Taxon: Hyptis pectinata (L.) Poit. **Family:** Lamiaceae

Common Name(s): comb hyptis **Synonym(s):** Mesosphaerum pectinatum (L.)

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 21 Mar 2016

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

Keywords: Aromatic Herb, Crop Weed, Environmental Weed, Unpalatable, Small-Seeded

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	n
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		
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
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	y=1, n=-1	y
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		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
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)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	n
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal		
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)		
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		
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**
	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 to tropical America, widely naturalized" [No evidence of domestication]

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. 2016. 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, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 21 Mar 2016]	"Other: . exact native range obscure Native: Northern America : Mexico Southern America Caribbean: Antigua and Barbuda; Bahamas; Barbados; Cuba; Dominica; Grenada; Guadeloupe; Hispaniola; Jamaica; Montserrat; Netherlands Antilles; Puerto Rico; St. Vincent and Grenadines Mesoamerica: Belize; Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua; Panama Northern South America: French Guiana; Guyana; Venezuela Western South America: Peru"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 21 Mar 2016]	

203	**Broad climate suitability (environmental versatility)**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Woodson, R. E., Schery, R. W., Nowicke, J. W., & Epling, C. C. (1969). Flora of Panama. Part IX. Family 169. Labiatae. Annals of the Missouri Botanical Garden, 56(1), 71-111	"A widespread but not abundant weed of the American tropics; to be expected at lower elevations."
	Smith, A.C. 1991. Flora Vitiensis Nova: a new flora of Fiji Volume 5. National Tropical Botanical Garden, Lawai, HI	"In Fiji Hyptis pectinata is seen from near sea level to about 200 m"
	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.	[Low elevation tropical weed] "in Hawai'i naturalized in low elevation, dry to mesic, disturbed habitats, especially roadsides, pastures, and abandoned fields, 1-390 m"

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	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 naturalized in low elevation, dry to mesic, disturbed habitats, especially roadsides, pastures, and abandoned fields, 1-390 m, on Kaua'i, O'ahu, Maui, and Hawai'i. First collected on O'ahu in 1931 (Wilder s.n., BISH)."

205	**Does the species have a history of repeated introductions outside its natural range?**	**y**
	Source(s)	**Notes**
	Woodson, R. E., Schery, R. W., Nowicke, J. W., & Epling, C. C. (1969). Flora of Panama. Part IX. Family 169. Labiatae. Annals of the Missouri Botanical Garden, 56(1), 71-111	"A widespread but not abundant weed of the American tropics; to be expected at lower elevations."
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"M. pectinatum is a shrubby herb native to Mexico, the Caribbean and northwest South America. It is introduced and widespread in sub-Saharan Africa (where erroneously considered native by some authors, at least formerly), and on many Pacific islands. It is also present in Florida (USA), Macronesian and Indian Ocean islands, Australia and south and southeast Asia."
	Smith, A.C. 1991. Flora Vitiensis Nova: a new flora of Fiji Volume 5. National Tropical Botanical Garden, Lawai, HI	"Widespread but not abundant in tropical America, introduced and naturalized in many other parts of the world."

301	**Naturalized beyond native range**	**y**
	Source(s)	**Notes**
	Wysong, M., Hughes, G. & Wood, K.R. (2007). New Hawaiian plant records for the island of Moloka'i. Bishop Museum Occasional Papers 96: 1-8	"Hyptis pectinata (L.) Poit. New island record Native to tropical America, H. pectinata (comb hyptis) was first collected on O'ahu in 1931 (Wilder s.n., BISH 53251). In Hawai'i it is widely naturalized in low-elevation, dry to mesic, disturbed habitats on Kaua'i , O'ahu, Maui, and Hawai'i (Wagner et al. 1999). On Kalaupapa peninsula it is a common weed in open, disturbed, mixed nonnative sites in and around Kauhakö Crater. Its presence there was previous cited by Medeiros et al. (1996) and Linney (1987). Material examined. MOLOKA'I: Kauhakö Crater, southwest aspect of the crater just below crater rim in dry, open, mixed nonnative shrubland, 73 m, 7 Dec 2004, Wysong 498."

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 naturalized in low elevation, dry to mesic, disturbed habitats, especially roadsides, pastures, and abandoned fields, 1-390 m, on Kaua'i, O'ahu, Maui, and Hawai'i. First collected on O'ahu in 1931 (Wilder s.n., BISH)."
	Oppenheimer, H.. 2007. New plant records from Moloka'i, Lāna'i, Maui, and Hawai'i for 2006. Bishop Museum Occasional Papers 96:17-34	"Known from the islands of Kaua'i, O'ahu, Maui, and Hawai'i in dry to mesic disturbed habitats, especially roadsides, pastures, and abandoned fields (Wagner et al. 1999: 802), this species was recently found on Läna'i growing under similar conditions. Elsewhere in these Records, Wysong et al. document this species from Moloka'i. Material examined. LÄNA'I: Hulopo'e, 390 m, occasional in waste areas, 20 Oct 2006, Oppenheimer H100639; woods near Kö'ele, 610 m, uncommon weed in open area of Eucalyptus plantings, 21 Dec 2006, Oppenheimer H120649."
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 21 Mar 2016]	"widely natzd. in tropics"

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Habitat: A weed in cultivated areas and wastelands."
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Disturbance-adapted weed with negative impacts on agriculture] "M. pectinatum is a common weed of disturbed and open ground, where it may form dense stands."

303	Agricultural/forestry/horticultural weed	y
	Source(s)	**Notes**
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	"In Australia, there are only a few recordings of this species and all are in the Cairns and Daintree areas (Queensland herbarium). It is spreading in wetter areas (Waterhouse, pers. comm.) and is showing potential to be a serious weed in unmaintained orchards and pastures I tropical areas."
	Smith, A.C. 1991. Flora Vitiensis Nova: a new flora of Fiji Volume 5. National Tropical Botanical Garden, Lawai, HI	"In Fiji Hyptis pectinata is seen from near sea level to about 200 m. as a vigorous and aggressive weed of agricultural, pastoral, and plantation lands, found in cultivated areas, wasteland, canefields, and coconut plantations, along roads, and on open hillsides" ... "In Fiji it may have become naturalized early in the present century and by the 1930's had become such an agricultural pest as to be declared a noxious weed"
	USDA Natural Resources Conservation Service. 2016. Hawaii State-listed Noxious Weeds. http://plants.usda.gov/java/noxious?rptType=State&statefips=15. [Accessed 21 Mar 2016]	Includes Hyptis pectinata

304	Environmental weed	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potentially] "Its main impacts are as an agricultural weed and as a weed of disturbed areas and wetland edges, where it may displace native vegetation. It is a designated noxious weed in Fiji (Mune and Parham, 1956) and Hawaii; an agricultural weed, environmental weed, naturalised and noxious weed by GCW (2013) and is a potential environmental weed in Australia (Csurhes and Edwards, 1998)."
	U.S. Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Designations of Critical Habitat for Plant Species From the Island of Oahu, HI. Federal Register. Vol. 67, No. 102: 37108-37272	[Threatens 10 endangered plant species on Oahu] "The major threats to Abutilon sandwicense are competition from the alien plant species Pimenta dioica (allspice), Hyptis pectinata (Comb hyptis), ... " ... "The major threats to Chamaesyce celastroides var. kaenana are competition from the alien plant species Leucaena leucocephala, Melinis repens (natal redtop), Schinus terebinthifolius, Pluchea symphytitfolia (sourbush), Hyptis pectinata" ... "The major threats to Lipochaeta tenuifolia are habitat degradation by feral goats and pigs; competition for light and space from alien plant species including Ageratina riparia, Blechnum occidentale, Grevillea robusta, Panicum maximum, Lantana camara, Hyptis pectinata" ... "The primary threats to Bonamia menziesii on Oahu are habitat degradation and possible predation by wild and feral pigs, goats, and cattle; competition with the alien plant species ..." ... "The major threats to Eugenia koolauensis on Oahu are habitat degradation by feral pigs; competition with alien plant species" ... "The main threats to Euphorbia haeleeleana on Oahu are habitat degradation and/or destruction by wild and feral ungulates including goats and pigs; predation by rats; fire; potential military activities; and competition with the alien plant species" ... "The major threats to Gouania vitifolia are competition from alien plant species" ... "The primary threats to Hibiscus brackenridgei ssp. mokuleianus on Oahu are habitat degradation and possible predation by pigs, goats, cattle, and rats; competition with the alien plant species" ... "On Oahu, the major threats to Nototrichium humile are habitat degradation by feral goats and pigs; military activities; competition from the alien plant species" ... "The primary threats to Schiedea hookeri on Oahu are habitat degradation and/or destruction by feral goats and pigs; competition with the alien plants"

305	Congeneric weed	y
	Source(s)	**Notes**
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	Hyptis capitata and H. suaveolens are considered noxious weeds in Australia

Qsn #	Question	Answer
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] "Erect, aromatic perennial herbs; stems 5- 25 dm long, glabrous to pubescent. Leaves ovate or elliptic, 2-3(-11) cm long, 1-1.5 cm wide, upper surface glabrous or nearly so, lower surface sparsely to densely tomentose and glaucous, margins crenate to serrate, apex acute to acuminate, base rounded to truncate, petioles 0.5-1(-5) cm long."

402	**Allelopathic**	
	Source(s)	**Notes**
	Suntia Roa NB, & Singh S. 2015. Allelopathic effects of Hyptis suaveolens L. on growth and metabolism of pea seedlings. Scientia Agriculturae, 12 (3), 171-176	[Unknown. Alllelopathy documented in a congener] "The present study deals with the allelopathic stress caused by allelochemicals present in leachate of Hyptis suaveolens L. on growth and metabolism of pea seedlings. Seeds were soaked in distilled water for 3 hours. Five Seeds of Pisum sativum were sown in each pot filled with acid washed sand. Pots were moistened exogenously with different concentrations of leachate viz. 25, 50, 75 and 100% respectively. Twenty days old seedlings were taken for biophysical and biochemical parameters Root length and shoot length, fresh weight and dry weight of pea seedlings decreased in dose dependent manner. Pigment content, protein, sugar and activities of nitrate reductase were decline. Activities of enzymes viz. superoxide dismutase, catalase and peroxidase increased under allelopathic stress caused by the allelochemicals present in the leachate of donor plant. Increases in lipid peroxidation were observed in terms of malondialdehyde (MDA) content. Allelopathic stress influence several metabolic activities of plant which lead to inhibition in growth and metabolism of recipient plant."

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.	"Erect, aromatic perennial herbs; stems 5- 25 dm long, glabrous to pubescent." [Lamiaceae (alt.Labiatae). No evidence]

404	**Unpalatable to grazing animals**	**y**
	Source(s)	**Notes**
	James, T. K., Champion, P. D., Dowsett, C. A., McNeill, M. R., & Houliston, G. J. (2014). Identification of weed seeds in soil samples intercepted at the New Zealand border. New Zealand Plant Protection, 67, 26-33	"A forb of the Lamiaceae family, this species is also native to tropical America and now widespread through the tropics. It is a serious weed of pastures due to grazing avoidance (Whistler 1995)."
	Henty, E.E. & Pritchard, G.H. 1975. Weeds of New Guinea and their control. 2nd edition. Department of Forests, Division of Botany, Lae, Papua New Guinea	"a weed of pastures, unpalatable to livestock and so able to increase under heavy grazing"
	Whistler, A.W. 1995. Wayside Plants of the Islands: A Guide to the Lowland Flora of the Pacific Island. Isle Botanica, Honolulu, HI	"It is a serious pest, particularly in pastures, since cattle do not eat it."

Qsn #	Question	Answer
	De Garine-Wichatitsky, M. & Spaggiari J.(2008). Alien plants in native sclerophyll forests of New Caledonia : the role of ungulates. Pages 80-84 in Proceedings of the Regional Workshop on Invasive Plant Species in Pastoral Areas. SPC, Suva, Fiji	"The frequency of browse of the introduced species (Table 1) varied greatly between species (e.g. D. virgatus or S. retusa were almost always browsed, whereas H. pectinata and S. torvum were never browsed)."

405	Toxic to animals	n
	Source(s)	**Notes**
	Henty, E.E. & Pritchard, G.H. 1975. Weeds of New Guinea and their control. 2nd edition. Department of Forests, Division of Botany, Lae, Papua New Guinea	"a weed of pastures, unpalatable to livestock and so able to increase under heavy grazing" [Unpalatable, but no evidence of toxicity]
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence
	Cornell University. 2016. Plants Poisonous to Livestock and other Animals. http://poisonousplants.ansci.cornell.edu/index.html. [Accessed 21 Mar 2016]	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Sousa, V. R. D., & Couri, M. S. (2013). Calycomyza hyptidis Spencer (Diptera, Agromyzidae): descriptions, redescriptions and first record in Ocimum basilicum (Lamiaceae) in Brazil. Revista Brasileira de Entomologia, 57(2), 209-212	"Calycomyza Hendel (Diptera, Agromyzidae) is a genus with a little more than 60 species in the Neotropical region (Boucher 2010), 21 of them recorded from Brazil (Spencer 1967; Martinez & Etienne 2002). Species of this genus are characterized for the distinct and contrasting coloration, usually with scutum black and notopleuron yellow. The presence of large and wide spines on male epandrium is also characteristic. The larvae are leafminers; some of them show a high degree of specificity, while others are oligophagous (Spencer 1973b)." ... "Calycomyza hyptidis Spencer was originally described from Florida in Hyptis pectinata L. (Lamiaceae) by Spencer (1966)."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Useful Tropical Plants Database. 2016. Hyptis pectinata. http://tropical.theferns.info/viewtropical.php?id=Hyptis+pectinata. [Accessed 21 Mar 2016]	"Known Hazards: None known"
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Used medicinally. No evidence of toxicity] "Decoction of the whole plant aphrodisiac, astringent, 10 treat intestinal worms, skin diseases, diarrhea, dysentery, stomatitis. Bark decoction drunk for the relief of menstrual problems. Leaves infusion or chewed for coughs, bronchitis, painful menstruation and fevers; leaves decoction for thrush. Molluscicidal"
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

Qsn #	Question	Answer
408	**Creates a fire hazard in natural ecosystems**	
	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.	[May contribute to fuel load in dry habitats] "naturalized in low elevation, dry to mesic, disturbed habitats, especially roadsides, pastures, and abandoned fields"

409	**Is a shade tolerant plant at some stage of its life cycle**	
	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.	[Occurs in high light environments] "in Hawai'i naturalized in low elevation, dry to mesic, disturbed habitats, especially roadsides, pastures, and abandoned fields"

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Soil drainage free Soil reaction acid alkaline neutral Soil texture heavy light medium Special soil tolerances infertile"

411	**Climbing or smothering growth habit**	**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.	"Erect, aromatic perennial herbs; stems 5- 25 dm long, glabrous to pubescent."

412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	"Chemical control has been effective against large thickets in Fiji (Anon. 1981)."
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"M. pectinatum is a common weed of disturbed and open ground, where it may form dense stands."
	Rentería, J. L., & Buddenhagen, C. E. (2006). Invasive plants in the Scalesia pedunculata forest at Los Gemelos, Santa Cruz, Galápagos. Galapagos Research, 64, 31-35	"Table1. Size of infestations for thicket-forming invasive species at Los Gemelos. Data are n (%) of observations" [H. pectinate thickets range in size from <25 m2 up to 200-500 m2]

Qsn #	Question	Answer
	Cates, A. H. (1969). Common weeds of Fiji and suggested methods of control. Weed control basic to agriculture development.: Proceedings 1st Asian-Pacific Weed Control Interchange, Hawaii 1967., 14-15	"Urena lobata and Hyptis pectinata (which forms dense thickets up to 12 ft high) can be controlled by foliar sprays of MCPA and 2, 4-D amine."

501	Aquatic	n
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Habitat: A weed in cultivated areas and wastelands."
	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] "Erect, aromatic perennial herbs" ... "in Hawai'i naturalized in low elevation, dry to mesic, disturbed habitats, especially roadsides, pastures, and abandoned fields,"

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 21 Mar 2016]	Family: Lamiaceae (alt.Labiatae) Subfamily: Nepetoideae Tribe: Ocimeae

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.	"Erect, aromatic perennial herbs" ... [Lamiaceae]

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	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.	"Erect, aromatic perennial herbs; stems 5- 25 dm long, glabrous to pubescent."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[No evidence. Widespread distribution] "M. pectinatum is a shrubby herb native to Mexico, the Caribbean and northwest South America. It is introduced and widespread in sub-Saharan Africa (where erroneously considered native by some authors, at least formerly), and on many Pacific islands. It is also present in Florida (USA), Macronesian and Indian Ocean islands, Australia and south and southeast Asia."

Qsn #	Question	Answer
602	**Produces viable seed**	y
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"It spreads readily by prolific production of tiny seeds, which are easily transported by water, animals, vehicles and in mud."
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Propagation: By seed."

603	**Hybridizes naturally**	
	Source(s)	**Notes**
	Aluri, R.J.S. (1996). The explosive floral-mechanism and pollination in the genus Hyptis (Lamiaceae). Proc. Indian Natn. Sci. Acad, 62(2), 117-124	[Unknown. Hybrids reported from congeners] "H. pachyphylla is visited by the first species and Xylocopa sp. (Harley 1986). Further, the putative hybrids from these two species naturally co-occur in the transition zone from the drier ground to the marsh. The hybrid individuals appear intermediate in habit, leaf and floral characters and are visited by A. mellifera adansonii only. Whether the hybrids survive or not, will 'depend on the extent to which the F1 and subsequent generations are both physiologically adapted to the environment and sufficiently fertile to ensure the continuation of the line (Harley 1986)."

604	**Self-compatible or apomictic**	
	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.	"Flowers 6-15 in comb-shaped cymes, these arranged in terminal racemes or panicles; calyx tubular, 2- 2.5 mm long, enlarging to 3-4 mm long in fruit, tomentose, the teeth bristly, slightly longer than calyx tube, the mouth densely ciliate; corolla violet or bright or reddish purple, fading to cream-colored, 3-3.5 mm long, lower lip saccate."
	Aluri, R.J.S. (1996). The explosive floral-mechanism and pollination in the genus Hyptis (Lamiaceae). Proc. Indian Natn. Sci. Acad, 62(2), 117-124	[Unknown. Self-compatibility reported in a congener] "Unlike in H. suaveolens, fruits mature in non-tripped flowers and thereby indicating self compatibility and self-pollination in H. capitata (Keller & Armbruster 1989)."

605	**Requires specialist pollinators**	**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.	"Flowers 6-15 in comb-shaped cymes, these arranged in terminal racemes or panicles; calyx tubular, 2- 2.5 mm long, enlarging to 3-4 mm long in fruit, tomentose, the teeth bristly, slightly longer than calyx tube, the mouth densely ciliate; corolla violet or bright or reddish purple, fading to creamcolored, 3-3.5 mm long, lower lip saccate."

Qsn #	Question	Answer
	Kubitzki, K. & Kadereit, J.W. (eds.). The families and genera of vascular plants: Volume VII. Flowering plants, Dicotyledons. Lamiales (except Acanthaceae including Avicenniaceae). Springer-Verlag, Berlin, Heidelberg, New York	"In the large tropical genus Hyptis (Nepetoideae), most species are bee-pollinated, and do not appear to have perfumed flowers."
	Aluri, R.J.S. (1996). The explosive floral-mechanism and pollination in the genus Hyptis (Lamiaceae). Proc. Indian Natn. Sci. Acad, 62(2), 117-124	"The floral descriptions of the following species - H. tagetifolia Harley, H. hamatidens Epling and Jativa, H. pedunuclaris Benth, H. nitidula Benth, H. dictyodea Pohl ex-Benth, H. verticillata Jacq., H. pectinata (L.) Poit. H. spicigra Lam., H. atrorubens Poit. H. brevipes Poit. and H. rhomboids Mart. & Gal. show that they possess explosive mechanism and appear to exhibit bee-pollination syndrome (Harley 1974)."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"M. pectinatum reproduces by prolific production of seed. It can complete reproductive cycle within 9 months (Andrade et al., 2009). Germination is stimulated by light and warmth (Neto et al., 2008)."

607	Minimum generative time (years)	1
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[9 months] "Given that the plant readily seeds within 9 months of planting (Andrade et al., 2006), and that the tiny seeds are easily spread, it is almost inevitable that M. pectinatum will become naturalized wherever it is grown as a crop, and would then spread into disturbed sites and other preferred habitats, such as wetlands."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"M. pectinatum spreads by tiny 'seeds' (actually nutlets) which can be transported in animal fur or in mud (Csurhes and Edwards, 1998). It is primarily a weed of disturbed places, including agricultural areas and roadsides, so its seeds are easily spread unintentionally by human activities, including on vehicles, domestic animals, and the transport of produce."
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	"The seeds are probably transported long distances in mud on vehicles and machinery (Waterhouse pers. comm.) or by sticking to the fur of animals (Whistler 1983)."

702	Propagules dispersed intentionally by people	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Possibly elsewhere. No evidence for Hawaiian Islands] "M. pectinatum appears to have been introduced to many places unintentionally and, partly for this reason, few details of its introduction history are known. However, as it is also a medicinal plant, it may have been spread to some places deliberately, both internationally and locally."
	USDA Natural Resources Conservation Service. 2016. Hawaii State-listed Noxious Weeds. http://plants.usda.gov/java/noxious?rptType=State&statefips=15. [Accessed 21 Mar 2016]	A Hawaii state noxious weed

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	**Notes**
	Wiersema, J.H. & León, B. 1999. World Economic Plants: A Standard Reference. CRC Press, Boca Raton, FL	"Weed (also poss. seed contam.)" [Potentially]
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potentially] "It is primarily a weed of disturbed places, including agricultural areas and roadsides, so its seeds are easily spread unintentionally by human activities, including on vehicles, domestic animals, and the transport of produce."

704	Propagules adapted to wind dispersal	
	Source(s)	**Notes**
	Soria, M., Taylor, U., Tye, A., & Wilkinson, S.R. 2002. Manual de identificación y manejo de malezas en Galápagos. Charles Darwin Research Station, Puerto Ayora, Galapagos, Ecuador	"Hyptis pectinata produce numerosas y pequeñas semillas que son fácilmente dispersadas por el viento." [Translation: Hyptis pectinata produces numerous small seeds that are easily dispersed by wind]
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"The species spreads by prolific production of tiny (≤ 1 mm) 'seeds' (actually nutlets), but does not have obvious adaptations for long-distance seed transport."

705	Propagules water dispersed	n
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Natural dispersal (non-biotic) The species spreads by prolific production of tiny (≤ 1 mm) 'seeds' (actually nutlets), but does not have obvious adaptations for long-distance seed transport. Vector transmission (biotic) Seeds can stick in animal fur."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	"The seeds are probably transported long distances in mud on vehicles and machinery (Waterhouse pers. comm.) or by sticking to the fur of animals (Whistler 1983)."

707	Propagules dispersed by other animals (externally)	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	"The seeds are probably transported long distances in mud on vehicles and machinery (Waterhouse pers. comm.) or by sticking to the fur of animals (Whistler 1983)."

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	No evidence. Unlikely, as plants are unpalatable & avoided by animals

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	CABI, 2016. Mesosphaerum pectinatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Possibly. Densities unknown] "The species spreads by prolific production of tiny (≤ 1 mm) 'seeds' (actually nutlets)"

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2016) Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/. [Accessed 21 Mar 2016]	"Storage Behaviour: Orthodox"

Qsn #	Question	Answer
803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	"Chemical control has been effective against large thickets in Fiji (Anon. 1981)."
	Reynolds, S. (1978). Suggested control methods for some pasture weeds. Alafua Agricultural Bulletin, 3(1), 7-13	"Control of bushy and woody weeds in pastures in the South Pacific Region is considered under the heads (1) management, (2) mechanical, (3) biological and (4) chemical. In regard to (1) Brachiaria brizantha is noted as a specially aggressive pasture grass capable in time of suppressing many weeds but along with which it is difficult to establish a legume. In regard to (4) species suggested tentatively for control with one or other of 2,4-D, 2,4,5-T, dicamba, Gramoxone [paraquat], glyphosate and Tordon 520 Brushkiller [composition unspecified] include Blechum pyramidatum, Cuphea carthagenensis, Pseudelephantopus spicatus, Nephrolepis spp., Psidium guajava, Clerodendrum fragrans, Hyptis pectinata, Cyperus aromaticus, Cassia tora, Ludwigia octovalvis, Casgilloa elastica, Stachytarpheta spp., Sida acuta and S. glomerata."
	Cates, A. H. (1969). Common weeds of Fiji and suggested methods of control. Weed control basic to agriculture development.: Proceedings 1st Asian-Pacific Weed Control Interchange, Hawaii 1967., 14-15	"Urena lobata and Hyptis pectinata (which forms dense thickets up to 12 ft high) can be controlled by foliar sprays of MCPA and 2, 4-D amine."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	Unknown

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	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.	[Unknown] "in Hawai'i naturalized in low elevation, dry to mesic, disturbed habitats, especially roadsides, pastures, and abandoned fields, 1-390 m, on Kaua'i, O'ahu, Maui, and Hawai'i."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Thrives in tropical climates
• Widely naturalized in tropics, including main Hawaiian Islands
• Disturbance-adapted crop weed
• Environmental weed, threatens native endangered species in Hawaiian Islands
• Other Hyptis species are invasive
• Unpalatable to grazing animals
• Tolerates many soil types
• Forms dense stands
• Reproduces by seeds
• Able to reach reproductive maturity in 9 months
• Seeds dispersed in animal fur or mud stuck to vehicles or machinery
• Seeds tiny, & may also be wind-dispersed
• Prolific seed production (densities unknown)

Low Risk Traits
• Primarily a weed of low elevation tropical climates
• Unarmed (no spines, thorns or burrs)
• Non-toxic (but unpalatable)
• Used medicinally
• Not reported to spread vegetatively
• Herbicides may provide effective control