

Taxon: Clidemia hirta	Family: Melastomataceae
Common Name(s): clidemia Koster's curse soap bush	Synonym(s): Melastoma hirtum L.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 16 Jul 2015
WRA Score: 28.0	Designation: H(Hawai'i)	Rating: High Risk

Keywords: Tropical Shrub, Environmental Weed, Thicket-Forming, Bird-Dispersed, Resprouts

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)	y
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		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	n
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals		
406	Host for recognized pests and pathogens	y=1, n=0	n
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	y

Qsn #	Question	Answer Option	Answer
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	y
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	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	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)	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	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

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.	[No evidence of domestication] "A weedy and widespread native of the Neotropics, now an invasive pest in much of the Paleotropics"
102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	NA
103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2015. 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, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 14 Jul 2015]	"Native: NORTHERN AMERICA Mexico SOUTHERN AMERICA Mesoamerica: Belize; Costa Rica; Guatemala; Honduras; Nicaragua; Panama Western South America: Bolivia; Colombia; Ecuador; Peru Southern South America: Paraguay"
202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 14 Jul 2015]	
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	DeWalt, S. J. (2003). The invasive tropical shrub <i>Clidemia hirta</i> (Melastomataceae) in its native and introduced ranges: tests of hypotheses of invasion. PhD Dissertation. Louisiana State University, Baton Rouge, LA	[Elevation range exceeds 1000 m, demonstrating environmental versatility] "The species is native to lowlands of Central and South America and the Caribbean Islands where it occurs in mesic to wet environments from sea level to 1500 m elevation"

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	" <i>Clidemia hirta</i> (Melastomataceae), commonly known as clidemia or "Koster's curse," is a serious weed in many ecosystems in Oceania as well as on the Southeast Asia and Indian subcontinents." ... " <i>Clidemia</i> is found in secondary-succession tropical rain forests in Central and South America and the Caribbean Islands, where it is not a common plant (Cook 1929; Wester and Wood 1977)."
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 14 Jul 2015]	"Native: NORTHERN AMERICA Mexico SOUTHERN AMERICA Mesoamerica: Belize; Costa Rica; Guatemala; Honduras; Nicaragua; Panama Western South America: Bolivia; Colombia; Ecuador; Peru Southern South America: Paraguay"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Cronk, Q.C.B. & Fuller, J.L. 2013. Plant Invaders: The Threat to Natural Ecosystems. Earthscan, New York, NY	"Regions where introduced Oceania- Hawaii (invasive [362]), Fiji (invasive/ruderal), Java, Samoa, British Solomon Is, Tonga and Palau [435]; Malagassia - Madagascar (naturalized) [186, 435]; Africa - Tanzania (naturalized) [435]; S., E. and SE Asia - Sri Lanka, India, Singapore (invasive) and Sabah [78, 335, 435]."

301	Naturalized beyond native range	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.	"A weedy and widespread native of the Neotropics, now an invasive pest in much of the Paletropics; in Hawai'i documented from mesic to wet forest on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. This species is widely distributed on O'ahu and a very serious pest in the Ko'olau and Wai'anae mountains. More recent infestations on Kaua'i, Moloka'i, and Hawai'i could, if not controlled, become a serious problem on those islands. First collected on O'ahu in 1949 (Degener & Murashige 21707, BISH), but observed as early as 1941 (Wester & Wood, 1977)."
	DeWalt, S. J. (2003). The invasive tropical shrub <i>Clidemia hirta</i> (Melastomataceae) in its native and introduced ranges: tests of hypotheses of invasion. PhD Dissertation. Louisiana State University, Baton Rouge, LA	" <i>Clidemia hirta</i> is now found worldwide in climatic conditions similar to its native range (Figure 1.1). It is recognized as an aggressive, disruptive invader of open and forested areas of the Hawaiian archipelago, American Samoa, Fiji, Mauritius, Seychelles, Southeast Asia (Peninsular Malaysia, Singapore and Borneo), Sri Lanka, and Tanzania (Lever 1937, Wester and Wood 1977, Gerlach 1993, Sheil 1994, Strahm 1999, Singhakumara et al. 2000, Peters 2001, Teo et al. 2003)."

302	Garden/amenity/disturbance weed	y
-----	---------------------------------	---

Qsn #	Question	Answer
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Most tropical island forest areas appear to be susceptible to <i>C. hirta</i> invasion regardless of their floristic composition, as long as some form of disturbance affects them. In Hawaii, all new instances of <i>C. hirta</i> occur in disturbed areas such as roadsides and following disturbance by storms, pigs, landslides and fire. In the East Usambaras (Tanzania) the shrub is found not only along roadsides but also in many parts of the undisturbed montane forest (Binggeli, 2003). Natural forest gaps are also prone to invasion; however, long-term studies of succession are required. In Australia, <i>C. hirta</i> prefers humid tropical lowlands and may invade both disturbed and undisturbed habitats."
	Peters, H. A. (2001). <i>Clidemia hirta</i> Invasion at the Pasoh Forest Reserve: An Unexpected Plant Invasion in an Undisturbed Tropical Forest. <i>Biotropica</i> , 33(1): 60-68	[Thrives in disturbed habitats] " <i>Clidemia hirta</i> is a highly invasive shrub in tropical forests throughout the world, but has had little success invading mainland sites and undisturbed forests. In the early 1990s, this plant was found to have invaded an unexpected site, an undisturbed continental tropical forest at Pasoh, Peninsular Malaysia. In 1997, a study was conducted of the <i>C. hirta</i> population at the Pasoh Forest Reserve. A demographic survey of the 50-ha long-term research plot at Pasoh located 1002 <i>C. hirta</i> individuals, 69 of which were reproductive at the time of the study. All but 8 individuals were located in high light gaps or gap edges. Relative growth rates were significantly higher in gaps and gap edges than in the understory, and no reproductive individuals were found in the understory. Mean plant size and dry biomass density increased steadily over the course of the study, while the observed mortality rate was 0 percent over two months. The biomass density of <i>Clidemia</i> at Pasoh was ,500 g/ha at the conclusion of this study, but because the population is confined almost exclusively to high light environments, its density in these sites is much higher. The location of <i>C. hirta</i> plants in gaps was significantly correlated with past disturbance by wild pigs, suggesting that soil disturbance and light availability are essential for their establishment. The implication of this study is that by competing with native species in gaps, <i>C. hirta</i> invasion has the potential to alter forest regeneration at Pasoh. Changing land use practices near the reserve have increased the number of wild pigs, and thus the level of disturbance, which may explain the recent success of <i>C. hirta</i> at Pasoh."

303	Agricultural/forestry/horticultural weed	y
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>C. hirta</i> is common in the New World. It is found in cocoa plantations but is not considered to be a serious pest. In Fiji, prior to its control, <i>C. hirta</i> rendered large areas of grazing land useless and interfered with the development of plantations such as rubber and cocoa."

Qsn #	Question	Answer
	Cronk, Q.C.B. & Fuller, J.L. 2013. Plant Invaders: The Threat to Natural Ecosystems. Earthscan, New York, NY	"In Fiji it has, in the past, invaded rubber and cocoa plantations, grasslands and forested areas, but is now controlled by an introduced insect in many areas, excluding the native forests and shaded places where the biological control agent (see biological control section) has not been very successful due to intolerance of shade [309, 435]. In Singapore it invades older secondary and primary forests [78]."
	Sankaran, K.V. & Suresh, T.A. 2013. Invasive alien plants in the forests of Asia and the Pacific. FAO, Bangkok	[Disrupts grazing] "The plant colonizes open areas disturbed by humans such as pastures, riversides, roadsides and forest margins." ... "It disrupts grazing land and the speedy growth of its thickets creates physical barrier to humans and animals."

304	Environmental weed	y
	Source(s)	Notes
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	" <i>Clidemia</i> (<i>Clidemia hirta</i> , Melastomataceae) is a significant disruptive weed in many ecosystems in Oceania and the Southeast Asian and Indian subcontinents. In Hawai'i, it forms dense monotypic stands in mesic to wet environments between 33 and 4,920 ft (10-1,500 m) elevation." ... "The impacts of this weed on native species and ecosystems are devastating. <i>Clidemia</i> has the potential of driving a number of species to extinction. However, impacts on the water balance of entire ecosystems may be more devastating in the long run."
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This plant is a serious pest in mesic and wet environments on Oahu and more recently in Wailau, Molokai, as well as Nahiku and Kailua areas, Maui. It has also become established on Kauai, West Maui, and Waiakea, Hawaii."
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Where invasive, the tree establishes in forest gaps and other disturbed sites, forming dense and almost impenetrable thickets that shade out all native vegetation due to the large leaves." ... "The plant is a serious weed in mesic and wet environments on the Hawaiian islands and on the Seychelles."

305	Congeneric weed	
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	<i>Clidemia dentata</i> , <i>Clidemia dependens</i> , <i>Clidemia rubra</i> listed as weeds, but evidence of impacts have not been well-documented

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] "Shrubs 0.5-3 m tall; young branches rounded, hirsute. Leaves ovate to oblongovate, 5-16 cm long, 3-8 cm wide, 5-nerved, upper surface sparsely strigose, lower surface finely bristly, margins ciliate, subentire to crenulate-denticulate, apex acute to short-acuminate, base rounded to subcordate, petioles 0.5-3 cm long."

Qsn #	Question	Answer
402	Allelopathic	n
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	No direct evidence documented
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.	"Shrubs 0.5-3 m tall" [Melastomataceae. No evidence]
404	Unpalatable to grazing animals	y
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>C. hirta</i> rendered large areas of grazing land useless and interfered with the development of plantations such as rubber and cocoa. The plant has no fodder value and no known uses."
	Chee, Y.K. & Faiz, A. 1991. Sheep grazing reduces chemical weed control in rubber. Pp 120-123 in Shelton, H.M. & Stur, W.W (eds.). Forages for Plantation Crops. Proc. of a Workshop. Sanur Beach, Bali, Indonesia	"In immature rubber of 1 - 5 years. most of the species are grazed by sheep except <i>Imperata cyfindrica</i> and weedy shrubs such as <i>Chromolaena odoratum</i> , <i>Melastoma malabathricum</i> , <i>Lantana camara</i> and <i>Clidemia hirta</i> ."
	Francis, J. K. (ed.). 2004. Wildland shrubs of the United States and its Territories: thamnisc descriptions: volume 1. Gen. Tech. Rep. IITF-GTR-26. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, San Juan, PR, & U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO	"Sheep have been shown to control most weeds in plantations but will not eat Koster's curse (Chee and Faiz 2002)."
405	Toxic to animals	
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Hydrolysable tannins of <i>C. hirta</i> leaves are toxic to goat's livers and kidneys and cause gastroenteritis (Murdiati et al., 1990). When fed the plant, goats suffer toxicity from hydrolysable tannin (Francis, 2004)."
	Francis, J. K. (ed.). 2004. Wildland shrubs of the United States and its Territories: thamnisc descriptions: volume 1. Gen. Tech. Rep. IITF-GTR-26. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, San Juan, PR, & U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO	"Sheep have been shown to control most weeds in plantations but will not eat Koster's curse (Chee and Faiz 2002). Goats suffer toxicity from hydrolysable tannin when fed the plant (Murdiati and others 1990)."
406	Host for recognized pests and pathogens	n

Qsn #	Question	Answer
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"In the New World all plants show signs of heavy herbivory, whereas in its naturalized range it appears to be only affected by insects introduced as biocontrol agents. Biological control, using the thrip <i>Liothrips urichi</i> , was initiated in Fiji in the early 1930s and two decades later in Hawaii (Mune and Parham, 1967; Wester and Wood, 1977). <i>L. urichi</i> seriously affects the growth of <i>C. hirta</i> in open sunny areas whereas in shaded areas (forest or frequent cloud cover) it is not effective. The thrips failed to establish following their introduction to the Solomon Islands (Julien, 1987). Over the past four decades extensive searches of biological control agents have been made to control <i>C. hirta</i> in Hawaiian forests (Nakahara et al., 1992). A pyralid moth, <i>Blepharomastix ebulealis</i> [<i>Ategumia ebulealis</i>], released in 1970 has been heavily parasitized and has been ineffective in controlling <i>C. hirta</i> . Several of 14 species of insects, recently evaluated in Trinidad, can be considered for introduction into Hawaii and the release of four pathogens is envisaged. A leaf spot fungus, <i>Colletotrichum gloeosporioides</i> f. sp. <i>clidemiae</i> , introduced from Panama to Hawaii for host-range studies, shows promise as a biocontrol agent."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	No evidence
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	Possible toxic effects if consumed by goats, but no evidence of human toxicity

Qsn #	Question	Answer
408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	[Benefits from fire, but not reported to increase fire risk] "Pigs, fires, landslides, and major windstorms all result in the opening of the subcanopy, and if <i>clidemia</i> seeds are present they germinate rapidly."
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Generally invades wetter habitats that are less prone to fire, but formation of monotypic stands may increase fire risk through increase of fuel loads] "Most tropical island forest areas appear to be susceptible to <i>C. hirta</i> invasion regardless of their floristic composition, as long as some form of disturbance affects them. In Hawaii, all new instances of <i>C. hirta</i> occur in disturbed areas such as roadsides and following disturbance by storms, pigs, landslides and fire. In the East Usambaras (Tanzania) the shrub is found not only along roadsides but also in many parts of the undisturbed montane forest (Binggeli, 2003). Natural forest gaps are also prone to invasion, however, long-term studies of succession are required. In Australia, <i>C. hirta</i> prefers humid tropical lowlands and may invade both disturbed and undisturbed habitats."

409	Is a shade tolerant plant at some stage of its life cycle	Y
	Source(s)	Notes
	Cronk, Q.C.B. & Fuller, J.L. 2013. Plant Invaders: The Threat to Natural Ecosystems. Earthscan, New York, NY	" <i>Clidemia hirta</i> is found in light conditions ranging from full sunlight to 100% canopy cover, demonstrating broad tolerance (435)."
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	"In moist, shaded environments, the bush reaches 16 ft (5 m) into the subcanopy." ... " <i>Clidemia</i> was first reported on East Maui in 1976, along Makapipi Stream just below Pogues Tunnel. One and one-half years later it was quite common above Kailua as far as O`opuola Stream, where it was growing in deep shade under uluhe (<i>Dicranopteris linearis</i>) and even epiphytically"
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"In the native range, this fast growing and shade-tolerant pioneer shrub grows in primary forests and along steep embankments."
	DeWalt, S. J., Denslow, J. S., & Hamrick, J. L. (2004). Biomass allocation, growth, and photosynthesis of genotypes from native and introduced ranges of the tropical shrub <i>Clidemia hirta</i> . <i>Oecologia</i> , 138(4): 521-531	"We tested the hypothesis that the tropical shrub <i>Clidemia hirta</i> appears more shade tolerant and is more abundant in its introduced than native range because of genetic differences in resource acquisition, allocation, and phenotypic plasticity between native and introduced genotypes." ... "Our study provided little evidence that Hawaiian genotypes of <i>C. hirta</i> differed genetically from Costa Rican genotypes in ways that would contribute to differences in habitat distribution or abundance." ... "We conclude that genetic shifts in resource use, resource allocation, or plasticity do not contribute to differences in habitat distribution and abundance between the native and introduced ranges of <i>C. hirta</i> ."

Qsn #	Question	Answer
	Wester, L. L., & Wood, H. B. (1977). Koster's curse (<i>Clidemia hirta</i>), a weed pest in Hawaiian forests. <i>Environmental Conservation</i> , 4(01): 35-41	[Invades forest understory] "The pest has colonized habitats similar to those occupied over its natural range—such as forest clearings, trail-sides, and burn-sites. In addition, in Hawaii it has intruded into the understory of forests which were formerly free from exotic weeds. Fears are held that the resulting ecological disruptions may place further stress on the frail island ecosystems and cause plant and animal extinctions while producing other management and aesthetic problems."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Francis, J. K. (ed.). 2004. <i>Wildland shrubs of the United States and its Territories: thamnic descriptions: volume 1</i> . Gen. Tech. Rep. IITF-GTR-26. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, San Juan, PR, & U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO	"It tolerates a wide range of soil properties as long as moisture is adequate."
	CABI, 2015. <i>Clidemia hirta</i> . In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	"Soil reaction acid neutral very acid Soil texture heavy medium"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Shrubs 0.5-3 m tall; young branches rounded, hirsute."

412	Forms dense thickets	y
	Source(s)	Notes
	Smith, C.W. 1985. <i>Impact of Alien Plants on Hawaii's Native Biota</i> . Pp. 180-250 in Stone & Scott (eds.). <i>Hawaii's terrestrial ecosystems: preservation & management</i> . CPSU, Honolulu, HI	" <i>Clidemia</i> invades undisturbed areas in Hawai'i, but population levels remain low. However, once an area is disturbed, colonization proceeds rapidly. Wester and Wood (1977) recorded the domination of an area on O'ahu by <i>clidemia</i> within two years after a fire. Similar responses have been seen elsewhere on O'ahu after fire. Hurricane Iwa, in 1981, disturbed much of the area along the Contour Trail in the Wai'anae Mountains on O'ahu. Two years later there was an almost impenetrable thicket of <i>clidemia</i> 10 ft (3 m) or more tall." ... " <i>Clidemia</i> occurs in dense, monotypic stands in mesic to wet environments from 36 ft (11 m) above sea level (never directly exposed to salt spray) to at least 4,000 ft (1,220 m) elevation."
	Peters, H. A. (2001). <i>Clidemia hirta</i> Invasion at the Pasoh Forest Reserve: An Unexpected Plant Invasion in an Undisturbed Tropical Forest. <i>Biotropica</i> , 33(1): 60-68	"This study shows that <i>C. hirta</i> is a treefall gap specialist at Pasoh. In some areas, dense thickets approaching monocultures dominated the center of gaps and gap edges."

Qsn #	Question	Answer
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Where invasive, the tree establishes in forest gaps and other disturbed sites, forming dense and almost impenetrable thickets that shade out all native vegetation due to the large leaves."

501	Aquatic	n
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Terrestrial] "Most tropical island forest areas appear to be susceptible to <i>C. hirta</i> invasion regardless of their floristic composition, as long as some form of disturbance affects them. In Hawaii, all new instances of <i>C. hirta</i> occur in disturbed areas such as roadsides and following disturbance by storms, pigs, landslides and fire. In the East Usambaras (Tanzania) the shrub is found not only along roadsides but also in many parts of the undisturbed montane forest (Binggeli, 2003). Natural forest gaps are also prone to invasion, however, long-term studies of succession are required. In Australia, <i>C. hirta</i> prefers humid tropical lowlands and may invade both disturbed and undisturbed habitats. It is a weed of pastures, open grasslands, plantations, roadsides, open woodlands, waterways, riparian vegetation, forest margins and rainforests in the Northern Territory, north-eastern Queensland and the coast to northern New South Wales (Queensland Government, 2013). "

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

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.	Melastomataceae

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.	"Shrubs 0.5-3 m tall; young branches rounded, hirsute."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes

Qsn #	Question	Answer
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[No evidence] " <i>C. hirta</i> originated in Central and South America, where it is still widely distributed. It is also native to the Caribbean islands (Wester and Wood, 1977). However, limits to the native range remain unclear, with USDA-ARS (2007) noting nativity from Mexico to Paraguay, though not including a number of countries such as El Salvador, Argentina and Brazil where it is clearly native (e.g. Missouri Botanical Garden, 2007). It is now found in a large number of tropical countries and particularly oceanic islands, and it is likely to be under-recorded."
	DeWalt, S. J. (2003). The invasive tropical shrub <i>Clidemia hirta</i> (Melastomataceae) in its native and introduced ranges: tests of hypotheses of invasion. PhD Dissertation. Louisiana State University, Baton Rouge, LA	[No evidence] "The species is native to lowlands of Central and South America and the Caribbean Islands where it occurs in mesic to wet environments from sea level to 1500 m elevation (Figure 1.1). In its native range, <i>Clidemia hirta</i> is found in naturally and anthropogenically disturbed areas such as pastures, riversides, roadsides, and tree plantations but not in old-growth forests (Wester and Wood 1977)."

602	Produces viable seed	y
	Source(s)	Notes
	DeWalt, S. J. (2003). The invasive tropical shrub <i>Clidemia hirta</i> (Melastomataceae) in its native and introduced ranges: tests of hypotheses of invasion. PhD Dissertation. Louisiana State University, Baton Rouge, LA	"The fruits are pulpy, dark blue berries that are produced year-round. Fruit may contain between 200 and 900 seeds, each about 0.5 mm in diameter."

603	Hybridizes naturally	
	Source(s)	Notes
	DeWalt, S. J., & Hamrick, J. L. (2004). Genetic variation of introduced Hawaiian and native Costa Rican populations of an invasive tropical shrub, <i>Clidemia hirta</i> (Melastomataceae). <i>American Journal of Botany</i> , 91(8): 1155-1162	[No intraspecific hybridization. Unknown if interspecific hybridization occurs] "Hawaiian populations had a high degree of genetic similarity, and no genetic differentiation was found among the four Hawaiian Islands sampled. These patterns of genetic variation in Hawaii suggest that no intraspecific hybridization of genotypes from different parts of the native range has occurred and that introductions to the different islands came from the same or similar source populations. The low levels of genetic diversity in parts of both the native and introduced ranges suggest that genetic variation is unrelated to invasiveness in <i>C. hirta</i> ."

604	Self-compatible or apomictic	y
	Source(s)	Notes
	DeWalt, S. J., & Hamrick, J. L. (2004). Genetic variation of introduced Hawaiian and native Costa Rican populations of an invasive tropical shrub, <i>Clidemia hirta</i> (Melastomataceae). <i>American Journal of Botany</i> , 91(8): 1155-1162	"The mating system of <i>C. hirta</i> in its native range includes both sexual reproduction through bee pollination and asexual reproduction through agamospermy (Renner, 1989; Melo et al., 1999). The proportion of seeds produced through agamospermy vs. sexual reproduction is not known for either the native or the introduced range."

605	Requires specialist pollinators	n
-----	---------------------------------	---

Qsn #	Question	Answer
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>C. hirta</i> is visited by <i>Augochloropsis</i> sp. of bee and pollinated by the bees <i>Bombus transversalis</i> , <i>Euglossa</i> sp., <i>Melipona fulva</i> , <i>Trigona</i> sp. and three genera of halictids (Ferreira et al., 1994; Melo et al., 1999)."
	DeWalt, S. J., & Hamrick, J. L. (2004). Genetic variation of introduced Hawaiian and native Costa Rican populations of an invasive tropical shrub, <i>Clidemia hirta</i> (Melastomataceae). <i>American Journal of Botany</i> , 91(8): 1155-1162	"We are unsure whether bee pollination occurs in Hawaii, but introduced honey bees (<i>Apis mellifera</i>) and native Colletidae bees could conduct buzz pollination of <i>C. hirta</i> ."

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	DeWalt, S. J., & Hamrick, J. L. (2004). Genetic variation of introduced Hawaiian and native Costa Rican populations of an invasive tropical shrub, <i>Clidemia hirta</i> (Melastomataceae). <i>American Journal of Botany</i> , 91(8): 1155-1162	" <i>C. hirta</i> does not propagate vegetatively."
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	"Merely uprooting the plants is insufficient, because even the leaves of <i>clidemia</i> form roots in suitable situations, e.g., on the ground in rain forest (A.C. Medeiros, pers. comm.)."

607	Minimum generative time (years)	1
	Source(s)	Notes
	Mandon-Dalger, I., Clergeau, P., Tassin, J., Riviere, J. N., & Gatti, S. (2004). Relationships between alien plants and an alien bird species on Reunion Island. <i>Journal of Tropical Ecology</i> , 20(6): 635-642	"juvenile stage is short (6-10 mo)"
	Graham, M. F., Patane, K. A., & Setter, S. D. (2008). Growth of Koster's curse (<i>Clidemia hirta</i>) from seedlings to reproductive maturity and following mechanical damage. Pp. 189-91 In RD van Klinken, VA Osten, FD Panetta and JC Scanlan (eds). Proceedings of the 16th Australian Weeds Conference	"When grown under favourable shade house conditions, <i>C. hirta</i> was able to produce flowers in 266 days (mean \pm SE of 382 ± 46.4 days) and fruit in 365 days (456 ± 40.7 days). This was slightly shorter than that recorded in the field, where flowering occurred after 275 days (477 ± 79.89 days), with fruiting at an estimated time of 374 days (Graham and Setter 2007). These figures were notably higher than those observed in Hawaii, where the exotic is thriving and plants have been observed bearing fruit in as few as 180 days (Tunison 1991). This, in turn, compares to the more rapid fruit set (86 days and 294 days for plants cut at 10 cm and 0 cm respectively) displayed following severe damage."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>C. hirta</i> may be transported over long distances in soil or as a seed contaminant (Binggeli, 2003)."

Qsn #	Question	Answer
	Mandon-Dalger, I., Clergeau, P., Tassin, J., Riviere, J. N., & Gatti, S. (2004). Relationships between alien plants and an alien bird species on Reunion Island. <i>Journal of Tropical Ecology</i> , 20(6): 635-642	"Similarly, bulbuls are obviously not the only disperser of <i>C. hirta</i> : other birds and human shoes disseminate these weeds."
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). <i>Hawaii's terrestrial ecosystems: preservation & management</i> . CPSU, Honolulu, HI	"There is increasing evidence that many of the new infestations are inadvertently established by marijuana growers."

702	Propagules dispersed intentionally by people	n
	Source(s)	Notes
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in <i>Alien plant invasions in native ecosystems of Hawaii</i> . University of Hawaii Press, Honolulu, HI	"Long-distance dispersal of <i>clidemia</i> is effected by people who work in or use the forests. No one group is entirely responsible for spread." ... "It is extremely unlikely that the introduction of <i>clidemia</i> is deliberate, as is the case with banana poka (<i>Passiflora mollissima</i>), because this weed is despised by all for its dense, rank growth."

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes
	CABI, 2015. <i>Clidemia hirta</i> . In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	"Pathway Vectors" ... "With coffee plants for planting in one case and as a seed contaminant in another"

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Weber, E. 2003. <i>Invasive Plant Species of the World. A Reference Guide to Environmental Weeds</i> . CABI Publishing, Wallingford, UK	[No adaptations for wind dispersal] "Fruits are abundantly produced and seed dispersed mainly by birds but also may be carried by animals moving through the thickets."

705	Propagules water dispersed	y
	Source(s)	Notes
	BioNET-EAFRINE. 2011. <i>Clidemia hirta</i> (Koster's Curse). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Clidemia_hirta_%28Kosters_Curse%29.htm . [Accessed 16 Jul 2015]	"This plant reproduces by seed, which are principally dispersed by fruit-eating birds. Other animals moving through thickets of this species may carry seeds away with them (e.g. feral pigs) and the fruit are also dispersed by floodwaters."
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in <i>Alien plant invasions in native ecosystems of Hawaii</i> . University of Hawaii Press, Honolulu, HI	[Occurrence along streams may facilitate secondary dispersal by water] "Pendant plants up to 50 ft (15 m) long have been observed along precipitous streams in Wailau Valley, Moloka'i (A.C. Medeiros, pers. comm.)."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Berries 6-9 mm long. Seeds 0.5-0.75 mm long."

Qsn #	Question	Answer
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"The seeds are principally dispersed by alien frugivorous birds, but any organism moving through the thickets will carry seeds away with it."
	Mandon-Dalger, I., Clergeau, P., Tassin, J., Riviere, J. N., & Gatti, S. (2004). Relationships between alien plants and an alien bird species on Reunion Island. <i>Journal of Tropical Ecology</i> , 20(6): 635-642	"We recorded several alien species identified as having a high importance value by MacDonald et al. (1991), including <i>C. hirta</i> , <i>L. camara</i> , <i>Solanum auriculatum</i> , <i>S. terebinthifolius</i> , <i>Psidium cattleianum</i> , <i>R. alceifolius</i> and <i>Litsea glutinosa</i> . These species were eaten by a large majority of red-whiskered bulbuls (87%, n=185). <i>Clidemia hirta</i> was present in 95.8% (n = 48) of our bird samples from the eastern part of the island, the only part where <i>C. hirta</i> was present. We have found up to 2000 seeds of <i>C. hirta</i> per dropping. <i>Clidemia hirta</i> and <i>S. auriculatum</i> can be considered as permanent fruit resources (Table 2) because they were eaten throughout the study period (respectively P=0.346 and P=0.310)." ... "On Reunion Island, we confirmed that the red-whiskered bulbul was mostly frugivorous. Among the fruit species, we noted that fruits of alien species of high importance value (MacDonald et al. 1991), especially <i>Clidemia hirta</i> , <i>Psidium cattleianum</i> , <i>Rubus alceifolius</i> , <i>Lantana camara</i> , <i>Solanum auriculatum</i> , <i>Litsea glutinosa</i> and <i>Schinus molle</i> were eaten by a large majority of bulbuls." ... "There is evidence that bulbuls disperse <i>C. hirta</i> and that the bird is common where this alien plant occurs. Our results suggest that the invasion of Reunion Island by <i>C. hirta</i> could be facilitated by frugivorous birds like the red-whiskered bulbul. The maintenance of high bulbul populations throughout the year in sites containing <i>C. hirta</i> can enhance local reproduction and dispersal of the alien plant, which in turn allows the bulbul to maintain and reproduce itself"

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in <i>Alien plant invasions in native ecosystems of Hawaii</i> . University of Hawaii Press, Honolulu, HI	"Pigs also carry seeds on their pelage."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Mandon-Dalger, I., Clergeau, P., Tassin, J., Riviere, J. N., & Gatti, S. (2004). Relationships between alien plants and an alien bird species on Reunion Island. <i>Journal of Tropical Ecology</i> , 20(6): 635-642	" <i>Clidemia hirta</i> was present in 95.8% (n = 48) of our bird samples from the eastern part of the island, the only part where <i>C. hirta</i> was present. We have found up to 2000 seeds of <i>C. hirta</i> per dropping."
	Shiels, A. B. (2011). Frugivory by introduced black rats (<i>Rattus rattus</i>) promotes dispersal of invasive plant seeds. <i>Biological Invasions</i> , 13(3), 781-792	"Dispersal via gut passage occurred for five of the 25 invasive plants tested (<i>Clidemia</i> , <i>Miconia</i> , <i>Buddleia</i> , <i>Ficus</i> , and <i>Rubus</i>)."
	Medeiros, A.C. 2004. Phenology, reproductive potential, seed dispersal and predation, and seedling establishment of three invasive plant species in a Hawaiian rain forest. PhD Dissertation. University of Hawaii Manoa, Honolulu, HI	"Non-native rats (<i>Rattus</i> spp.) were discovered to be dispersing viable <i>Clidemia</i> seeds that did not differ significantly in germinability or germination rate from control seeds."

Qsn #	Question	Answer
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	[Pigs & mongoose disperse seeds internally] "Seeds are viable after passage through mongooses (Burkhart, pers. comm.). Feral pigs must be added to this list, as they are attracted to the fruit during the peak fruiting season. Seedlings are often seen in dense clusters of several square inches, strongly suggesting that they are growing in the remnants of pig droppings."

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	Mandon-Dalger, I., Clergeau, P., Tassin, J., Riviere, J. N., & Gatti, S. (2004). Relationships between alien plants and an alien bird species on Reunion Island. <i>Journal of Tropical Ecology</i> , 20(6): 635-642	"each fruit contains over 300 seeds (Gatti 2000), juvenile stage is short (6-10 mo), mature plants produce over 500 fruits per year" ... "Clidemia hirta was present in 95.8% (n = 48) of our bird samples from the eastern part of the island, the only part where C. hirta was present. We have found up to 2000 seeds of C. hirta per dropping."
	Singhakumara, B. M. P., Uduporuwa, R. S. J. P., & Ashton, P. M. S. (2000). Soil Seed Banks in Relation to Light and Topographic Position of a Hill Dipterocarp Forest in Sri Lanka1. <i>Biotropica</i> , 32(1): 190-196	"TABLE 2. Germinants per m2 of soil by species for each topographic position and light treatment." [Clidemia hirta = 6330 per m2 in partial shade of valleys]
	DeWalt, S. J., & Hamrick, J. L. (2004). Genetic variation of introduced Hawaiian and native Costa Rican populations of an invasive tropical shrub, <i>Clidemia hirta</i> (Melastomataceae). <i>American Journal of Botany</i> , 91(8): 1155-1162	"The fruits are pulpy, dark-blue berries produced year-round and contain from 200 to 900 seeds, each about 0.5 mm in diameter."
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	"The seed bank produced by these plants is colossal over a very short period of time. Each fruit contains well over 100 seeds, and a mature plant produces in excess of 500 fruits each season."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Peters, H. A. (2001). <i>Clidemia hirta</i> Invasion at the Pasoh Forest Reserve: An Unexpected Plant Invasion in an Undisturbed Tropical Forest. <i>Biotropica</i> , 33(1): 60-68	"Clidemia hirta seeds were first found at Pasoh during a study of the seed bank by P. S. Ashton in 1971."
	CABI, 2015. <i>Clidemia hirta</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Seeds form a very large seed bank where they remain viable for up to 4 years."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Smith, C. W. (1992). Distribution, status, phenology, rate of spread, and management of <i>Clidemia</i> in Hawaii. Pp. 241-253 in Alien plant invasions in native ecosystems of Hawaii. University of Hawaii Press, Honolulu, HI	"Clidemia is susceptible to a number of herbicides, e.g. 2,4,5-T, 2,4-D, Trichlopyr (Teoh et al. 1982). The first two chemicals are banned in most areas of the U.S., and the population soon regenerates from seedlings unless further applications are made. Chemical treatment of clidemia does not appear practical in Hawai'i's native ecosystems, especially those that are difficult of access."

Qsn #	Question	Answer
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Seedlings and saplings can be pulled or dug out. If cut, the cut stumps are treated with triclopyr to prevent coppicing. Glyphosate is an effective herbicide as a foliar spray."
	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	"Triclopyr amine at <i>Clidemia hirta</i> 1–2% product in water in foliar application was effective at Kipahulu, Maui (Haleakala National Park). A 50% triclopyr amine application to cut stump was effective at 1 month in a trial at Ha'ena, Kauai (Limahuli Gardens). Thinline basal bark application of triclopyr ester was effective on plants 7–9 ft tall at Kipahulu Valley, Maui (Haleakala National Park). Triclopyr ester at 2 lb/ acre effective, especially with 0.5% crop oil (Univ. Hawai'i). Drizzle applications of glyphosate and of triclopyr were ineffective (Univ. Hawai'i), but Pat Thile, DOFAW, reported good results with drizzle applications of triclopyr in oil on recovering clidemia that had been previously cut back."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Francis, J. K. (ed.). 2004. Wildland shrubs of the United States and its Territories: thamnisc descriptions: volume 1. Gen. Tech. Rep. IITF-GTR-26. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, San Juan, PR, & U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO	"Individual stems live 2 or 3 years in Puerto Rico, although plants may live longer by sprouting. There is little motivation to encourage Koster's curse and often a need to control it. Single-pass mowing is usually ineffective."
	Graham, M. F., Patane, K. A., & Setter, S. D. (2008). Growth of Koster's curse (<i>Clidemia hirta</i>) from seedlings to reproductive maturity and following mechanical damage. Pp. 189-91 In RD van Klinken, VA Osten, FD Panetta and JC Scanlan (eds). Proceedings of the 16th Australian Weeds Conference	[Resprouts after cutting] "Subsequently half the plants were cut at ground level and the remainder at 10 cm from the soil surface, simulating incomplete hand removal, so the response to damage could be observed." ... "Survival rates were high post damage, averaging 95% and 89.5% for plants cut at 0 cm and 10 cm, respectively. Plants cut at both heights vigorously re shot, displaying greater dry weight, height, canopy diameter and number of leaves than uncut plants" ... "The vigorous regrowth following cutting resulted in a much denser, leafier, multi-stemmed plant. This response is consistent with that reported for overseas populations of <i>C. hirta</i> (DeWalt 2003, DeWalt et al. 2004)."

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

Qsn #	Question	Answer
	DeWalt, S. J., Denslow, J. S., & Ickes, K. (2004). Natural-enemy release facilitates habitat expansion of the invasive tropical shrub <i>Clidemia hirta</i> . <i>Ecology</i> , 85(2): 471-483	"Exclusion of natural enemies had no effect on survival in open sites in Costa Rica or in either habitat in Hawaii. Fungicide application promoted relative growth rates of plants that survived to the end of the experiment in both habitats of Costa Rica but not in Hawaii, suggesting that fungal pathogens only limit growth of <i>C. hirta</i> where it is native. Galls, stem borers, weevils, and leaf rollers were prevalent in Costa Rica but absent in Hawaii. In addition, the standing percentage of leaf area missing on plants in the control (water only) treatment was five times greater on plants in Costa Rica than in Hawaii and did not differ between habitats. The results from this study suggest that significant effects of herbivores and fungal pathogens may be limited to particular habitats. For <i>Clidemia hirta</i> , its absence from forest understory in its native range likely results in part from the strong pressures of natural enemies. Its invasion into Hawaiian forests is apparently aided by a release from these herbivores and pathogens."
	CABI, 2015. <i>Clidemia hirta</i> . In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	"In the New World all plants show signs of heavy herbivory, whereas in its naturalized range it appears to be only affected by insects introduced as biocontrol agents. Biological control, using the thrip <i>Liothrips urichi</i> , was initiated in Fiji in the early 1930s and two decades later in Hawaii (Mune and Parham, 1967; Wester and Wood, 1977). <i>L. urichi</i> seriously affects the growth of <i>C. hirta</i> in open sunny areas whereas in shaded areas (forest or frequent cloud cover) it is not effective. The thrips failed to establish following their introduction to the Solomon Islands (Julien, 1987). Over the past four decades extensive searches of biological control agents have been made to control <i>C. hirta</i> in Hawaiian forests (Nakahara et al., 1992). A pyralid moth, <i>Blepharomastix ebulealis</i> [<i>Ategumia ebulealis</i>], released in 1970 has been heavily parasitized and has been ineffective in controlling <i>C. hirta</i> . Several of 14 species of insects, recently evaluated in Trinidad, can be considered for introduction into Hawaii and the release of four pathogens is envisaged. A leaf spot fungus, <i>Colletotrichum gloeosporioides</i> f. sp. <i>clidemiae</i> , introduced from Panama to Hawaii for host-range studies, shows promise as a biocontrol agent."
	Wester, L. L., & Wood, H. B. (1977). Koster's curse (<i>Clidemia hirta</i>), a weed pest in Hawaiian forests. <i>Environmental Conservation</i> , 4(01): 35-41	"The tropical American shrub <i>Clidemia hirta</i> (Koster's Curse) has become a pest in pastures, cropland, and forests, where it has become naturalized in many parts of the humid tropics. It has spread through the island of Oahu, Hawaii, since 1941, despite attempts at biological control by the introduction of the parasitic thrips, <i>Liothrips urichi</i> , which had proven effective in suppressing growth of this noxious weed in Fiji."

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Widely naturalized tropical weed
- Disturbance-adapted
- Weed of agriculture & pastures
- Environmental weed
- Unpalatable
- Possibly toxic to browsing animals
- Shade tolerant
- Tolerates many soil types
- Forms dense thickets & prevents native plant regeneration
- Reproduces by seeds
- Able to produce seeds through agamospermy
- May be able to spread vegetatively (but primarily by seed)
- Reaches maturity in <1 year
- Seeds dispersed by birds, water & unintentionally as a result of human activity
- Prolific seed production (>1000/m²)
- Forms a persistent seed bank (at least 4 years)
- Able to resprout after cutting to the base
- No effective biocontrol agents present in the Hawaiian Islands

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Herbicides may provide effective control
- In some locations, biocontrol has been effective