Taxon: Heliocarpus donnellsmithii Rose

Family: Malvaceae

Common Name(s): chai
damajao
jolocin
jonote colorado
majagua
majao
mecate colorado
mecate de agua

Synonym(s): Heliocarpus caeciliae Loes.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 30 Nov 2021

WRA Score: **8.0** **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Pioneer Tree, Invasive Elsewhere, Shade-Intolerant, Wind-Dispersed, Seed Bank

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	n
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)	y
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	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		

Qsn #	Question	Answer Option	Answer
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		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
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		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)		
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people		
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
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**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	[No evidence of domestication] "Distribution: Plants of southern Mexico and Central America. This species is of rather wide continental distribution but its presence in Martinique is difficult to explain, unless through introduction."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2021). 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**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	"Distribution: Plants of southern Mexico and Central America. This species is of rather wide continental distribution but its presence in Martinique is difficult to explain, unless through introduction."
	González-Espinosa, M., Meave, J.A., Lorea-Hernández, F.G., Ibarra-Manríquez, G. & Newton, A.C. (eds.). (2011). The Red List of Mexican Cloud Forest Trees. Fauna & Flora International, Cambridge, UK	"Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica, Lesser Antilles"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	"Distribution: Plants of southern Mexico and Central America. This species is of rather wide continental distribution but its presence in Martinique is difficult to explain, unless through introduction."

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	González-Espinosa, M., Meave, J.A., Lorea-Hernández, F.G., Ibarra-Manríquez, G. & Newton, A.C. (eds.). (2011). The Red List of Mexican Cloud Forest Trees. Fauna & Flora International, Cambridge, UK	"Elevational range: 0–1,700 m"

Qsn #	Question	Answer
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"H. donnellsmithii prefers to grow in areas with mean annual temperature ranging from 18°C to 36°C and mean annual rainfall ranging from 1000 mm to 3000 mm. This species thrives in open areas with full sunlight and does not tolerate shaded conditions. Temperatures above 30°C are required to cause seed to become permeable and thus to germinate (Vázquez-Yanes and Orozco-Segovia, 1982; Vásquez-Sánchez and Ramos, 1992)."
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	[Elevation range >1000 m in tropical climates] "Distribution: Plants of southern Mexico and Central America. This species is of rather wide continental distribution but its presence in Martinique is difficult to explain, unless through introduction. It is abundant on the edges of forest, in secondary growth, and on mountain slopes at altitudes from 100 to 1500 m."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	"Distribution: Plants of southern Mexico and Central America. This species is of rather wide continental distribution but its presence in Martinique is difficult to explain, unless through introduction."
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Outside its native distribution range, this species only occurs in Martinique. On this island, H. donnellsmithii is listed as a "successional activator" tree with the potential to modify the natural successional patterns."
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Outside its native distribution range, this species only occurs in Martinique. On this island, H. donnellsmithii is listed as a "successional activator" tree with the potential to modify the natural successional patterns."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Outside its native distribution range, this species only occurs in Martinique. On this island, H. donnellsmithii is listed as a "successional activator" tree with the potential to modify the natural successional patterns."
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

Qsn #	Question	Answer
	Simpson, A., Turner, R., Blake, R., Liebhold, A., and Dorado, M. (2021). United States Register of Introduced and Invasive Species: U.S. Geological Survey data release, https://doi.org/10.5066/P95XL09Q. [Accessed 30 Nov 2021]	No evidence within the United States

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"H. donnellsmithii is reported as an introduced species only in Martinique. On this island, this species is behaving as a “successional activator” tree with the potential to modify natural successional patterns (Fournet, 2002; Joseph and Abati, 2016, INPN, 2018)."
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The species Heliocarpus donnell-smithii Rose is an early secondary, fast-growing tree of short life span found from southern Mexico to Costa Rica and the west Indies. It grows in both dry and moist tropical forests. In the tropical wet forest it is found only in light gaps and young secondary vegetation. The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)."

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[No evidence] "H. donnellsmithii is reported as an introduced species only in Martinique. On this island, this species is behaving as a “successional activator” tree with the potential to modify natural successional patterns (Fournet, 2002; Joseph and Abati, 2016, INPN, 2018)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence to date

304	Environmental weed	
	Source(s)	**Notes**
	Préfet de la Martinique. (2021). Guide des espèces végétales exotiques envahissantes (EEE) de Martinique. http://www.martinique.developpement-durable.gouv.fr. [Accessed 29 Nov 2021]	"Compétition avec les espèces locales en formant des fourrés denses monospécifiques" [Translation: Competition with local species forming dense monospecific thickets]
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potentially] "H. donnellsmithii is reported as an introduced species only in Martinique. On this island, this species is behaving as a “successional activator” tree with the potential to modify natural successional patterns (Fournet, 2002; Joseph and Abati, 2016, INPN, 2018)."

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

Qsn #	Question	Answer
	US Fish and Wildlife Service. (2015). Endangered and Threatened Wildlife and Plants; Endangered Status for 49 Species From the Hawaiian Islands; Proposed Rule. Federal Register Vol. 80, No. 189: 58820-58909	[Heliocarpus popayanensis identified as a major threat to the endangered Cyanea kauaulaensis] "Heliocarpus popayanensis (moho) is a nearly 100-ft (30-m) tall tree native to Mexico and Argentina. This species was planted extensively in Hawaii by foresters beginning in 1941, and has since escaped into lowland wet forest and cliffs on Kauai, Oahu, Lanai, and Hawaii Island (Wagner et al. 1999, p. 1292; Wagner et al. 2012, p. 72). The seeds are wind-dispersed, and this species is becoming a dominant feature is some forest areas on Oahu (Smith 1998). It grows rapidly, and spreads readily in disturbed forest where it can outcompete native vegetation (Motooka et al. 2003, in litt.)."
	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	[Heliocarpus popayanensis Kunth Syn. H. americana var. popayanensis] "Environmental impact: Grows rapidly and spreads readily in disturbed wetter mesic forests"

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	[No evidence] "Small trees about 10 m. high; older branches glabrous, smooth, yellow to yellowish brown, irregularly punctate with white lenticels; younger branches and inflorescence axes slightly pubescent with short stellate and simple hairs. Leaves broadly ovate, 12-14 cm. long and 8-10 cm. wide, not lobed, 5-costate at the base, shortly acuminate, base rounded or obtuse, irregularly serrated, lower serrations glandular, upper surface dark green, essentially glabrous with short greatly suppressed stellate hairs, lower surface lighter green, slightly more pubescent than the upper, nearly glabrate, with short stellate pubescence; petioles glabrous, smooth, 6-8 cm. long."

402	Allelopathic	
	Source(s)	**Notes**
	Flores-Carmona, M. D. C., Cruz-Ortega, R., & Anaya, A. L. (2008). Allelopathic potential of some tropical trees of Ecological Reserve El Eden, Quintana Roo, Mexico. Allelopathy Journal, 21(1), 57-72	[No field evidence of allelopathy for other Heliocarpus sp.] "We investigated the allelopathic potential of leaves of six tropical trees (Jatropha gaumeri, Pedilanthus tithymaloides, Sebastiania adenophora, Zuelania guidonia, Zanthoxylum caribaeum and Heliocarpus sp.) from the Ecological Reserve El Eden, Quintana Roo, Mexico. Aqueous leachates from dry leaves (1%) were tested in vitro on the root growth of 7 test plants [Echinochloa crus-galli, Lolium multiflorum, Zea mays, Amaranthus hypochondriacus, Lycopersicon esculentum, Phaseolus vulgaris and Cucurbita pepo (ungerminated and pre-germinated)] and the diameter growth of 3 phytopathogenic fungi [Alternaria sp., Fusarium oxysporum and Helminthosporium sp]. Aqueous leachates of P. tithymaloides, S. adenophora, Z. caribaeum, J. gaumeri and Heliocarpus sp. were most phytotoxic. S. adenophora and Heliocarpus sp. aqueous leachates inhibited the growth diameter of all phytopathogenic fungi."

403	Parasitic	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	"Small trees about 10 m. high" [No evidence]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	Oppenheimer, H. (2007). New plant records from Molokaʻi, Lānaʻi, Maui, and Hawaiʻi for 2006. Bishop Museum Occasional Papers 96:17-34	[Related taxon, Heliocarpus popayanensis, presumably unpalatable] "Apparently this species is not palatable to axis deer, since many seedlings and saplings seemed unbrowsed despite obvious evidence of deer activity in the area."
	Grandtner, M. M. (2005). Elsevier's Dictionary of Trees: Volume 1: North America. Elsevier	Unknown. Uses listed include bottle stoppers, fiber for hammocks, floats, and paper, but no uses as fodder or forage for browsing/grazing animals

405	Toxic to animals	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 in genus
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence in genus

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	González-Espinosa, M., Meave, J.A., Lorea-Hernández, F.G., Ibarra-Manríquez, G. & Newton, A.C. (eds.). (2011). The Red List of Mexican Cloud Forest Trees. Fauna & Flora International, Cambridge, UK	[No evidence] "The timber is light and it is used for roofing. The bark is used for making hammocks and beaten to produce a paper-like material."
	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 in genus
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence in genus

408	Creates a fire hazard in natural ecosystems	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Trejo, D. A. R. (2008). Fire regimes, fire ecology, and fire management in Mexico. AMBIO: a Journal of the Human Environment, 37(7): 548-556	[A component of vegetation that dominates fire-perturbed areas. Flammability or contribution to fire regime unknown] "For the fire-perturbed areas, the same authors also found that species typical of secondary, savannalike or savanna vegetation dominated the forest (Bursera simaruba, Byrsonima crassifolia, Cecropia obtusifolia, Cedrela odorata, Cordia alliodora, Heliocarpus donnell-smithii, Lysiloma acapulcensis, Piscidia piscipula, Tabebuia rosea, and Zuelania guidonia)."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tropical min forest pioneer tree Heliocarpus donnell-smithii Rose establishes itself only in light gaps of the forest canopy." ... "Due to the constant temperatures, most of the seeds in the forest soils remain dormant until a cover break perturbation occurs. The few seeds that germinate under the canopy cover produce unsuccessful seedlings because of the low light intensity"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Soil texture heavy light medium"
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	[Apparently not substrate limited] "Plants of southern Mexico and Central America. This species is of rather wide continental distribution but its presence in Martinique is difficult to explain, unless through introduction. It is abundant on the edges of forest, in secondary growth, and on mountain slopes at altitudes from 100 to 1500 m."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	"Small trees about 10 m. high; older branches glabrous, smooth, yellow to yellowish brown, irregularly punctate with white lenticels; younger branches and inflorescence axes slightly pubescent with short stellate and simple hairs."

412	Forms dense thickets	y
	Source(s)	**Notes**
	Préfet de la Martinique. (2021). Guide des espèces végétales exotiques envahissantes (EEE) de Martinique. http://www.martinique.developpement-durable.gouv.fr. [Accessed 29 Nov 2021]	"Compétition avec les espèces locales en formant des fourrés denses monospécifiques" [Translation: Competition with local species forming dense monospecific thickets]

Qsn #	Question	Answer
	Standley, P.C. & Steyermark, J.A. (1949). Flora of Guatemala. Volume 24. Part VI. Fieldiana, Botany Series. Chicago Natural History Museum Press	[A component of thicket vegetation] "Moist or dry forest or thickets, often in second growth, ascending from near sea level to about 2,300 meters, most common .at lower elevations on foothills" ... "The tree often occurs in abundance in the Pacific foothills."

501	Aquatic	n
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"It is abundant on the edges of forest, in secondary growth, and on mountain slopes at altitudes from 100 to 1500 m."

502	Grass	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 29 Nov 2021]	"Family: Malvaceae Subfamily: Grewioideae"

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 29 Nov 2021]	"Family: Malvaceae Subfamily: Grewioideae"

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	"Small trees about 10 m. high; older branches glabrous, smooth, yellow to yellowish brown, irregularly punctate with white lenticels; younger branches and inflorescence axes slightly pubescent with short stellate and simple hairs."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)."

Qsn #	Question	Answer
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	"This species is of rather wide continental distribution but its presence in Martinique is difficult to explain, unless through introduction. It is abundant on the edges of forest, in secondary growth, and on mountain slopes at altitudes from 100 to 1500 m."
	González-Espinosa, M., Meave, J.A., Lorea-Hernández, F.G., Ibarra-Manríquez, G. & Newton, A.C. (eds.). (2011). The Red List of Mexican Cloud Forest Trees. Fauna & Flora International, Cambridge, UK	Classified as a species of Least Concern (LC)

602	Produces viable seed	y
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)."

603	Hybridizes naturally	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	
	Source(s)	**Notes**
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	[Unknown if hermaphroditic plants are capable of selfing] "Inflorescences gynodioecious, usually terminal, rarely axillary; the hermaphrodite large and spreading"

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"H. donnellsmithii has small, bisexual flowers arranged in inflorescences. In Mexico, flowers are visited principally by honeybees (Standley and Steyermark, 1949; Villanueva, 2002)."

Qsn #	Question	Answer
	Martínez-Hernández, E., Cuadriello-Aguilar, J. I., Ramírez-Arriaga, E., Medina-Camacho, M., Sosa-Nájera, M. S., & Melchor-Sánchez, J. E. (1994). Foraging of Nannotrigona testaceicornis, Trigona (Tetragonisca) angustula, Scaptotrigona mexicana and Plebeia sp. in the Tacaná region, Chiapas, México. Grana, 33(4-5), 205-217	[Visited by native bee species] "The sources consumed by Nannotrigona testaceicornis (Na), Trigona (Tetragonisca) angustula (Te), Scaptotrigona mexicana (Sc) and Plebeia sp. (Pl) were studied at two localities in southeast Mexico: Unión Juárez (U.J.) and Santa Teresita (S.T.), by means of melissopalynological analyse of pollen, honey and larval food. A total of 246 samples were collected in an annual cycle from April (1987) to March (1988). The analyse showed that these native bees are polylectic. At U.J., 54 species of plants were important and there was an overlap of trophic niches in the four bee species when they collected nectar and pollen from Ageratum houstonianun, Alchornea latifolia, Tremna micrantha, Coffea arabica and Citrus limon. Two bee species foraged at 12 plant taxa, including Iresine celosia (Sc, Te), Vernonia canescens (Sc, Pl), Cercidium praecox (Na, Sc). At S.T. 65 taxa were important with an overlap in (Na, Te, Sc and Pl) at one nectaropolliniferous species: Sapindus saponaria. Three native bees collected at Spondias purpurea (Na, Pl, Sc) and Petiveria alliaceae (Na, Pl, Te). An overlap between two bee species occurred in 8 plant species. These included Mimosa orthocarpa (Na, Sc), Celtis iguanaea (Te, Na), Crossopetalum parvifolium (Sc, Te) and Heliocarpus donnell-smithii (Na, Pl). At both localities each bee species showed a preference for certain plants. In the larval food nectaropolliniferous and polliniferous species were important and three principal nourishment mechanisms were observed. Finally, swarming was only detected in Na at both localities from September (1987) to February (1988)."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"H. donnellsmithii is spread by seeds. Mature trees produce large amounts of small, indehiscent, wind-dispersed fruits."
	Préfet de la Martinique. (2021). Guide des espèces végétales exotiques envahissantes (EEE) de Martinique. http://www.martinique.developpement-durable.gouv.fr. [Accessed 30 Nov 2021]	"Mode de Multiplication: Uniquement connu par graines." [Translation: Multiplication Mode: Known only by seed.]

607	Minimum generative time (years)	
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	[Probably <4 years] "The species Heliocarpus donnell-smithii Rose is an early secondary, fast-growing tree of short life span found from southern Mexico to Costa Rica and the west Indies."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)." [Unlikely. No evidence, and no means of attachment]

702	Propagules dispersed intentionally by people	
	Source(s)	**Notes**
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Unknown, but no current evidence of widespread cultivation] "Heliocarpus donnellsmithii is a pioneer tree that can be found growing in forest edges, forest gaps, secondary forests, disturbed sites, abandoned crop and pasturelands. Mature trees can produce large amounts of seeds that are easily dispersed by wind. It is a disturbance-dependent species and its germination and seedling establishment rates are high (>60%) in open areas with high sunlight intensity. Outside its native distribution range, this species only occurs in Martinique. On this island, H. donnellsmithii is listed as a “successional activator” tree with the potential to modify the natural successional patterns."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)." [No evidence. Not grown with commercial crops]

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)."

705	Propagules water dispersed	
	Source(s)	**Notes**
	Préfet de la Martinique. (2021). Guide des espèces végétales exotiques envahissantes (EEE) de Martinique. http://www.martinique.developpement-durable.gouv.fr. [Accessed 29 Nov 2021]	[A wind-dispersed species, but occurrence along waterways may contribute to secondary movement of seeds by water] "Pousse sur les pentes abruptes, dans les forêts d’altitude et le long des cours d’eau. Espèce pionnière dans les zones plus ouvertes" [Translation: Grows on steep slopes, in highland forests and along waterways. Pioneer species in more open.]

706	Propagules bird dispersed	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)."
	Lay, K.K. (1949). A Revision of the Genus Heliocarpus L. Annals of the Missouri Botanical Garden, 36(4), 507–541	[Not fleshy-fruited] "The fruit ellipsoid, nearly glabrate at maturity, slightly rugose, 5 mm. long and 3 mm. wide, borne on a gynophore 8 -12 mm. long, bearing 2-4 pairs of plumose bristles, the fringe of two rows of plumose bristles 5-7 mm. long; the seed obliquely ovoid, 2-3 mm. long and about 2 mm. wide, with a distinct groove in the middle."

707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"Mature trees of H. donnell-smithii established in old light gaps of the forest and in secondary vegetation produce large volumes of seeds that are widely dispersed by the wind during the dry season. Those seeds reach the soil of the forest and also the nearby soil of abandoned crop and pasture land." [No means of external attachment]

708	**Propagules survive passage through the gut**	**n**
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"Mature trees of H. donnell-smithii established in old light gaps of the forest and in secondary vegetation produce large volumes of seeds that are widely dispersed by the wind during the dry season. Those seeds reach the soil of the forest and also the nearby soil of abandoned crop and pasture land." [No evidence that seeds are consumed or internally dispersed]

801	**Prolific seed production (>1000/m2)**	**y**
	Source(s)	**Notes**
	de la Peña-Domene, M., Howe, H. F., Cruz-León, E., Jiménez-Rolland, R., Lozano-Huerta, C., & Martínez-Garza, C. (2017). Seed to seedling transitions in successional habitats across a tropical landscape. Oikos, 126(3), 410-419	"Table A1. Seed mass and components of seeds per recruit" [Heliocarpus donnell-smithii estimated to produce 7774.00 seeds per recruit, standardized on a m2 scale]
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	"The tree produces huge amounts of small, indehiscent, wind-dispersed and single-seeded fruits during the short dry season (Pennington and Sarukhan 1968)."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Vázquez-Yanes, C., & Orozco-Segovia, A. (1982). Seed germination of a tropical rain forest pioneer tree (Heliocarpus donnell-smithii) in response to diurnal fluctuation of temperature. Physiologia Plantarum, 56(3), 295-298	[Seeds continue to germinate after one year of storage in rain forest soil] "The experiment on the longevity of buried seeds consisted of mixing groups of 200 seeds with rain forest soil previously heated to kill any seeds that might be present in it. The mixture was introduced in a small bag of nylon net and buried at a depth of 5 cm in the rain forest soil. A bag was disinterred each month during a year. The soil inside it was spread out on a wet surface inside a growth chamber with a temperature program of 25°C for 18 h and 36°C for 6 h, and the final total germination recorded." ... "The variability in germination between each monthly sample was considerable but there were viable seeds in all the nylon net bags throughout the year. The losses were probably due to germination in the soil because there were empty coats of seeds in every bag, and those losses may correspond to the seeds that normally germinate at constant temperatures in the sample." ... "The trees of this species produce many seeds during the dry season; and part of the annual seed production can remain dormant for some time (Fig. 2). and become integrated into the seed bank of the soil until there is a gap that allows direct irradiation of the soil."

803	**Well controlled by herbicides**	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	Préfet de la Martinique. (2021). Guide des espèces végétales exotiques envahissantes (EEE) de Martinique. http://www.martinique.developpement-durable.gouv.fr. [Accessed 30 Nov 2021]	[Control technique suggests plants will resprout unless entirely uprooted] "Arrachage manuel des jeunes plants en veillant à bien enlever l'intégralité du système racinaire." [Translation: Manual uprooting of young plants, making sure to remove the entire system root.]

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. (2021). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m, demonstrating environmental versatility
• Thrives, and can spread, in regions with tropical climates
• Reported to be naturalized in Martinique (but not reported in the Hawaiian Islands to date)
• A fast-growing pioneer tree that quickly establishes and can modify natural succession patterns
• Other Heliocarpus species are invasive
• Reported to form dense stands in Martinique that may compete with and exclude other vegetation
• Tolerates many soil types
• Reproduces by prolific seed production
• Fast-growing
• Seeds dispersed by wind, gravity, and possibly other means
• Seeds may persist in the seed bank for over one year

Low Risk Traits
• Limited evidence of introduction outside native range
• Unarmed (no spines, thorns, or burrs)
• Non-toxic
• Seedlings establish in high light environments (dense shade may inhibit ability to spread)
• Not reported to spread vegetatively