

Taxon: <i>Cordia dichotoma</i> G. Forst.	Family: Boraginaceae
Common Name(s): clammy cherry glueberry tree Indian cherry sebesten	Synonym(s): <i>Cordia griffithii</i> C. B. Clarke <i>Cordia myxa</i> auct. non L. <i>Cordia premnifolia</i> Ridley <i>Varronia sinensis</i> Lour.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 21 Sep 2016
WRA Score: 9.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Tropical Tree, Naturalized, Edible Fruit, Bird-Dispersed, Coppices

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	n
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)	n
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
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	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyaphrathatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 20 Sep 2016]	[No evidence of domestication] "Origin and geographic distribution <i>Cordia dichotoma</i> occurs from northern India to southern China, southward throughout South-East Asia to Australia and New Caledonia."

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 20 Sep 2016]	"Native: Asia-Temperate China: China - Fujian, - Guangdong, - Guizhou, - Yunnan, - Guangxi, - Xizang Eastern Asia: Japan - Ryukyu Islands; Taiwan Asia-Tropical Indian Subcontinent: India; Pakistan; Sri Lanka Indo-China: Cambodia; Laos; Myanmar; Thailand; Vietnam Malesia: Indonesia - Celebes, - Irian Jaya, - Java, - Kalimantan, - Lesser Sunda Islands, - Moluccas, - Sumatra; Malaysia; Papua New Guinea; Philippines Australasia Australia: Australia - Queensland, - Northern Territory Pacific Southwestern Pacific: New Caledonia"

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 20 Sep 2016]	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 20 Sep 2016]	[Elevation range exceeds 1000 m, demonstrating a degree of environmental versatility] "C. dichotoma is a tree of tropical and subtropical regions. It grows in the sub-Himalayan tract and outer ranges, ascending up to about 1 500 m elevation. It is found in a variety of forests ranging from the dry deciduous forests of Rajasthan to the moist deciduous forests of Western Ghats and tidal forests in Myanmar. In Maharashtra, it grows in moist monsoon forest also."

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	Notes
	Wu, Z. Y. & P. H. Raven, eds. 1995. Flora of China. Vol. 16 (Gentianaceae through Boraginaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fujian, Guangdong, Guangxi, Guizhou, Taiwan, SE Xizang, Yunnan [Cambodia, N India, Indonesia, Japan (Ryukyu Islands), Kashmir, Laos, Malaysia, Myanmar, Pakistan, Thailand, Vietnam; NE Australia, Pacific Islands]"
	Herbarium Pacificum Staff. 1996. New Hawaiian pest plant records for 1995. Bishop Museum Occasional Papers. 46: 3-8	"Significance. Long cultivated on the University of Hawaii, Manoa campus, and in a few locations around Honolulu as a street and shade tree, this is the first collection made from plants that are clearly naturalized. Neal (1965) records <i>C. myxa</i> L. as a synonym for <i>C. dichotoma</i> but current taxonomic thinking recognizes 2 species (Verdcourt 1991). <i>Cordia dichotoma</i> is distinguishable from the 2 species discussed in Wagner et al. (1990: 392) by its softly hairy or glabrous foliage, fragrant white flowers less than or equal to 15 mm long, and flesh-colored to dull pinkish, pulpy fruits, the base of which is enclosed in a saucer-shaped calyx."

Qsn #	Question	Answer
205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Specimen trees grow on the University of Hawaii Manoa campus and in several neighborhoods around Honolulu."
	Haysom, K.A. & Murphy, S.T. (2003). The status of invasiveness of forest tree species outside their natural habitat: a global review and discussion paper. Forest Health and Biosecurity Working Paper FBS/3E. FAO, Rome, Italy	"Table 6. The 74 alien forestry species found to be associated with naturalization or invasion events in North America" [<i>Cordia dichotoma</i> - Countries where naturalized and invasive = USA (Florida)]
	Dave's Garden. 2016. Fragrant Manjack - <i>Cordia dichotoma</i> . http://davesgarden.com/guides/pf/go/188792/ . [Accessed 20 Sep 2016]	"This plant has been said to grow in the following regions: Grenoble, La Habra, California"

301	Naturalized beyond native range	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Kueffer, C. & Mauremootoo, J. 2004. Case studies on the status of invasive woody plant species in the Western Indian Ocean 3. Mauritius (islands of Mauritius and Rodrigues). Working Paper FBS/4-3E. FAO, Rome, Italy	"Rouillard and Guého (1999) is an extensive source of expert knowledge about invasive and potentially invasive species in Mauritius." ... "Cordia dichotoma (syn. C. myxa) is naturalized in the coastal zone and along roads."
	Herbarium Pacificum Staff. 1996. New Hawaiian pest plant records for 1995. Bishop Museum Occasional Papers. 46: 3-8	"Significance. Long cultivated on the University of Hawaii, Manoa campus, and in a few locations around Honolulu as a street and shade tree, this is the first collection made from plants that are clearly naturalized. Neal (1965) records C. myxa L. as a synonym for C. dichotoma but current taxonomic thinking recognizes 2 species (Verdcourt 1991). Cordia dichotoma is distinguishable from the 2 species discussed in Wagner et al. (1990: 392) by its softly hairy or glabrous foliage, fragrant white flowers less than or equal to 15 mm long, and flesh-colored to dull pinkish, pulpy fruits, the base of which is enclosed in a saucer-shaped calyx. Material examined. OAHU: Waimanalo, Bellows Air Force Base, back road, seeds are probably being spread by bulbuls, 18 Oct 1994, E. Funk s.n."
	Haysom, K.A. & Murphy, S.T. (2003). The status of invasiveness of forest tree species outside their natural habitat: a global review and discussion paper. Forest Health and Biosecurity Working Paper FBS/3E. FAO, Rome, Italy	"Table 6. The 74 alien forestry species found to be associated with naturalization or invasion events in North America" [Cordia dichotoma - Countries where naturalized and invasive = USA (Florida)]

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Dave's Garden. 2016. Fragrant Manjack - Cordia dichotoma. http://davesgarden.com/guides/pf/go/188792/ . [Accessed 20 Sep 2016]	[Regarded as a nuisance] "This is a very messy plant since it drops dozens of fruit each day. Nearly all the fallen fruit split upon impact if they fall on a paved surface. The fruit also leaves minor stains on pavement."

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

304	Environmental weed	
	Source(s)	Notes
	Kueffer, C. & Mauremootoo, J. 2004. Case studies on the status of invasive woody plant species in the Western Indian Ocean 3. Mauritius (islands of Mauritius and Rodrigues). Working Paper FBS/4-3E. FAO, Rome, Italy	[Possibly. Impacts unspecified] "Lowland forests experience annual rainfall of 1 000–1 800 mm and can be found below 200– 400 m asl (Page and D'Argent 1997). The natural lowland dry and semi-dry forest has almost completely disappeared. Invasive woody plant species in this habitat are Acacia cocinna, Acacia farnesiana, Acacia nilotica, Albizia lebbeck, Cordia dichotoma ... "

305	Congeneric weed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Edward, E., Munishi, P., & Hulme, P. (2009). Relative Roles of Disturbance and Propagule Pressure on the Invasion of Humid Tropical Forest by <i>Cordia alliodora</i> (Boraginaceae) in Tanzania. <i>Biotropica</i> , 41(2), 171-178	" <i>C. alliodora</i> poses a significant threat to the East Usambaras as well as other humid forests where it is promoted for agroforestry."
	CABI, 2016. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	[<i>Cordia alliodora</i> & <i>Cordia oblique</i>] " <i>C. obliqua</i> is a perennial fast-growing small tree included in the Global Compendium of Weeds (Randall, 2012). This species has been intentionally introduced throughout the tropics where it is cultivated mostly for its fruits. It produces yellow or pinkish-yellow shining drupes which are dispersed by birds and by humans when they consume its fruits. <i>C. obliqua</i> has been listed as invasive in Cuba and Puerto Rico where it is principally invading coastal areas, coastal hills, open forests, and thickets (Kairo et al., 2003; Oviedo Prieto et al., 2012; Rojas-Sandoval and Acevedo-Rodriguez, 2014). In Cuba it is listed as one of the 100 worst invasive species for the island and it is also considered an environmental transformer species (Oviedo Prieto et al., 2012). " ... "Introduced <i>C. alliodora</i> has been found to be associated with invasion events in Tonga and Vanuatu (Haysom and Murphy, 2003). In Vanuatu, use of the young plantations for pasture, as was common practice under coconuts, with overgrazing in the dry season, left areas of bare soil ideal for regeneration of <i>C. alliodora</i> (Tolfts, 1997; Tschinkel, 1965). A mass of <i>C. alliodora</i> seedlings grew up, eliminating ground cover and spreading to neighbouring pastures where these were overgrazed. Only a very small area has been affected outside the plantations, but this is potentially an expensive problem for local cattle producers. Within its native range, <i>C. alliodora</i> is a successful colonizer of disturbed sites (e.g. pasture, coffee, cocoa), sometimes forming monospecific stands. There is, however, no record of weediness, probably owing to the poorer soil conditions (nutrients, compaction etc.) into which it is dispersed. Given <i>C. alliodora</i> 's ecological characteristics, its capacity to invade undisturbed closed forest habitats is probably limited. The restrictions in its use as an exotic are more likely to be related to its limitations as a plantation species rather than its potential as a weed."
	Richardson, D. M. (1998). Forestry trees as invasive aliens. <i>Conservation biology</i> , 12(1), 18-26	[<i>Cordia alliodora</i>] "In the Galapagos archipelago, for example, four alien trees are highly invasive in natural systems. Two of these (<i>Cedrela odorata</i> and <i>Cordia alliodora</i>) were introduced for timber, one for its fruits (<i>Psidium guajava</i>), and one for quinine (<i>Cinchona succirubra</i>)."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Wu, Z. Y. & P. H. Raven, eds. 1995. Flora of China. Vol. 16 (Gentianaceae through Boraginaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Trees 3–4(–20) m tall. Petiole 2–5 cm; leaf blade ovate to broadly ovate or elliptic, 6–13 × 4–9 cm, sparsely pubescent or glabrous, base rounded to broadly cuneate, margin usually subundulate to undulate dentate, rarely entire, apex obtuse to mucronate."

402	Allelopathic	
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Qsn #	Question	Answer
	Source(s)	Notes
	Appiah, K., Li, Z., Zeng, R. S., Luo, S., Oikawa, Y., & Fujii, Y. (2015). Determination of allelopathic potentials in plant species in Sino-Japanese floristic region by sandwich method and dish pack method. <i>International Journal of Basic and Applied Sciences</i> , 4(4), 381-394	[Strong inhibitory effect on lettuce seedlings. First report of allelopathy] "Eight other species (<i>Cordia dichotoma</i> , <i>Asarum nipponicum</i> , <i>Bischofia polycarpa</i> , <i>Mahonia lomariifolia</i> , <i>Taxus wallichiana</i> , <i>Magnolia liliiflora</i> , <i>Hemerocallis fulva</i> , and <i>Acronychia pedunculata</i>) showed strong inhibitory activity on lettuce seedling with radicle elongation in the range of 29.5-39.8% of the untreated control for 10 mg treatment." ... "In the Boraginaceae family, <i>Cordia dichotoma</i> had the highest inhibition on lettuce radicle elongation. <i>Cordia dichotoma</i> have been listed as non-consensus invasive woody plant in the coastal and dry lowlands in Mauritius [38]. This species have been used traditionally in India to treat ulcerative colitis (UC) and colic pain. Ganjare et al., [39] showed that apigenin isolated from the bark of <i>Cordia dichotoma</i> was responsible for the treatment of UC since it showed significant healing and reduction in inflammation enzymes when screened against UC. Polysaccharide in fruit of <i>Cordia dichotoma</i> is a potential candidate for use as herbal excipient in the formulation of orodispersible tablets [40]. The leaves and bark of <i>Cordia dichotoma</i> have shown high antioxidant, antimicrobial and ant implantation activities [41], [42], and [43]. The leaves have been found to contain quercetin and quercitrin whereas arabinoglucan, L-arabinose and D-glucose have been found in the fruits [44]."

403	Parasitic	n
	Source(s)	Notes
	CAB International, 2005. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	" <i>C. dichotoma</i> is a small- to medium-size tree (12-25 m tall and 1-1.5 m girth) with a short and often crooked stem." [Boraginaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 20 Sep 2016]	" <i>Cordia dichotoma</i> also provides high-quality fodder which is available throughout most of the year." ... "seedlings are susceptible to grazing."

405	Toxic to animals	n
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 21 Sep 2016]	[No evidence, although fruit may have a narcotic effect on fish] " <i>Cordia dichotoma</i> also provides high-quality fodder which is available throughout most of the year." ... "seedlings are susceptible to grazing." ... "In China though, the fruits are used to stupefy fish."

Qsn #	Question	Answer
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence. Edible to humans] "ripe fruits eaten by the children, the seeds contain oil, leaves eaten as vegetable"

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 21 Sep 2016]	"A large number of insect pests are reported, defoliators being among the most important. Larvae of some insects of the families Chrysomelidae, Glyphiplerygidae, Noctuidae, Lymantreedae, Notodontidae, Pyralidae, Sphingidae and Yponomeutidae defoliate the leaves. Larvae of Gracilariidae and Lyonetiidae mine the leaves and those of Eucosmidae roll the leaves. Larvae of some insects belonging to families Eucosmidae, Curculionidae and Pyralidae bore into the fruits and shoots. Austrothrips cochinchinensis forms galls and feeds on the sap. Aceria gallae and A. pobuzii infest C. dichotoma in Taiwan and cause galls on leaves, fruits, shoots and tender stems. The weevil Barioscapus cordiae, adults attack the fruits and feed on the green pedicel, sepals and pollen grains inside the buds."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence. Edible & medicinal uses] "ripe fruits eaten by the children, the seeds contain oil, leaves eaten as vegetable" ... "Used in Ayurveda, Unani and Sidha. Fruit very mucilaginous, demulcent, blood purifier, used in diseases of lungs, kidney and spleen; fruit decoction given to persons having a low sperm count. Bark used with milk and candy in syphilis and urinary diseases; bark and leaves decoction taken for expelling retained placenta. Stem bark decoction taken for dyspepsia, diarrhea, dysentery, fever, headache, stomachache, and as a tonic. Leaves juice cooling, applied as a poultice to treat migraine, inflammation and swellings; leaves chewed to cure mouth ulcers; leaf decoction in the treatment of cough and cold; fresh leaf juice applied on ulcers and headache.)"

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 21 Sep 2016]	[Unlikely given habitat & moisture requirements] "It is found in a variety of forests ranging from the dry deciduous forests of Rajasthan to the moist deciduous forests of Western Ghats and tidal forests in Myanmar. In Maharashtra, it grows in moist monsoon forest also. It does not grow gregariously, but is found growing singly in moist shady ravines and valleys. In areas with annual rainfall less than 500 mm, it thrives along streams or depressions where moisture is available."

409	Is a shade tolerant plant at some stage of its life cycle	y
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Qsn #	Question	Answer
	Source(s)	Notes
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"C. dichotoma is moderately tolerant of shade, although from the pole stage it prefers open conditions."
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 20 Sep 2016]	"It does not grow gregariously, but is found growing singly in moist shady ravines and valleys." ... "From pole stage it prefers complete overhead light, but seedlings and saplings can withstand a fair amount of shade."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"It tolerates a range of soils, but thrives on deep, moist, sandy loams, and does not grow well on dry, shallow, or gravelly soils."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"C. dichotoma is a small- to medium-size tree (12-25 m tall and 1-1.5 m girth) with a short and often crooked stem."

412	Forms dense thickets	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 20 Sep 2016]	"It does not grow gregariously, but is found growing singly in moist shady ravines and valleys."

501	Aquatic	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org . [Accessed 20 Sep 2016]	[Terrestrial] "C. dichotoma is a tree of tropical and subtropical regions. It grows in the sub-Himalayan tract and outer ranges, ascending up to about 1 500 m elevation. It is found in a variety of forests ranging from the dry deciduous forests of Rajasthan to the moist deciduous forests of Western Ghats and tidal forests in Myanmar. In Maharashtra, it grows in moist monsoon forest also. It does not grow gregariously, but is found growing singly in moist shady ravines and valleys. In areas with annual rainfall less than 500 mm, it thrives along streams or depressions where moisture is available."

502	Grass	n
	Source(s)	Notes

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Sep 2016]	Family: Boraginaceae Subfamily: Cordioideae
503	Nitrogen fixing woody plant	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 20 Sep 2016]	Family: Boraginaceae Subfamily: Cordioideae
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wu, Z. Y. & P. H. Raven, eds. 1995. Flora of China. Vol. 16 (Gentianaceae through Boraginaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Trees 3–4(–20) m tall. Petiole 2–5 cm; leaf blade ovate to broadly ovate or elliptic, 6–13 × 4–9 cm, sparsely pubescent or glabrous, base rounded to broadly cuneate, margin usually subundulate to undulate dentate, rarely entire, apex obtuse to mucronate."
601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 20 Sep 2016]	"Natural regeneration can be unreliable, because a high proportion of seeds may be affected by seed borers, and the seedlings are susceptible to grazing." [No evidence that this effects persistence of populations]
	Wu, Z. Y. & P. H. Raven, eds. 1995. Flora of China. Vol. 16 (Gentianaceae through Boraginaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Widespread distribution] "Open woods on slopes, mountain streamsides. Fujian, Guangdong, Guangxi, Guizhou, Taiwan, SE Xizang, Yunnan [Cambodia, N India, Indonesia, Japan (Ryukyu Islands), Kashmir, Laos, Malaysia, Myanmar, Pakistan, Thailand, Vietnam; NE Australia, Pacific Islands]."
602	Produces viable seed	y
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 20 Sep 2016]	"Propagation and planting <i>Cordia dichotoma</i> is propagated by seed, cuttings or by stump plants. Branches root easily, and are often used as garden stakes. The number of seeds per kg ranges from 4200–6700. Natural regeneration can be unreliable, because a high proportion of seeds may be affected by seed borers, and the seedlings are susceptible to grazing. Artificial regeneration by direct sowing is possible, but more reliable results can be achieved with planting stock."

Qsn #	Question	Answer
603	Hybridizes naturally	
	Source(s)	Notes
	Miller, J. S. (1985). Hybridization in <i>Cordia</i> section <i>Varronia</i> (Boraginaceae). <i>Cordia</i> section <i>Varronia</i> . <i>American Journal of Botany</i> , 72(6): 963	[Unknown. Hybridization documented in genus] " <i>Cordia</i> section <i>Varronia</i> is a group of 50-60 species of shrubs which are widespread in the Neotropics. Treatments of this section in the past have varied widely in the circumscription of species. Field and herbarium studies indicate that natural hybrids are commonly produced between many species of this group. Some of these hybrids have been described as new species by authors in the past, adding to the confusion in this group. Hybrids between such distantly related species as <i>Cordia curassavica</i> and <i>Cordia bullata</i> produce no viable pollen and appear to be sterile. They may however, persist vegetatively. Hybrids between closely related species such as <i>Cordia globose</i> and <i>Cordia bullata</i> are variable in pollen stainability but always produce some stainable pollen. These hybrids often backcross with parents and introgression may occur in areas where the species are sympatric. These groups have been analyzed both morphologically and in terms of leaf flavonoids and the data used to provide a better circumscription of species within the section."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 <i>Agroforestry Database: a tree reference and selection guide</i> version 4.0. http://www.worldagroforestry.org . [Accessed 20 Sep 2016]	"Flowers are bisexual. Flowering takes place from March to May with the new leaves. The old leaves are shed during winter and the trees are leafless for a short period in early summer. Fruits are formed soon after flowering, develop quickly and ripen from June to August in north India and normally before May in south India. Seed dispersal is aided by birds and monkeys which feed on the ripe fruit. Flowers bisexual."
	Opler, P. A., Baker, H. G., & Frankie, G. W. (1975). Reproductive biology of some Costa Rican <i>Cordia</i> species (Boraginaceae). <i>Biotropica</i> , 7(4): 234-247	[Unknown. Various breeding systems documented in genus] "With the exception of <i>Cordia alliodora</i> , which possesses a variable amount of self-compatibility (table 4 and Mendoza 1965), all <i>Cordia</i> species are heterostyled with associated self incompatibility or are dioecious."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Wu, Z. Y. & P. H. Raven, eds. 1995. <i>Flora of China</i> . Vol. 16 (Gentianaceae through Boraginaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Inflorescences terminating leafy lateral branches, dichotomously branched into corymbose cymes, widely spaced, 5–8 cm wide. Flowers dimorphic, sessile. Calyx campanulate, 5–6 mm, 5-lobed; lobes unequal, triangular. Corolla white, ca. as long as calyx; lobes shorter than tube, margin somewhat undulate. Filaments of staminate flowers ca. 3.5 mm, filaments of bisexual flowers 1–2 mm. Rudimentary pistil globose. Style united portion 1–1.5 mm, first branches ca. 1 mm, second branches 2–3 mm; stigma spatulate."
	Sivaram, V. (2001). Honeybee flora and beekeeping in Karnataka State, India. In <i>Proceedings of the 37th international apiculture congress, Apimondia, Durban</i>	"Table: 1. Honeybee flora duration and flowering duration in Karnataka" [<i>Cordia dichotoma</i> provides pollen & nectar & is presumably pollinated by honeybees]

Qsn #	Question	Answer
	Meena, N. K., Singh, B., Kant, K., Meena, R. D., & Solanki, R. K. (2015). Role of insect pollinators in pollination of seed spices-A review. International Journal of Seed Spices, 5(1), 1-17	"Table1: Enumeration of bee flora in Indian continent" [<i>Cordia dichotoma</i> visited by bees]

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 20 Sep 2016]	" <i>Cordia dichotoma</i> is propagated by seed, cuttings or by stump plants. Branches root easily, and are often used as garden stakes."

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Rathore, M. (2009). Nutrient content of important fruit trees from arid zone of Rajasthan. Journal of Horticulture and Forestry, 1(7), 103-108	"A tree starts fruit production after 4 - 5 years of planting."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Rathore, M. (2009). Nutrient content of important fruit trees from arid zone of Rajasthan. Journal of Horticulture and Forestry, 1(7), 103-108	"It is generally planted along with farm boundary, roadside and in garden as shade tree..." [Planted in heavily trafficked areas]
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Specimen trees grow on the University of Hawaii Manoa campus and in several neighborhoods around Honolulu." [Planted in heavily trafficked urban areas]
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 21 Sep 2016]	[Sticky pulp may provide means of external attachment] "Fruit drupaceous, ovoid, 10—13(—25) mm long, yellowish-white, orange or pinkish when ripe, 1(—3)-seeded, outer mesocarp pulpy and sticky, mucilaginous. Seed ovoid, flattened, up to 6 mm long, endosperm absent."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Rathore, M. (2009). Nutrient content of important fruit trees from arid zone of Rajasthan. Journal of Horticulture and Forestry, 1(7), 103-108	"It is generally planted along with farm boundary, roadside and in garden as shade tree however its commercial plantation is done at various places in Rajasthan."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Specimen trees grow on the University of Hawaii Manoa campus and in several neighborhoods around Honolulu."

703	Propagules likely to disperse as a produce contaminant	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Rathore, M. (2009). Nutrient content of important fruit trees from arid zone of Rajasthan. <i>Journal of Horticulture and Forestry</i> , 1(7), 103-108	"A tree starts fruit production after 4 - 5 years of planting." [Unlikely given relatively long time to maturity & relative size of fruit & seeds]

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Wu, Z. Y. & P. H. Raven, eds. 1995. <i>Flora of China</i> . Vol. 16 (Gentianaceae through Boraginaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Drupes yellow or reddish, subglobose, 1–1.5 cm in diam., with sticky mesocarp, surrounded by persistent calyx."

705	Propagules water dispersed	
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 21 Sep 2016]	[Occurrence along streams may aid in secondary dispersal by water] "in areas with less than 500 mm rainfall it grows in depressions and alongside streams."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Herbarium Pacificum Staff. 1996. New Hawaiian pest plant records for 1995. <i>Bishop Museum Occasional Papers</i> . 46: 3-8	" <i>Cordia dichotoma</i> is distinguishable from the 2 species discussed in Wagner et al. (1990: 392) by its softly hairy or glabrous foliage, fragrant white flowers less than or equal to 15 mm long, and flesh-colored to dull pinkish, pulpy fruits, the base of which is enclosed in a saucer-shaped calyx." ... "seeds are probably being spread by bulbuls,"
	Wu, Z. Y. & P. H. Raven, eds. 1995. <i>Flora of China</i> . Vol. 16 (Gentianaceae through Boraginaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Drupes yellow or reddish, subglobose, 1–1.5 cm in diam., with sticky mesocarp, surrounded by persistent calyx."
	David, J. P., Manakadan, R., & Ganesh, T. 2015. Frugivory and seed dispersal by birds and mammals in the coastal tropical dry evergreen forests of southern India: A review. <i>Tropical Ecology</i> , 5 (1): 41-55	"Table 3. Important fruit-species for frugivores in coastal TDEF" [<i>Cordia dichotoma</i> - Consumer group = Birds and Mammals]

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 21 Sep 2016]	[Sticky pulp may provide means of external attachment] "Fruit drupaceous, ovoid, 10–13(–25) mm long, yellowish-white, orange or pinkish when ripe, 1(–3)-seeded, outer mesocarp pulpy and sticky, mucilaginous. Seed ovoid, flattened, up to 6 mm long, endosperm absent."

Qsn #	Question	Answer
708	Propagules survive passage through the gut	y
	Source(s)	Notes
	David, J. P., Manakadan, R., & Ganesh, T. 2015. Frugivory and seed dispersal by birds and mammals in the coastal tropical dry evergreen forests of southern India: A review. <i>Tropical Ecology</i> , 5 (1): 41-55	"In Sriharikota the Bonnet Macaque was recorded feeding on 34 species of fruit. The majority of seeds recorded in the droppings were fig species (<i>Ficus</i>) and <i>Cordia dichotoma</i> ." ... The Golden Jackal (<i>Canis aureus</i>) represents Family Canidae. ... In Sriharikota 21 fruit species were recorded in its scat, with the bulk of the fruit found in the diet (judging by the abundance and frequency of occurrence of seeds in scats) being <i>Syzygium cumini</i> (33 %, n = 473), <i>Phoenix farinifera</i> (18 %), <i>Cordia dichotoma</i> (15 %), and <i>Memecylon umbellatum</i> (14 %)." ... "Both the Golden Jackal and Small Indian Civet are opportunistic feeders that eat significant amounts of fallen fruits and disperse them. In Sriharikota, the most common species in the forest such as <i>C. dichotoma</i> , <i>D. ferrea</i> , <i>G. rhamnifolia</i> , <i>M. umbellatum</i> , <i>P. farinifera</i> , and <i>S. cumini</i> and large-sized fruits such as <i>Mimusops elengi</i> and <i>Zizyphus mauritiana</i> are chiefly dependent on the Golden Jackal and Small Indian Civet for dispersal (David et al. 2011)."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyaphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 21 Sep 2016]	[Densities unknown] "Fruit drupaceous, ovoid, 10–13(–25) mm long, yellowish-white, orange or pinkish when ripe, 1(–3)-seeded" ... "The number of seeds per kg ranges from 4200–6700." ... "In Indo-China, a mature tree of <i>Cordia dichotoma</i> can produce 20–50 kg of fruit per year."

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 Sep 2016]	"Storage Behaviour: No data available for species. Of 12 known taxa of genus <i>Cordia</i> , 100.00% Orthodox(p/?)"
	Baskin, C.C. & Baskin, J.M. 2014. <i>Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination</i> . Second Edition. Academic Press, San Francisco, CA	"TABLE 10.10 Dormancy in seeds of trees of moist warm temperature woodlands. *5type of dormancy is inferred. g.h., greenhouse; nur., nursery." [<i>Cordia dicholoma</i> - ND = nondormant]
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyaphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 21 Sep 2016]	[Unknown, but seeds may be heavily affected by seed borers] "The number of seeds per kg ranges from 4200–6700. Natural regeneration can be unreliable, because a high proportion of seeds may be affected by seed borers, and the seedlings are susceptible to grazing."

Qsn #	Question	Answer
	Salazar, R. & Jøker, D. (2000). <i>Cordia alliodora</i> (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	[Unknown. Related species lose viability quickly in field conditions or if not stored properly] <i>Cordia alliodora</i> - "The seed is orthodox, but if not stored properly it loses viability fast. It is especially important to use bags that are completely airtight, either heavy plastic or aluminium. In Costa Rica experience is that after two weeks at room temperature the germination is down to 40%. Best storage is at 5°C and moisture content 7-10%. An experiment from Colombia showed that seed stored at 5°C and 8.5% moisture content retained 76% germination after 14 months."

803	Well controlled by herbicides	
	Source(s)	Notes
	Pacific Island Ecosystems at Risk (PIER). (2013). <i>Cordia alliodora</i> . http://www.hear.org/Pier/species/cordia_alliodora.htm . [Accessed 21 Sep 2016]	[Unknown. No information on herbicide efficacy or chemical control of this species. Response to herbicides may be similar to that of related taxa] " <i>Cordia alliodora</i> ... Control: Difficult, as plants sprout readily. Grubbing or treatment with herbicides is probably necessary."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Aguilar, N.O., 2001. <i>Cordia dichotoma</i> J.G. Forster [Internet] Record from Proseabase. van Valkenburg, J.L.C.H. and Bunyapraphatsara, N. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 20 Sep 2016]	"It coppices and pollards well."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalized on Oahu, Hawaiian Islands, Mauritius & Florida
- Regarded as invasive in Mauritius, but negative impacts have not been specified
- Other *Cordia* species have become invasive
- Demonstrates allelopathic properties on lettuce in lab settings (field confirmation needed)
- Shade tolerant
- Tolerates many soil types
- Seeds dispersed by birds, frugivorous mammals & intentionally by people
- Capable of spreading vegetatively by stumps & branches
- Able to coppice & resprout after cutting (& may require herbicide application for effective control)

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Provides fodder for livestock
- Edible fruit
- Ornamental & medicinal uses
- Reaches maturity in 4-5 years
- Seeds may lose viability quickly