispersal system, in which primary dispersal by vertebrates is followed by secondary dispersal by ants. Dispersal aided by ants may be of significance in the biology of this exotic hemiepiphyte in southern Florida, where it is naturalized and appears to be spreading."
	Traveset, A. (1998). Effect of seed passage through vertebrate frugivores' guts on germination: a review. Perspectives in Plant Ecology, Evolution and Systematics, 1(2), 151-190	"When both birds and bats were tested with the same plant species, it was observed that bats had no effect on germination in three cases (Carissa edulis, Ficus luschnathiana and Morus nigra), enhanced germination in Azadirachta indica and Ficus microcarpa, and inhibited it in Clausena anisata compared to birds (Table 3)." ... "Within the genus Ficus, the effect of seed passage through various vertebrates (primates, bats and birds) has been examined in nine species, the results being a consistent germination enhancement in five of them, and variable in four (F. carica, F. glabrata, F. insipida and F. microcarpa)."

801	Prolific seed production (>1000/m2)	y
	Source(s)	**Notes**
	Corlett, R. T., Boudville, V., & Seet, K. (1990). Seed and wasp production in five fig species (Ficus, Moraceae). Malayan Nature Journal, 44(2), 97-102	"13.5-89.2 seeds/syncogium" and More than one-third of the ripe syconia from the monoecious F. microcarpa contained no seeds. [Table1. Average about 50 seeds per syngonium, trees easily produce 60 syngonia per m2]

Qsn #	Question	Answer
	Hays, B. R., Sperry, J., Drake, D. R., & Hruska, A. M. (2018). Husking Stations Provide Insight into Diet of Nonnative Rodents on O ʻahu, Hawai ʻi. Pacific Science, 72 (3), 335-345	"Table 1.2 The percent cover, total annual seed rain, and animal-handled seed rain of species that made up > 1.5% of cover or > 1% of the total alien or native seed rain at one or more sites. The absolute percent cover for each species corresponds to the stratum in which it had its greatest percent cover (Appendix 1). Annual seed rain is the total number of seeds captured per m2 and includes seeds found in whole or partial fruit, or outside fruit (including animal-handled seeds). Animal-handled seeds are seeds that occurred in fecal material or occurred outside fruit in a sample containing no whole or partial fruits." [Ficus microcarpa = 7,430 seeds per m2 collected at the Tantalus site]

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Baskin, C.C. & Baskin, J.M. (2014). Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination. Second Edition. Academic Press, San Francisco, CA	[Longevity unknown] "TABLE 10.10 Dormancy in seeds of trees of moist warm temperature woodlands. *5type of dormancy is inferred. g.h., greenhouse; nur., nursery" [Ficus microcarpa = ND (nondormant.)]

803	Well controlled by herbicides	y
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. (2003). Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Management: The most effective way to kill large Chinese banyans is by placing 0.10-0.17 fl oz (3-5 ml) of herbicide into holes drilled into the trunk each foot around trunk. Because of the compartmentalization of the trunks from the rooted and merged adventitious roots, the trunks must be drilled at each segment to ensure effective control. This can best be done by making follow- up treatments after symptoms from earlier treatments reveal unaffected stem segments. Banyans strangling a host tree can be treated in this way with glyphosate without killing the host. Triclopyr and dicamba were also effective in killing banyan by applications to drilled holes."
	Kaufman, S.R. & Kaufman, W. (2023). Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Third Edition, Revised and Updated. Stackpole Books, Essex, Connecticut	"Small plants can be hand pulled. Figs are particularly susceptible to the herbicide triclopyr. Larger plants can be cut and the stumps treated with triclopyr, but care must be taken not to get herbicide on the host plant."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"It can be pruned low as a ground cover, trimmed taller as a hedge or barrier planting, grown singly as a specimen plant, used for bonsai, or planted in the rock garden or on a hillside."
	Chace, T.D. (2013). How to Eradicate Invasive Plants. Timber Press, Portland, OR	"Seedlings can be pulled. Larger ones can be chopped back or cut down. but watch for regenerating sprouts and keep after them."
	Datiles,.M. J., & Acevedo-Rodríguez, P. (2024). Ficus microcarpa (Indian laurel tree). CABI Compendium. https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.24130. [Accessed 10 Jan 2024]	"The species can be physically controlled by pruning to prevent the plant from maturing into a woody shrub or tree-like form."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes

Qsn #	Question	Answer
	Datiles,.M. J., & Acevedo-Rodríguez, P. (2024). Ficus microcarpa (Indian laurel tree). CABI Compendium. https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.24130. [Accessed 10 Jan 2024]	"Non-pollinating fig wasps have been suggested as possible biocontrol agents for invasive Ficus spp. At least 43 fig wasps utilize F. microcarpa figs, with more than 20 species present in the plant's introduced range (Wang, 2014). A large galler species, Meselatus bicolor, is independent of the pollinator and can suppress both male and female reproductive successes of figs via competition for nutrients and preventing pollinators from entering figs, making it a potential biocontrol agent (Wang, 2014). Wang et al. (2015) reported the presence of this species in the Mediterranean region. M. bicolor prevents seeds and pollinators from developing in the figs it occupies, and has only been recorded from F. microcarpa, giving it the potential to be a valuable biological control agent in other countries outside the Mediterranean where F. microcarpa has become invasive (Wang et al., 2015)."
	Zheng, H., Wu, Y., Ding, J., Binion, D., Fu, W., & Reardon, R. (2004). Invasive Plants of Asian Origin Established in the United States and Their Natural Enemies Volume 1. USDA Forest Service, Morgantown, WV	"Thirty-nine species of fungi have been reported to injure plants of the genus Ficus. Seventy-three arthropods in 28 families of five orders have been found on members of the genus."
	Matsunaga, J. N. (2018). Macrohomotoma gladiata Kuwayama, 1908 (Hemiptera: Psylloidea: Homotomidae). New Pest Advisory No. 22-01. Plant Pest Control Branch, Hawaii Department of Agriculture, Honolulu. https://hdoa.hawaii.gov. [Accessed 8 Jan 2024]	[Unknown if this psyllid will affect F. microcarpa's competitive ability] "In November 2022, Hawai'i Department of Agriculture, Plant Pest Control Branch (HDOA-PPC) was contacted by a business in the Māpunapuna industrial area about a tree fully covered in a "snow-like" white substance (Fig. 1). Upon a site visit, a single Ficus microcarpa (Chinese banyan) tree was found to be heavily infested with psyllids. Immediate surveys in the surrounding areas found additional infested trees (Fig. 2)." ... "Ficus microcarpa L. (Moraceae) is the primary host plant and the only species M. gladiata has been confirmed from to date. According to Hollis and Broomfield (1989), previous records in literature of this species attacking other Ficus spp. are questionable." ... "Colonies of immature psyllids feed on new shoots (Figs. 1, 9-11), which cause young leaves to curl, protecting them within these leaf layers. The infestation causes stunted growing tips and may cause tip dieback (Fig 10). Immatures produce white woolly wax secretions which cover shoot tips and leaves like "snow." Excessive sooty mold grows on the copious amounts of honeydew near the feeding colonies (Fig. 1)."

Summary of Risk Traits:

Ficus microcarpa (Chinese banyan) is a large branching tree with hanging adventitious roots that can root and form columnar stems that can eventually merge with the trunk. It is native to from Ceylon to India, southern China, Ryukyu Islands, Australia, and New Caledonia, and has been cultivated in tropical regions around the world. After its pollinating wasp was introduced in 1938, it was able to be spread by birds and is now naturalized on all main Hawaiian Islands. Chinese banyan is epiphytic and can germinate in the crotches of other trees, send roots to the ground, and eventually strangle the host, including native and non-native trees. It has also become a landscaping nuisance and weed, and its roots can damage sidewalks, buildings, rain gutters, culverts, bridges, and archaeological sites.

High Risk / Undesirable Traits
• Thrives and spreads in regions with tropical climates
• Naturalized on all main Hawaiian Islands, as well as Midway and French Frigate Shoals, as well as elsewhere in the world.
• A landscaping and urban weed, with roots capable of spreading into and damaging walls, roofs and gutters of buildings, sidewalks, and other structures.
• An environmental weed in the Hawaiian Islands, capable of establishing in and strangling native host trees
• Other Ficus species are invasive weeds
• Tolerates many soil types
• Epiphytic, strangling growth habit
• Capable of forming dense stands with its hanging aerial roots
• Reproduces by seeds (now that the pollinating wasp has been introduced)
• Seeds are dispersed by birds, other frugivorous animals, secondarily by ants and through intentional cultivation.
• Capable of prolific seed production (>1000/m2)
• Tolerates and regrows after pruning or mechanical damage

Low Risk Traits
• Frequent pruning of Ficus microcarpa var. crassifolia (Wax ficus) to maintain as a low ground cover, hedge or for bonsai may prevent fruiting and spread.
• Unarmed (no spines, thorns, or burrs)
• Palatable foliage (leaves used as fodder in some countries)
• Grows best in high light environments (dense shade may inhibit spread)
• Herbicides may provide effective control