

**Taxon:** *Dacrycarpus imbricatus* (Blume) de Laub.

**Family:** Podocarpaceae

**Common Name(s):** kajoerapat  
kimerah  
kiputri  
podocarp

**Synonym(s):** *Podocarpus cupressinus* R. Br. ex  
*Podocarpus imbricatus* Blume

**Assessor:** Chuck Chimera

**Status:** Assessor Approved

**End Date:** 12 Oct 2018

**WRA Score:** 5.0

**Designation:** EVALUATE

**Rating:** Evaluate

**Keywords:** Tropical Tree, Naturalized, Dense Stands, Dioecious, Bird-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	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
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		
405	Toxic to animals	y=1, n=0	n
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	y=1, n=0	y
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	n
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		
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation		
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		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m <sup>2</sup> )		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides		
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
	Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands	[No evidence of domestication] "This widespread species is one of the most valuable timber trees in SE Asia."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2018. 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
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 10 Oct 2018]	"Native Asia-Temperate CHINA: China [Guangdong] Asia-Tropical INDIAN SUBCONTINENT: India PAPUASIA: Papua New Guinea INDO-CHINA: Cambodia, Laos, Myanmar (n.), Thailand (n.) MALESIA: Indonesia, Malaysia, Philippines"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 10 Oct 2018]	

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

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Climatic amplitude (estimates) - Altitude range: 0 - 3400 m - Mean annual rainfall: 2400 - 4600 mm - Rainfall regime: bimodal; uniform - Dry season duration: 1 - 3 months - Mean annual temperature: 22 - 32°C - Mean maximum temperature of hottest month: 26 - 28°C - Mean minimum temperature of coldest month: 20 - 25°C - Absolute minimum temperature: > 18°C"
	Wu, Z. Y. & Raven, P. H. (eds.) 1999. Flora of China. Vol. 4 (Cycadaceae through Fagaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Montane rainforests (Hainan), mixed evergreen broad-leaved forests (mainland), or in pure stands, in valleys of mountain streams on slightly acid, montane yellow-earth; 400–1500 m."
	Earle, C.J. (2018). The Gymnosperm Database - <i>Dacrycarpus imbricatus</i> . <a href="https://www.conifers.org/po/Dacrycarpus_imbricatus.php">https://www.conifers.org/po/Dacrycarpus_imbricatus.php</a> . [Accessed 11 Oct 2018]	"N Burma, far S China, Vietnam, Laos, Malaya, Philippines (Luzon, Mindanao), Sumatra, Borneo, Java, Celebes, Moluccas (Morotal, Ceram), Lesser Sunda Islands (Bali-Timor), New Guinea (incl. New Britain and New Ireland), New Hebrides, and Fiji (de Laubenfels 1988, FIPI 1996). Within its range, mean annual temperature is 18.0°C, with an average minimum in the coldest month of 11.7°C, and a mean annual precipitation of 2569 mm (Biffin et al. 2011, Table S5). Var. <i>imbricatus</i> is confined to Java, the Lesser Sunda Islands (Bali-Timor) and the SW. & C Celebes. It is "[m]ostly scattered and common in primary and secondary rain-forest, not rarely as an emergent, and co-dominant in West Java with <i>Podocarpus neriifolius</i> and <i>Altingia noronhae</i> , on the south slope of Mt Tjeremai volcano characterizing the zone between 2400 2700 m without other co-dominants, a situation not yet explained, in Timor found under more or less seasonal conditions in isolated specimens laden with <i>Usnea</i> [an epiphytic lichen] in grassland after deforestation, mostly between 1000-2500 m, but in Lombok reported as low as 200 m and in Celebes ascending to 3000 m. Probably exterminated at lower elevations in Java by deforestation" (de Laubenfels 1988). Zone 10 (cold hardness limit between -1°C and +4.4°C) (Bannister and Neuner 2001)."
	WRA Specialist. 2018. Personal Communication	Broad elevation range demonstrates environmental versatility

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 10 Oct 2018]	"Native Asia-Temperate CHINA: China [Guangdong] Asia-Tropical INDIAN SUBCONTINENT: India PAPUASIA: Papua New Guinea INDO-CHINA: Cambodia, Laos, Myanmar (n.), Thailand (n.) MALESIA: Indonesia, Malaysia, Philippines"

Qsn #	Question	Answer
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18	"This tree, native to Java, was first planted in the Arboretum in 1921 as <i>Podocarpus cupressina</i> and volunteers were first documented in the Lyon Arboretum 1934 annual report. It is characterized by flat, linear, dimorphic leaves 0.8–1.3 cm long or ca. 0.2 cm long, the latter appressed along young, green branches (Brandis 1906: 696). The leaf size, shape, and arrangement superficially resembles some <i>Cupressus</i> species. The seeds are attached to red, fleshy receptacles and are presumably dispersed by birds. Naturalized plants of all life stages are found widely scattered throughout unmanaged parts of the Arboretum, but they were not observed at high densities anywhere. Material examined: O'AHU: In bamboo thicket, 'Aihualama, Lyon Arboretum, 18 Apr 2005, C. Daehler 1099 (BISH, duplicate HAW); Mānoa Valley (cultivated), 29 Oct 1934, Grant 7548 (BISH); head of Mānoa Valley, adjacent to the Lyon Arboretum property, 15 Apr 1990, L. Pyle sub G.W. Staples 582 (BISH)."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	" <i>D. imbricatus</i> is a resinous tree which grows to 30 m and sometimes more, with a bole up to 2 m in diameter. It has a wide natural range across south Asia and the Pacific and has been planted for ornamental purposes."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18	"This tree, native to Java, was first planted in the Arboretum in 1921 as <i>Podocarpus cupressina</i> and volunteers were first documented in the Lyon Arboretum 1934 annual report. It is characterized by flat, linear, dimorphic leaves 0.8–1.3 cm long or ca. 0.2 cm long, the latter appressed along young, green branches (Brandis 1906: 696). The leaf size, shape, and arrangement superficially resembles some <i>Cupressus</i> species. The seeds are attached to red, fleshy receptacles and are presumably dispersed by birds. Naturalized plants of all life stages are found widely scattered throughout unmanaged parts of the Arboretum, but they were not observed at high densities anywhere. Material examined: O'AHU: In bamboo thicket, 'Aihualama, Lyon Arboretum, 18 Apr 2005, C. Daehler 1099 (BISH, duplicate HAW); Mānoa Valley (cultivated), 29 Oct 1934, Grant 7548 (BISH); head of Mānoa Valley, adjacent to the Lyon Arboretum property, 15 Apr 1990, L. Pyle sub G.W. Staples 582 (BISH)."

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	Agricultural/forestry/horticultural weed	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
<b>304</b>	<b>Environmental weed</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
<b>305</b>	<b>Congeneric weed</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
<b>401</b>	<b>Produces spines, thorns or burrs</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y. & Raven, P. H. (eds.) 1999. Flora of China. Vol. 4 (Cycadaceae through Fagaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "Trees to 40 m tall; trunk to 2 m d.b.h.; bark superficially dark brown or blackish, weathering gray, red-brown and granular fibrous within, flaking in thin strips"
<b>402</b>	<b>Allelopathic</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence found
<b>403</b>	<b>Parasitic</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y. & Raven, P. H. (eds.) 1999. Flora of China. Vol. 4 (Cycadaceae through Fagaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Trees to 40 m tall" [Podocarpaceae. No evidence]
<b>404</b>	<b>Unpalatable to grazing animals</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Nguyen Tien Hiep, Phan Ke Loc, Nguyen Duc To Luu, P.I. Thomas, A. Farjon, L. Averyanov & J. Regalado Jr. (2004). Vietnam Conifers: Conservation Status Review 2004. Fauna & Flora International, Vietnam Programme, Hanoi	[Cones palatable] "Podocarps, especially <i>Dacrycarpus imbricatus</i> , produce a great quantity of fleshy cones that are important source of food for many forest animals (Nguyen Duc To Luu, unpublished data)."
	WRA Specialist. 2018. Personal Communication	Palatability of foliage unknown
<b>405</b>	<b>Toxic to animals</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>

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
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence
	NIH U.S. National Library of Medicine. 2018. TOXNET Toxicology Data Network. <a href="https://toxnet.nlm.nih.gov/">https://toxnet.nlm.nih.gov/</a> . [Accessed 12 Oct 2018]	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.). (1999). Plant Resources of South-East Asia. No 5(2). Timber Trees: Minor Commercial Timbers. Backhuys Publishers, Leiden, The Netherlands	"The mistletoe <i>Korthalsella dacrydii</i> (Ridley) Dans. has been observed on <i>Dacrycarpus</i> , but its importance is probably insignificant."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	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
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence
	NIH U.S. National Library of Medicine. 2018. TOXNET Toxicology Data Network. <a href="https://toxnet.nlm.nih.gov/">https://toxnet.nlm.nih.gov/</a> . [Accessed 12 Oct 2018]	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	" <i>D. imbricatus</i> is one of the most fire-resistant trees in the natural forests of Java."
	Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.). (1999). Plant Resources of South-East Asia. No 5(2). Timber Trees: Minor Commercial Timbers. Backhuys Publishers, Leiden, The Netherlands	[No evidence. A fire resistant tree of wet habitats] " <i>Dacrycarpus</i> generally occurs scattered but sometimes it is common and even dominant, or rarely occurs in pure stands in primary rain forest. It often grows in very humid locations such as poorly drained or boggy sites, sometimes on river banks or well-drained mountain slopes. Most species occur in submontane or montane habitats at 800–2500 m altitude but may descend almost to sea-level or ascend to 3600 m although at the higher altitudes the trees do not reach exploitable timber sizes." ... "Canopy closure of <i>D. imbricatus</i> in pure plantations takes a long time. <i>Dacrycarpus</i> is one of the most fire-resistant trees in the natural forest of Java."

Qsn #	Question	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Van Sam, H., Nanthavong, K., & Kessler, P. J. (2004). Trees of Laos and Vietnam: A field guide to 100 economically or ecologically important species. <i>Blumea</i> , 49(2-3), 201-349	"Light demanding tree, but shade tolerant when young, prefers fertile, humid and sandy soil." [Shade tolerance when young could allow tree to establish in forest understories]

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Farjon, A. (2017). <i>A Handbook of the World's Conifers. Volume 1. Second, Revised Edition.</i> Koninklijke Brill NV, Leiden, The Netherlands	" <i>Dacrycarpus imbricatus</i> is common on volcanic or ultramafic soils, and occasionally occurs on sandstone or limestone."
	Earle, C.J. (2018). <i>The Gymnosperm Database - Dacrycarpus imbricatus.</i> <a href="https://www.conifers.org/po/Dacrycarpus_imbricatus.php">https://www.conifers.org/po/Dacrycarpus_imbricatus.php</a> . [Accessed 12 Oct 2018]	"preferring humid, fertile soil, especially sandy soils, but also growing on clay-stony soil."
	de Laubenfels, D.J. 1988. <i>Flora Malesiana. Series I, Spermatophyta: Flowering plants. Volume 10, part 3. Coniferales.</i> Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands	"Soils. Many conifers prefer nutrient-poor soils, and are often even confined to them, but there are also species which are mostly found on richer latosols, e.g. <i>Dacrycarpus imbricatus</i> which grows excellently on young volcanic soils."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Nguyen Tien Hiep, Phan Ke Loc, Nguyen Duc To Luu, P.I. Thomas, A. Farjon, L. Averyanov & J. Regalado Jr. (2004). <i>Vietnam Conifers: Conservation Status Review 2004.</i> Fauna & Flora International, Vietnam Programme, Hanoi	"An upright tree with a long clear bole, emergent with wide, dome shaped crown, lower branches pendulous, reaching up to 35 m high with a dbh to 1 m."

412	Forms dense thickets	y
	Source(s)	Notes
	de Laubenfels, D.J. 1988. <i>Flora Malesiana. Series I, Spermatophyta: Flowering plants. Volume 10, part 3. Coniferales.</i> Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands	"a volcano in W. Central Java, there is between c. 1800-2500 m a very large gregarious dominant stand of <i>Dacrycarpus imbricatus</i> only. It remains unclear to what factor in the past this has to be ascribed."
	Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.). (1999). <i>Plant Resources of South-East Asia. No 5(2). Timber Trees: Minor Commercial Timbers.</i> Backhuys Publishers, Leiden, The Netherlands	" <i>Dacrycarpus</i> generally occurs scattered but sometimes it is common and even dominant, or rarely occurs in pure stands in primary rain forest."
	Enright, N. J., & Jaffré, T. (2011). <i>Ecology and Distribution of the Malesian Podocarps.</i> In <i>Ecology of the Podocarpaceae in Tropical Forests</i> , B. L. Turner and L. A. Cernusak, eds., pp. 57–77. <i>Smithsonian Contributions to Botany</i> , No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Several podocarp species also occur above the tree line as shrubs in alpine scrub, including <i>Dacrycarpus kinabaluensis</i> on Borneo, <i>Dacrydium medium</i> in Sumatra, <i>Podocarpus spathoides</i> in Peninsular Malaysia, and <i>Dacrycarpus imbricatus</i> and <i>Podocarpus pilgeri</i> in central Irian Jaya (west New Guinea), where they form dense thickets 1–2 m high on infertile sandstone sites at 3,000 m (G. Hope, Australian National University, Canberra, Australia, personal communication)."



Qsn #	Question	Answer
	Wu, Z. Y. & Raven, P. H. (eds.) 1999. Flora of China. Vol. 4 (Cycadaceae through Fagaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Forms pure stands within native range] "Montane rainforests (Hainan), mixed evergreen broad-leaved forests (mainland), or in pure stands, in valleys of mountain streams on slightly acid, montane yellow-earth; 400–1500 m."
<b>501</b>	<b>Aquatic</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y. & Raven, P. H. (eds.) 1999. Flora of China. Vol. 4 (Cycadaceae through Fagaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Terrestrial] "Montane rainforests (Hainan), mixed evergreen broad-leaved forests (mainland), or in pure stands, in valleys of mountain streams on slightly acid, montane yellow-earth; 400–1500 m"
<b>502</b>	<b>Grass</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 11 Oct 2018]	Family: Podocarpaceae
<b>503</b>	<b>Nitrogen fixing woody plant</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 11 Oct 2018]	Family: Podocarpaceae
<b>504</b>	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Van Sam, H., Nanthavong, K., & Kessler, P. J. (2004). Trees of Laos and Vietnam: A field guide to 100 economically or ecologically important species. Blumea, 49(2-3), 201-349	"Trees up to 35 m high, up to 200 cm diam., bole straight, cylindrical."
<b>601</b>	<b>Evidence of substantial reproductive failure in native habitat</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"D. imbricatus is a resinous tree which grows to 30 m and sometimes more, with a bole up to 2 m in diameter. It has a wide natural range across south Asia and the Pacific and has been planted for ornamental purposes."
	Thomas, P. 2013. <i>Dacrycarpus imbricatus</i> . The IUCN Red List of Threatened Species 2013: e.T42445A2980614. <a href="http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T42445A2980614.en">http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T42445A2980614.en</a> . [Accessed 11 Oct 2018]	"Due to its very wide distribution from southern China to Fiji in the southwest Pacific, <i>Dacrycarpus imbricatus</i> is currently assessed as Least Concern. The three varieties which are recognized would also be listed as Least Concern. "
<b>602</b>	<b>Produces viable seed</b>	<b>y</b>

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.). (1999). Plant Resources of South-East Asia. No 5(2). Timber Trees: Minor Commercial Timbers. Backhuys Publishers, Leiden, The Netherlands	"Dacrycarpus can be propagated by seed or cuttings. <i>D. imbricatus</i> has about 16 000 dry seeds/kg. In this species, 59% of the seeds germinated in 16-63 days in Peninsular Malaysia; a germination rate of 88- 98% has been reported for the Philippines. Exposure to the sun for 6-18 hours prior to sowing enhanced germination significantly."
	Van Sam, H., Nanthavong, K., & Kessler, P. J. (2004). Trees of Laos and Vietnam: A field guide to 100 economically or ecologically important species. <i>Blumea</i> , 49(2-3), 201-349	"Female cones solitary or paired at the tip of twigs, usually one fertile, receptacle glaucous, obovoid, 3–4 by 1–2.5 mm. Seeds globose, 5–6 by 4–6 mm, reddish brown when ripe." ... "Found in tropical forests, altitude 300–1000 m, usually mixed with <i>Altingia siamensis</i> , <i>Celtis australis</i> , <i>Cinnamomum</i> spp., <i>Gironniera subaequalis</i> , <i>Lithocarpus</i> spp., and <i>Mallotus yunnanensis</i> . Light demanding tree, but shade tolerant when young, prefers fertile, humid and sandy soil. Natural regeneration is good. Cones: February to April; mature ones: October to December."
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Germination of tropical podocarp species is usually rapid, ranging from 20 to 60 days for <i>Dacrycarpus imbricatus</i> , <i>Nageia fleuryi</i> , and <i>P. neriifolius</i> , with seeds then losing viability so that there is no persistent soil-stored seed bank."

603	Hybridizes naturally	
	<b>Source(s)</b>	<b>Notes</b>
	de Laubenfels, D.J. 1988. <i>Flora Malesiana</i> . Series I, Spermatophyta: Flowering plants. Volume 10, part 3. Coniferales. Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands	"Occasionally hybrids have been noted or suspected. Many species occur side by side in nature without any apparent hybridization." [Podocarpaceae family description. Unknown for <i>Dacrycarpus imbricatus</i> . No evidence found]

604	Self-compatible or apomictic	n
	<b>Source(s)</b>	<b>Notes</b>
	Farjon, A. (2017). <i>A Handbook of the World's Conifers</i> . Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands	"Shrubby to large dioecious trees to 40-50 m tall"

605	Requires specialist pollinators	n
	<b>Source(s)</b>	<b>Notes</b>
	Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.). (1999). Plant Resources of South-East Asia. No 5(2). Timber Trees: Minor Commercial Timbers. Backhuys Publishers, Leiden, The Netherlands	" <i>Dacrycarpus</i> is pollinated by wind. In Thailand <i>D. imbricatus</i> flowers from January to May and the seeds ripen from March to September."
	de Laubenfels, D.J. 1988. <i>Flora Malesiana</i> . Series I, Spermatophyta: Flowering plants. Volume 10, part 3. Coniferales. Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands	"Podocarpaceae ... Most genera are dioecious and pollination is by wind."

Qsn #	Question	Answer
	Regal, P. (1982). Pollination by Wind and Animals: Ecology of Geographic Patterns. Annual Review of Ecology and Systematics, 13, 497-524	[Wind-pollinated] "The anemophilous coniferous forests at higher elevations and in the western United States are well known, as is the conspicuous transition to oaks and conifers at higher elevations in Mexico and northern Central America (102). In Papua New Guinea there is a decline in tree species-richness with increasing altitude; as elevation increases oaks become more common, then southern beech ( <i>Nothofagus</i> ); conifers such as <i>Agathis</i> , <i>Araucaria</i> , <i>Podocarpus</i> , <i>Dacrydium</i> , <i>Falcatofolium</i> , <i>Phyllocladus</i> , <i>Dacrycarpus</i> , and <i>Papuacedrus</i> also become more common (63, 123). The distributions of <i>Nothofagus</i> and 40 species of conifers on new Caledonia are complex, influenced by the serpentine, calcareous, and other peculiar soils; but it seems that these trees also become more common at higher altitudes (30, 58, 122). Thus the probability of encountering wind-pollinated trees seems to increase with altitude even in many low-latitude areas."

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.). (1999). Plant Resources of South-East Asia. No 5(2). Timber Trees: Minor Commercial Timbers. Backhuys Publishers, Leiden, The Netherlands	" <i>Dacrycarpus</i> can be propagated by seed or cuttings. <i>D. imbricatus</i> has about 16 000 dry seeds/kg. In this species, 59% of the seeds germinated in 16-63 days in Peninsular Malaysia; a germination rate of 88- 98% has been reported for the Philippines. Exposure to the sun for 6-18 hours prior to sowing enhanced germination significantly."
	de Laubenfels, D.J. 1988. Flora Malesiana. Series I, Spermatophyta: Flowering plants. Volume 10, part 3. Coniferales. Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands	"Sometimes the stem of full-grown trees produces sprouts at the base (VAN STEENIS, 1940)." [Unknown if sprouts allow trees to expand vegetatively]

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.). (1999). Plant Resources of South-East Asia. No 5(2). Timber Trees: Minor Commercial Timbers. Backhuys Publishers, Leiden, The Netherlands	"The annual diameter increment of <i>D. imbricatus</i> in natural forest in the Philippines is 0.7 mm and 2.1 mm for diameter class 0-10 cm and 50-60 cm, respectively. The mean annual height increment of <i>D. imbricatus</i> in a 28-year-old plantation in Java dominated by <i>Schima wallichii</i> (DC.) Korth. ssp. <i>noronhae</i> (Reinw. ex Blume) Bloembergen var. <i>noronhae</i> and a second layer of <i>Altingia excelsa</i> Noroiia is 0.3--0.7 m. The mean annual increment in a 7.5- year-old open plantation was 0.9-1.0 m in height and 1.0 cm in diameter." [Presumably >3 years to maturity based on annual growth rate]

Qsn #	Question	Answer
701	<b>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Podocarp seeds are dispersed by birds, and perhaps some small mammals, which are attracted by the typically single-seeded fleshy fruit and/or swollen bract."

702	<b>Propagules dispersed intentionally by people</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands	"It is used in tropical countries as an ornamental tree in parks and gardens."

703	<b>Propagules likely to disperse as a produce contaminant</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Podocarp seeds are dispersed by birds, and perhaps some small mammals, which are attracted by the typically single-seeded fleshy fruit and/or swollen bract."

704	<b>Propagules adapted to wind dispersal</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Podocarp seeds are dispersed by birds, and perhaps some small mammals, which are attracted by the typically single-seeded fleshy fruit and/or swollen bract."
	Van Sam, H., Nanthavong, K., & Kessler, P. J. (2004). Trees of Laos and Vietnam: A field guide to 100 economically or ecologically important species. Blumea, 49(2-3), 201-349	"Seeds wingless, completely covered by a fleshy structure referred to as an epimatium, epimatium and integument sometimes connate and forming a leathery testa."

Qsn #	Question	Answer
705	<b>Propagules water dispersed</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Coomes, D. A., & Bellingham, P. J. (2011). Temperate and Tropical Podocarps: How Ecologically Alike Are They? In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 119–140. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	" <i>Dacrycarpus imbricatus</i> . Northern Burma, far southern China, Vietnam, Laos, Malaya, Philippines, Sumatra, Borneo, Java, Celebes, Moluccas, Lesser Sunda Islands, New Guinea, New Hebrides, Fiji." ... "In China in mixed forests or pure stands on slightly acidic yellow earth soils in valleys of montane streams at 400–1,500 m." [Distribution along streams suggests seeds could be secondarily moved by water. Buoyancy of seeds unknown]

706	<b>Propagules bird dispersed</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Morley, R. J. (2011). Dispersal and Paleoecology of Tropical Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 21–41. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	" <i>Dacrycarpus</i> has a long history in Australia and New Zealand, first occurring in the late Paleocene (Martin, 1994), and in Patagonia (South America), first occurring in the early Eocene (Wilf, 2007)." ... "The appearance in northwest Borneo was within Nannofossil Zone NN15 between 3.4 and 4.04 mya. Dispersal was probably by birds, and the dispersal route was through an island chain."
	Schmidt, L. H. (2007). Tropical Forest Seed. Springer-Verlag, Berlin Heidelberg	"Fig. 2.2. Animal-dispersed seeds. Seeds may be ingested and pass through the whole digestive track and be deposited with the faeces. In other cases seeds are regurgitated and sometimes they are just sucked free for pulp. From upper left: <i>Diospyros</i> , <i>Sandoricum</i> , <i>Maranthus</i> , <i>Olea</i> , <i>Peyena</i> , <i>Aglaia</i> , <i>Swintonia</i> , <i>Cordia</i> , <i>Syzygium</i> , <i>Dacrycarpus</i> (arillate seed), <i>Gnetum</i> , <i>Acacia</i> , <i>Sindora</i> (arillate seed), <i>Tamarindus</i> "
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Podocarp seeds are dispersed by birds, and perhaps some small mammals, which are attracted by the typically single-seeded fleshy fruit and/or swollen bract."
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Oahu. Bishop Museum Occasional Papers 87: 3-18	"The seeds are attached to red, fleshy receptacles and are presumably dispersed by birds."

707	<b>Propagules dispersed by other animals (externally)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Podocarp seeds are dispersed by birds, and perhaps some small mammals, which are attracted by the typically single-seeded fleshy fruit and/or swollen bract." [No evidence. Possible that rodents could carry seeds externally to consume arils, but no direct evidence found]

708	<b>Propagules survive passage through the gut</b>	<b>y</b>
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Schmidt, L. H. (2007). Tropical Forest Seed. Springer-Verlag, Berlin Heidelberg	"Fig. 2.2. Animal-dispersed seeds. Seeds may be ingested and pass the through the whole digestive track and be deposited with the faeces. In other cases seeds are regurgitated and sometimes they are just sucked free for pulp. From upper left: Diospyros, Sandoricum, Maranthus, Olea, Peyena, Aglaia, Swintonia, Cordia, Syzygium, Dacrycarpus (arillate seed), Gnetum, Acacia, Sindora (arillate seed), Tamarindus"
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Podocarp seeds are dispersed by birds, and perhaps some small mammals, which are attracted by the typically single-seeded fleshy fruit and/or swollen bract."
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Oahu. Bishop Museum Occasional Papers 87: 3-18	"The seeds are attached to red, fleshy receptacles and are presumably dispersed by birds."

801	Prolific seed production (>1000/m2)	
	<b>Source(s)</b>	<b>Notes</b>
	Schmidt, L. H., & Luu, N. D. T. (2004). Dacrycarpus imbricatus (Blume) de Laubenf. Seed Leaflet No. 98	"There are 16,000-20,000 seeds per kg." [Natural seed densities unknown]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	<b>Source(s)</b>	<b>Notes</b>
	Enright, N. J., & Jaffré, T. (2011). Ecology and Distribution of the Malesian Podocarps. In Ecology of the Podocarpaceae in Tropical Forests, B. L. Turner and L. A. Cernusak, eds., pp. 57–77. Smithsonian Contributions to Botany, No. 95. Smithsonian Institution Scholarly Press, Washington, D.C.	"Germination of tropical podocarp species is usually rapid, ranging from 20 to 60 days for Dacrycarpus imbricatus, Nageia fleuryi, and P. neriifolius, with seeds then losing viability so that there is no persistent soil-stored seed bank."
	Schmidt, L. H., & Luu, N. D. T. (2004). Dacrycarpus imbricatus (Blume) de Laubenf. Seed Leaflet No. 98	"Seeds have recalcitrant to intermediate storage character. They tolerate drying to about 15-29% mc and can be stored cool for 3-4 months without significant loss in viability."

803	Well controlled by herbicides	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2018. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	<b>Source(s)</b>	<b>Notes</b>
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"- Tolerates fire - Ability to self-prune"

Qsn #	Question	Answer
	Schmidt, L. H. (2007). Tropical Forest Seed. Springer-Verlag, Berlin Heidelberg	"Rooting of cuttings can be done from coppice material."
	de Laubenfels, D.J. 1988. Flora Malesiana. Series I, Spermatophyta: Flowering plants. Volume 10, part 3. Coniferales. Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands	"Sometimes the stem of full-grown trees produces sprouts at the base"

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18	[Unknown. No natural enemies reported in this publication] "This tree, native to Java, was first planted in the Arboretum in 1921 as <i>Podocarpus cupressina</i> and volunteers were first documented in the Lyon Arboretum 1934 annual report. It is characterized by flat, linear, dimorphic leaves 0.8–1.3 cm long or ca. 0.2 cm long, the latter appressed along young, green branches (Brandis 1906: 696). The leaf size, shape, and arrangement superficially resembles some <i>Cupressus</i> species. The seeds are attached to red, fleshy receptacles and are presumably dispersed by birds. Naturalized plants of all life stages are found widely scattered throughout unmanaged parts of the Arboretum, but they were not observed at high densities anywhere. Material examined: O'AHU: In bamboo thicket, 'Aihualama, Lyon Arboretum, 18 Apr 2005, C. Daehler 1099 (BISH, duplicate HAW); Mānoa Valley (cultivated), 29 Oct 1934, Grant 7548 (BISH); head of Mānoa Valley, adjacent to the Lyon Arboretum property, 15 Apr 1990, L. Pyle sub G.W. Staples 582 (BISH)."

**Summary of Risk Traits:**

High Risk / Undesirable Traits

- Elevation range exceeds 3000 m, demonstrating environmental versatility
- Grows in tropical climates (climate of Hawaiian Islands unlikely to be a limiting factor)
- Naturalized in Lyon Arboretum, Oahu, Hawaiian Islands
- Shade tolerant when young (able to establish in forest understories)
- Tolerates many soil types
- Forms pure stands in native range
- Reproduces by bird-dispersed seeds
- Seeds dispersed by birds & intentionally by people
- Tolerates fire & able to form basal sprouts (possible coppicing ability)

Low Risk Traits

- No reports of negative or detrimental impacts to date (but only reported as naturalized in Hawaiian Islands)
- Unarmed (no spines, thorns, or burrs)
- Non-toxic
- Slow growth rate & presumably long time to reproductive maturity (exact age unknown)
- Seeds germinate rapidly & do not form a persistent soil seed bank