

**Taxon:** *Calotropis gigantea* (L.) W. T. Aiton

**Family:** Apocynaceae

**Common Name(s):** bowstring-hemp  
crown flower  
crownplant  
giant milkwood  
giant-milkweed

**Synonym(s):** *Asclepias gigantea* L.

**Assessor:** Chuck Chimera

**Status:** Assessor Approved

**End Date:** 22 Mar 2018

**WRA Score:** 12.0

**Designation:** H(HPWRA)

**Rating:** High Risk

**Keywords:** Tropical Shrub, Disturbance Weed, Toxic, Monarch Butterfly Host, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed		
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	y
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
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	y
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	1
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	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	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
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 20 Mar 2018]	[No evidence of domestication] "In the past both <i>Calotropis gigantea</i> (Madar fibre) and <i>Calotropis procera</i> (French cotton or Akund) were cultivated and used as a source of a strong bark fibre for string, fishing nets and cloth, and their seed floss was used for packing and stuffing, as it was too short and too light for spinning. In Indonesia and Thailand, however, the floss is said to be made into thread, sometimes combined with cotton fibre. <i>Calotropis gigantea</i> has also been tested for use in the paper pulp fabrication, and as a source of methane, through anaerobic fermentation for biofuel production, although its potential is limited due to its invasive properties. <i>Calotropis gigantea</i> is sometimes used as fuel wood, but it is of poor quality. In Indo-China, charcoal from the wood was used in gun powder and fireworks. The leaves can be used for mulching, green manuring of rice fields and for binding sandy soil. In Vietnam, <i>Calotropis gigantea</i> is planted as a hedge plant. A fermented mixture of the latex and salt is used to remove the hair from goat skins for production of 'nari leather' and of sheep skins to make leather which is used for book-binding. The gynostegium is used by the Chinese in Indonesia in sweetmeats. In India, Thailand, the Philippines and Hawaii the long-lasting flowers of <i>Calotropis gigantea</i> are used in various floral arrangements in temples and in rosaries. It is also widely planted as an ornamental. "

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

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

Qsn #	Question	Answer
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2018]	"Native Asia-Temperate China: China Guangdong, Guangxi, Hainan, Sichuan, Yunnan Western Asia: Iran Asia-Tropical Indian Subcontinent: Bhutan ; India ; Nepal ; Pakistan ; Sri Lanka Indo-China: Laos ; Myanmar ; Thailand ; Vietnam Malesia: Indonesia ; Malaysia"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2018]	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 20 Mar 2018]	" <i>Calotropis gigantea</i> grows in dry uncultivated land, open waste land, along roadsides and railways, up to 1000 m altitude."
	Missouri Botanical Garden. 2018. <i>Calotropis gigantea</i> . <a href="http://www.missouribotanicalgarden.org">http://www.missouribotanicalgarden.org</a> . [Accessed 20 Mar 2018]	"Native Range: Asia, tropical Africa Zone: 11 to 12 "

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a>. [Accessed 20 Mar 2018]</p>	<p>"Native Asia-Temperate China: China Guangdong, Guangxi, Hainan, Sichuan, Yunnan Western Asia: Iran Asia-Tropical Indian Subcontinent: Bhutan ; India ; Nepal ; Pakistan ; Sri Lanka Indo-China: Laos ; Myanmar ; Thailand ; Vietnam Malesia: Indonesia ; Malaysia Naturalized Africa East Tropical Africa: Kenya ; Tanzania Northeast Tropical Africa: Sudan South Tropical Africa: Angola ; Mozambique West-Central Tropical Africa: Gabon ; Zaire Western Indian Ocean: Mauritius ; Seychelles Asia-Tropical Papuasia: Papua New Guinea Australasia Australia: Australia Northern Territory, Queensland Pacific North-Central Pacific: United States Hawaii South-Central Pacific: French Polynesia Tuamotu Archipelago Southwestern Pacific: Fiji ; Samoa Southern America Caribbean: Cuba ; Trinidad and Tobago Northern South America: Guyana ; Suriname ; Venezuela"</p>

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	<p>Staples, G.W. &amp; Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI</p>	<p>"C. gigantea is now cultivated as an ornamental in tropical regions worldwide and has become widely naturalized..."</p>
	<p>Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. &amp; Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a>. [Accessed 20 Mar 2018]</p>	<p>"<i>Calotropis gigantea</i> is native to continental Asia and South-East Asia and has been introduced in the Pacific Islands, Australia, Central and northern South America and Africa as an ornamental near villages and temples and as a weed. In Africa it is recorded from Gabon, DR Congo, Sudan, Kenya, Tanzania, Angola and Mozambique, as well as from Seychelles and Mauritius. However, its distribution is incompletely known, and it probably occurs in other countries as well. "</p>

301	Naturalized beyond native range	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Frohlich, D. &amp; Lau, A. 2008. New plant records from O'ahu for 2007. Bishop Museum Occasional Papers 100: 3-12</p>	<p>"A native to several regions including India, Sri Lanka, China, Malaysia, and Indonesia, <i>Calotropis gigantea</i> is widely cultivated as an ornamental in tropical regions worldwide and has become widely naturalized in many of these areas, including northern Australia (Staples &amp; Herbst 2005). This species has been previously documented as naturalized on both Kaua'i and Maui. On O'ahu, it was found naturalized in a dry, grassy road construction site, with no mature individuals in the area. Material examined. O'AHU: Found during North/South road survey (UTM 598437, 2360755), small shrub sapling ca 0.6 m tall, no fruits or flowers, lone individual found sprouting in dry grassy pasture in road construction area, 76.2 m, 15 Oct 2007, A. Lau &amp; D. Frohlich 2007101508."</p>
	<p>Staples, G.W. &amp; Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI</p>	<p>"Apparently native to the region from India and Sri Lanka eastward to China, Malaysia, and Indonesia, <i>C. gigantea</i> is now cultivated as an ornamental in tropical regions worldwide and has become widely naturalized, including in northern Australia."</p>
	<p>Wysong, M. &amp; Hughes, G. 2007. New Hawaiian plant records for the island of Moloka'i. Bishop Museum Occasional Papers 96: 1-8</p>	<p>"Native to the region from India and Sri Lanka eastward to China and Indonesia, <i>C. gigantea</i> (crown flower) is cultivated as an ornamental in tropical regions worldwide. In Hawai'i the lavender color form was apparently introduced before 1871 and the white form by about 1920, although possibly earlier (Staples &amp; Herbst 2005). It has been previously recorded as naturalized on Kaua'i and Maui, and has been collected on Moloka'i as early as 1928 from a planted individual at Kalua'aha (Degener 3524, BISH). In Kalaupapa it is an uncommon ornamental and is known to be naturalizing at one location on the south side of the lighthouse cottages. Material examined. MOLOKA'I: Kalaupapa peninsula, cultivated plant in lawn on north side of lighthouse cottages; plantings on south side of cottages appear to be naturalizing, 30 m, 9 Aug 2005, Wysong 763."</p>
	<p>USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a>. [Accessed 20 Mar 2018]</p>	<p>"Naturalized  Africa  East Tropical Africa: Kenya ; Tanzania  Northeast Tropical Africa: Sudan  South Tropical Africa: Angola ; Mozambique  West-Central Tropical Africa: Gabon ; Zaire  Western Indian Ocean: Mauritius ; Seychelles  Asia-Tropical  Papuasia: Papua New Guinea  Australasia  Australia: Australia Northern Territory, Queensland  Pacific  North-Central Pacific: United States Hawaii  South-Central Pacific: French Polynesia Tuamotu Archipelago  Southwestern Pacific: Fiji ; Samoa  Southern America  Caribbean: Cuba ; Trinidad and Tobago  Northern South America: Guyana ; Suriname ; Venezuela"</p>

Qsn #	Question	Answer
	Starr, F., Starr, K. & Loope, L.L. 2003. New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 74: 23-34	"Previously reported as persisting near old home sites and escaping in Kohala and Kona, Hawai'i, and on Kaho'olawe but not known to be naturalized (Wagner et al., 1999), <i>C. gigantea</i> (crown flower) is widely cultivated on Maui, has been observed spreading from ornamental plantings, and is occasionally found far away from any known plants in Kihei, Kahului, and Wailuku. Native to India and Southeast Asia (St. John, 1973; Whistler, 2000), this popular lei flower is distinguished by a large erect habit up to 13 ft [4 m]; milky sap; white powdery opposite leaves 3.5–9.0 in [8–23 cm] long; and axillary umbels of white to pale purple, crown-like flowers (Whistler, 2000). The feral form seems to most often have purple flowers. Material examined: MAUI: E. Maui, North Kihei, S. Kihei Rd on sand dunes, 5 ft [1.5 m], 9 Mar 2001, Starr & Martz 010309-1; E. Maui, Kihei, just mauka of the Maui Research and Technology Park, on mauka side of gate, coming up in pasture area recently disturbed to install a culvert, 250 ft [75 m], 3 May 2001, Starr & Martz 010503-2. W. Maui, Kahului, in abandoned sugar cane field, 100 ft [30 m], Starr & Martz 010701-1."
	Starr, F., Starr, K. & Loope, L.L. 2004. New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	"Previously reported to be naturalized on Maui (Starr et al., 2002), <i>C. gigantea</i> is now also known from Kaua'i, where this common ornamental is locally established in sandy areas along the coast in the Kekaha/Mānā Plain area. This collection represents a new island record for Kaua'i. Material examined: KAUA'I: Kekaha, Kekaha Beach Park, on sand near coast, 10 ft [3 m], 26 Feb 2002, Starr & Starr 0202263."

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Rejmánek, M., Huntley, B. J., Le Roux, J. J., & Richardson, D. M. (2017). A rapid survey of the invasive plant species in western Angola. <i>African Journal of Ecology</i> , 55(1), 56-69	"Angola is one of the most neglected African countries in terms of botanical research, in respect of both native and naturalized species. We conducted a rapid assessment of invasive plant species in western Angola during August 2014. In thirteen primary vegetation types, we recorded populations of 44 naturalized plant species, nineteen of which are conclusively invasive (spreading far from introduction sites)." ... "Canonical correspondence analysis was used to assess the presence and abundance of invasive plant species with respect to the major abiotic factors and vegetation types. Three fairly distinct groups of species emerge from this analysis: (i) species of dry lowland habitats ( <i>Calotropis gigantea</i> , <i>Leucaena leucocephala</i> and <i>Opuntia stricta</i> );..."
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	" <i>C. gigantea</i> may have the potential to cause problems comparable to <i>C. procera</i> which is a noxious weed in the Northern Territory and Western Australia. In South-east Asia, <i>C. gigantea</i> occupies a wide range of disturbed areas including coastal systems. In tropical regions of northern Australia, it has potential to invade degraded rangeland pastures and coastal dunes. In the Northern Territory, eradication appears feasible as it is only known to exist as isolated individuals or as cultivated plants in Darwin. Eradication of scattered populations over vast, remote areas of Cape York, however, is very unlikely."

Qsn #	Question	Answer
	Chopra, R. N., Badhwar, R. L., & Ghosh, S. (1949). Poisonous Plants of India. Government of India Press, Delhi	"Frequently met with throughout India as a weed on fallow land and in waste ground except in the Punjab where it is sometimes found in gardens"
	Cavalcante, A., & Major, I. (2006). Invasion of alien plants in the Caatinga biome. <i>AMBIO: A Journal of the Human Environment</i> , 35(3), 141-143	"One way or the other, one thing seems certain, based on the observations made so far: it is the most aggressive phytoinvader of the Caatinga, occurring sporadically or forming clusters in the most diverse places in this biome. All these places have in common the fact that they have suffered previous human interference."
	Kumar, P. S., Suresh, E., & Kalavathy, S. (2013). Review on potential herb <i>Calotropis gigantea</i> (L.) R. Br. <i>Scholars Academic Journal of Pharmacy</i> , 2(2), 135-143	"Through its wind and animal dispersed seeds, it quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures. It has a preference for and is often dominant in areas of abandoned cultivation especially disturbed sandy soils and low rainfall. It is assumed to be an indicator of over cultivation"

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	" <i>Calotropis gigantea</i> ... Weed of: Cotton, Orchards & Plantations, Pastures" [Possibly yes. Impacts not specified in cited references]
	Queensland Government. (2018). <i>Weeds of Australia. Calotropis gigantea</i> . <a href="http://keyserver.lucidcentral.org">http://keyserver.lucidcentral.org</a> . [Accessed 20 Mar 2018]	[Potentially] "This introduced shrub with milky sap is frequently cultivated as a garden plant (i.e. ornamental) in the tropical parts of northern Australia. It has become naturalised in drier tropical regions and in sandy coastal habitats and may be very easily confused with the more widespread and more significant environmental weed known as calotrope ( <i>Calotropis procera</i> ). Giant calotrope ( <i>Calotropis gigantea</i> ) may cause problems comparable to this species and has potential to invade degraded rangeland pastures, river flats and coastal dunes. For example, it is one of many ornamental species that is invasive along the sandy beachfronts of Far North Queensland."

304	Environmental weed	
	Source(s)	Notes
	Queensland Government. (2018). <i>Weeds of Australia. Calotropis gigantea</i> . <a href="http://keyserver.lucidcentral.org">http://keyserver.lucidcentral.org</a> . [Accessed 20 Mar 2018]	[Potentially] "This introduced shrub with milky sap is frequently cultivated as a garden plant (i.e. ornamental) in the tropical parts of northern Australia. It has become naturalised in drier tropical regions and in sandy coastal habitats and may be very easily confused with the more widespread and more significant environmental weed known as calotrope ( <i>Calotropis procera</i> ). Giant calotrope ( <i>Calotropis gigantea</i> ) may cause problems comparable to this species and has potential to invade degraded rangeland pastures, river flats and coastal dunes. For example, it is one of many ornamental species that is invasive along the sandy beachfronts of Far North Queensland."

305	Congeneric weed	y
	Source(s)	Notes



Qsn #	Question	Answer
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	" <i>Calotropis procera</i> ... as a weed it is common in disturbed sandy soils along roadsides, watercourses and waste places, particularly near habitation and often extending into run-down pastures."
	Bebawi, F. F., Campbell, S. D., & Mayer, R. J. (2015). Seed bank longevity and age to reproductive maturity of <i>Calotropis procera</i> (Aiton) WT Aiton in the dry tropics of northern Queensland. <i>The Rangeland Journal</i> , 37(3), 239-247	"In Australia, <i>C. procera</i> is considered an invasive weed that threatens the sustainability of pasture production, particularly in the dry tropics of north Queensland (Kleinschmidt and Johnson 1977; Forster 1992; Martin 1996; Vitelli et al. 2008; Campbell et al. 2013), in the Northern Territory (Miller 2003) and in Western Australia in the Kimberley region (Forster 1992; Smith 2011). It has the ability to form dense infestations, which are difficult and costly to control (Grace 2006; Vitelli et al. 2008)."

401	Produces spines, thorns or burrs	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	[No evidence] "Shrubs 1–5 m tall. Petiole 1–4 mm; leaf blade obovate-oblong or oblong, 7–30 × 3–15 cm, base cordate, apex obtuse, cottony tomentose when young, frequently glabrescent and glaucous green; lateral veins 4–8 pairs. Cymes umbel-like, with fine woolly hairs; peduncle robust, 5–12 cm. Pedicel thick, 2–5 cm. Calyx almost flat, 1.2–1.5 cm in diam. Flower buds cylindric. Corolla usually purplish or lilac with paler greenish base, 2.5–3.5 cm in diam., fleshy, glabrous; lobes ovate, 1–1.5 × 0.6–1 cm, spreading or reflexed, margin revolute. Corona shorter than gynostegium. Follicles obliquely elliptic to oblong-lanceolate in outline, 5–10 × 2–4 cm, both ends incurved. Seeds broadly ovate, 5–7 × 3–4 mm; coma 2.5–4 cm."

Qsn #	Question	Answer
402	<b>Allelopathic</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 20 Mar 2018]	"Some reports indicate that <i>Calotropis gigantea</i> affects germination and seedling vigour of agricultural crops. However, the extracts failed to produce any detrimental effects on weeds."
	Mangal, K. M., Kumar, A., & Saini, P. (2015). Germination and seedling vigour of <i>Vigna sinensis</i> as affected by allelopathy of <i>Calotropis gigantea</i> L. <i>Indian Journal of Agricultural Research</i> , 48(1), 29-34	[Potentially Yes] "In present study an attempt has been made to investigate the allelopathic effects at different concentrations (25, 50, 75 & 100 %) of <i>Calotropis</i> leaves extract on seed germination, seed biomass and radicle length of <i>Vigna sinensis</i> . The results showed that the germination delayed at the higher concentrations, and the final germination percentage was decreased by increasing leaf extract concentration. Seed biomass was decreased with increasing the concentrations and highest concentration (100 %) adversely affected the fresh as well as dry seed biomass. The seeds were highly affected at two concentrations (50 and 100%). The leaf extract also possessed the biological activity against many bacterial and fungus cultures. Phytochemical screening of the extract showed the presence of a number of bioactive constituents such as glycosides, tannins, saponins, terpenes, phenols and flavonoids etc. Hence, it could be suggested that <i>Calotropis gigantea</i> should not be planted close to agricultural crops due to adverse effects on their growth."

403	Parasitic	n
	<b>Source(s)</b>	<b>Notes</b>
	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	"Shrubs 1–5 m tall." [Family: Apocynaceae Subfamily: Asclepiadoideae. No evidence]

404	Unpalatable to grazing animals	y
	<b>Source(s)</b>	<b>Notes</b>
	Kumar, P. S., Suresh, E., & Kalavathy, S. (2013). Review on potential herb <i>Calotropis gigantea</i> (L.) R. Br. <i>Scholars Academic Journal of Pharmacy</i> , 2(2), 135-143	"Through its wind and animal dispersed seeds, it quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures." ... "It is one of the few plants not consumed by grazing animals" ... "It thrives on poor soils particularly where overgrazing has removed competition from native grasses"
	Dhungel, S., & O'Gara, B. (1991). Ecology of the Hog Deer in Royal Chitwan National Park, Nepal. <i>Wildlife Monographs</i> , (119), 3-40	[ <i>Calotropis gigantea</i> is an indicator of overgrazing, suggesting its relative unpalatability] "Grazing, timber felling, and lopping have reduced many fringe areas to low scrub with a short grass cover and unpalatable shrubs in the Jaimangala and Badreni areas just outside the Park boundary (Laurie 1978). Semal, vellor, and sal trees are often lopped by villagers and elephant people for fodder. Many areas now have shrubs such as <i>Colebrookia oppositifolia</i> and <i>Calotropis gigantea</i> and grasses such as <i>Cassia tora</i> , indicating overgrazing."

Qsn #	Question	Answer
405	<b>Toxic to animals</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	" <i>Calotropis gigantea</i> ... Caustic, can be violently irritant, in contact with the eye, the latex causes severe irritation; abortifacient, antiinflammatory, antipyretic, analgesic, anticonvulsant, anxiolytic, sedative, cytotoxic, procoagulant, anti-diarrheal, antidote for snakebites and scorpion stings."
	Wag! 2018. Yucca Poisoning in Dogs. <a href="https://wagwalking.com/condition/cardiac-glycosides-poisoning">https://wagwalking.com/condition/cardiac-glycosides-poisoning</a> . [Accessed 22 Mar 2018]	"Cardiac glycosides are compounds that can disrupt the natural rhythm of the heart. These compounds occur naturally in several types of plants and is used in medications designed to regulate the heart." ... "Cardiac glycosides, usually in the form of digoxin, are often used in the treatment of congestive heart failure. The early signs of toxicity from the cardiac glycosides can mimic the heart problem it is meant to treat, making diagnosis difficult." ... "There are several types of plants that contain naturally occurring cardiac glycosides. Some of the more common plants (and their common names) that have developed these chemicals as a defense include: ... <i>Calotropis gigantea</i> "
	Chopra, R. N., Badhwar, R. L., & Ghosh, S. (1949). Poisonous Plants of India. Government of India Press, Delhi	"The leaves have also been administered with food in criminal poisoning. Sometimes these plants are used as a cattle poison."
	Nelson, L., Shih, R.D. & Balick, M.J. 2007. Handbook of Poisonous and Injurious Plants, The New York Botanical Garden. Springer, New York, NY	"Toxic Part: The latex has a direct irritant action on mucous membranes, particularly in the eye. Skin reactions to this plant may be caused by allergy rather than to a direct irritant action. All parts of the plant contain a cardioactive steroid and calcium oxalate crystals."

406	Host for recognized pests and pathogens	
	<b>Source(s)</b>	<b>Notes</b>
	Missouri Botanical Garden. 2018. <i>Calotropis gigantea</i> . <a href="http://www.missouribotanicalgarden.org">http://www.missouribotanicalgarden.org</a> . [Accessed 22 Mar 2018]	"No serious insect or disease problems."
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	"The leaf hopper <i>Poecilocus pictus</i> is a pest of <i>Calotropis gigantea</i> plants. The oleander aphid ( <i>Aphis nerii</i> ) and the caterpillars of the tiger butterfly ( <i>Danaus chrysippus</i> ) and of the monarch butterfly ( <i>Danaus plexippus</i> ) feed on <i>Calotropis</i> spp., using the cardenolides as a chemical defence mechanism. The nematodes <i>Meloidogyne incognita</i> and <i>Meloidogyne javanica</i> are found on the roots of <i>Calotropis gigantea</i> in India, although the leaf extract kills them. A sap transmissible mosaic disease of <i>Calotropis gigantea</i> is transmitted by <i>Aphis nerii</i> ."

407	Causes allergies or is otherwise toxic to humans	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 20 Mar 2018]	"All parts of <i>Calotropis gigantea</i> are toxic, due to the presence of several cardiac glycosides (cardenolides)." ... " <i>Calotropis gigantea</i> is also known to cause allergic contact dermatitis, and the latex causes kerato-conjunctivitis."
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"All parts of the crownflower plant contain cardiac glycosides that cause poisoning if eaten; however, because of its acrid taste, poisonous quantities are rarely ingested."
	Chopra, R. N., Badhwar, R. L., & Ghosh, S. (1949). <i>Poisonous Plants of India</i> . Government of India Press, Delhi	"In India the juice of these plants is said to be used for infanticide, the fresh juice being forced down the throat of the infant. It is also used as an abortifacient, and for this purpose it is either given internally or painted over the mouth of the womb, through the vagina, when it sets up intense irritation. The juice is sometimes used for suicidal, but rarely for homicidal purposes. The leaves have also been administered with food in criminal poisoning. Sometimes these plants are used as a cattle poison."
	Nelson, L., Shih, R.D. & Balick, M.J. 2007. <i>Handbook of Poisonous and Injurious Plants</i> , The New York Botanical Garden. Springer, New York, NY	"Toxic Part: The latex has a direct irritant action on mucous membranes, particularly in the eye. Skin reactions to this plant may be caused by allergy rather than to a direct irritant action. All parts of the plant contain a cardioactive steroid and calcium oxalate crystals."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	Logan, N. (2011). <i>Community Fire Protection and Arid Ecosystem Restoration in Leeward Hawaii Island</i> . Integrated Living Systems Design, LLC. <a href="https://permaculturglobal.org/projects/779-community-fire-protection-and-arid-ecosystem-restoration-in-leeward-hawaii-island">https://permaculturglobal.org/projects/779-community-fire-protection-and-arid-ecosystem-restoration-in-leeward-hawaii-island</a> . [Accessed 22 Mar 2018]	"This pilot study analysis identifies species and costs associated with developing living fuel breaks in coastal leeward Hawaii." [ <i>Calotropis gigantea</i> proposed as a potential living fire break]
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	[Unknown. No evidence, but may contribute to fuel load in fire prone, dry habitats] " <i>Calotropis gigantea</i> grows in dry uncultivated land, open waste land, along roadsides and railways, up to 1000 m altitude."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Plants for a Future. 2018. <i>Calotropis gigantea</i> . <a href="https://www.pfaf.org">https://www.pfaf.org</a> . [Accessed 20 Mar 2018]	"It cannot grow in the shade." ... "Prefers a well-drained soil in a sunny position[ 302 ]."
	Missouri Botanical Garden. 2018. <i>Calotropis gigantea</i> . <a href="http://www.missouribotanicalgarden.org">http://www.missouribotanicalgarden.org</a> . [Accessed 20 Mar 2018]	"Sun: Full sun" ... "Thrives in medium moisture, well-drained soils in full sun."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Kumar, P. S., Suresh, E., & Kalavathy, S. (2013). Review on potential herb <i>Calotropis gigantea</i> (L.) R. Br. Scholars Academic Journal of Pharmacy, 2(2), 135-143	"... prefers disturbed sandy soils with mean annual rainfall: 300-400 mm." ... "The plant grows very well in a variety of soils and different environmental conditions" ... "It thrives on poor soils particularly where overgrazing has removed competition from native grasses"
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 20 Mar 2018]	"It grows on a variety of soils, but prefers littoral sandy soils, and in different climates, but usually with a periodic dry period."
	Plants for a Future. 2018. <i>Calotropis gigantea</i> . <a href="https://www.pfaf.org">https://www.pfaf.org</a> . [Accessed 20 Mar 2018]	"Prefers a well-drained soil in a sunny position[ 302 ]. Succeeds in a variety of soils, but prefers littoral, sandy soils[ 299 ]."

411	Climbing or smothering growth habit	n
	<b>Source(s)</b>	<b>Notes</b>
	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	"Shrubs 1–5 m tall."

412	Forms dense thickets	
	<b>Source(s)</b>	<b>Notes</b>
	Cavalcante, A., & Major, I. (2006). Invasion of alien plants in the Caatinga biome. <i>AMBIO: A Journal of the Human Environment</i> , 35(3), 141-143	[Forming clusters, which indicates that denser infestations may eventually become established] "One way or the other, one thing seems certain, based on the observations made so far: it is the most aggressive phytoinvader of the Caatinga, occurring sporadically or forming clusters in the most diverse places in this biome. All these places have in common the fact that they have suffered previous human interference."
	Kumar, P. S., Suresh, E., & Kalavathy, S. (2013). Review on potential herb <i>Calotropis gigantea</i> (L.) R. Br. Scholars Academic Journal of Pharmacy, 2(2), 135-143	[No evidence] "Through its wind and animal dispersed seeds, it quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures. It has a preference for and is often dominant in areas of abandoned cultivation especially disturbed sandy soils and low rainfall. It is assumed to be an indicator of over cultivation"
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	[Unknown. No evidence] " <i>Calotropis gigantea</i> grows in dry uncultivated land, open waste land, along roadsides and railways, up to 1000 m altitude."

Qsn #	Question	Answer
501	<b>Aquatic</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	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	[Terrestrial] "Shrubs 1–5 m tall." ... "Woods of dry areas, stream banks; 0–1400 m."

502	<b>Grass</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2018]	Family: Apocynaceae Subfamily: Asclepiadoideae Tribe: Asclepiadeae Subtribe: Asclepiadinae

503	<b>Nitrogen fixing woody plant</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2018]	Family: Apocynaceae Subfamily: Asclepiadoideae Tribe: Asclepiadeae Subtribe: Asclepiadinae

504	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	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	"Shrubs 1–5 m tall."

601	<b>Evidence of substantial reproductive failure in native habitat</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	"No germplasm collections of <i>Calotropis gigantea</i> are known. The ease of growing <i>Calotropis gigantea</i> and its widespread occurrence in villages, in sandy areas and on seashores means that it is in no danger of genetic erosion."

602	<b>Produces viable seed</b>	y
	<b>Source(s)</b>	<b>Notes</b>
	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	"Because fruit rarely forms, seed is not readily available."

Qsn #	Question	Answer
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	" <i>Calotropis gigantea</i> can be propagated by seed or stem cuttings. The seeds are dispersed by wind and water. It can also be multiplied by tissue culture methods such as cell suspension cultures."

603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	
	Source(s)	Notes
	Lemus-Jiménez, L. J., & Ramírez, N. (2005). Breeding systems of the Paraguana coastal plain plants, Venezuela. <i>Revista de Biología Tropical</i> , 53(3-4), 415-430	[Listed as auto-incompatible] "ANEXO 1 Producción de frutos y semillas de acuerdo a tratamientos de autopolización y polinización cruzada, resultados de las pruebas estadísticas y conclusión del sistema genético de reproducción para 50 especies de la planicie costera de la Península de Paraguaná." [ <i>Calotropis gigantea</i> - Al: Autoincompatible]
	Liu, P., Liu, H. M., Wan, L. C., Li, L., Zheng, Y., & Zhang, T. K. (2015). Floral Syndrome and Breeding System of <i>Calotropis gigantea</i> . <i>Acta Horticulturae Sinica</i> , 10, 017	[Partly self-compatible, but requires pollinators under natural conditions] "The hybridization indexes of 4 indicated that the breeding was the outcrossing and partly self compatible, and demanded the pollinators. That the pollination on the anther slit instead of the stigma had certain limitations was surveyed through the test of the hand-pollinate on the <i>C. gigantea</i> ." ... "There were no spontaneous self-pollination phenomenon and no apomixis phenomenon under field conditions."

605	Requires specialist pollinators	y
	Source(s)	Notes
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 20 Mar 2018]	" <i>Calotropis gigantea</i> is fast growing and flowers throughout the year, but especially during the hot season. It is primarily pollinated by bees, butterflies and wasps."

Qsn #	Question	Answer
	<p>Bufford, J. L., &amp; Daehler, C. C. (2014). Sterility and lack of pollinator services explain reproductive failure in non-invasive ornamental plants. <i>Diversity and Distributions</i>, 20(8), 975-985</p>	<p>"We found that supplemental pollination results in fruit set in the milkweed <i>C. gigantea</i>, a species which otherwise does not produce fruit in Hawai'i, strongly suggesting that lack of pollination services limits seed set and invasiveness of this species in Hawai'i. <i>C. gigantea</i> flowers in the native range are pollinated by several <i>Xylocopa</i> species, which are slightly larger than <i>X. sonorina</i> Smith, found in Hawai'i (Wanntorp, 1974; Ramakrishna &amp; Arekal, 1979). <i>X. sonorina</i> therefore may not have the right physical configuration to effect pollination. In figs, the arrival of fig wasps has resulted in the production of seeds and invasive spread of some species of fig (Nadel et al., 1992). Should an appropriate pollinator for <i>C. gigantea</i> arrive in Hawai'i, it could become invasive, as it is recognized as invasive elsewhere (Keigh &amp; Longman, 2004; Cavalcante &amp; Major, 2006; D. Eisikowitch pers. comm.). The large carpenter bees that pollinate <i>C. gigantea</i> in its native range could be introduced with wood products, where they can nest, but would be easier to detect than fig wasps as an accidental arrival and are not likely to be introduced deliberately. While the risk of invasion following pollinator introduction is substantial, screening could reduce the risk of the introduction of an appropriate pollinator for <i>C. gigantea</i>."</p>

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	<p>Smith, N.M. (2002). <i>Weeds of the Wet/Dry Tropics of Australia -a Field Guide</i>. Environment Centre NT, Inc., Darwin, N.T.</p>	<p>"Seeds spread by wind and water over large distances. Local stands increased in size by suckering. Also spread as an ornamental plant."</p>

607	Minimum generative time (years)	1
	Source(s)	Notes
	<p>Bebawi, F. F., Campbell, S. D., &amp; Mayer, R. J. (2015). Seed bank longevity and age to reproductive maturity of <i>Calotropis procera</i> (Aiton) WT Aiton in the dry tropics of northern Queensland. <i>The Rangeland Journal</i>, 37(3), 239-247</p>	<p>[Able to produce seeds in &lt;1 year] "In Experiment 2 time to reach reproductive maturity was studied. The latter experiment included its sister species, <i>C. gigantea</i> (L.) W.T. Aiton, for comparison and two separate seed lots were tested in 2009 and 2012 to determine if exposure to different environmental conditions would influence persistence." ... "Experiment 2 showed that both <i>C. procera</i> and <i>C. gigantea</i> plants could flower once they had reached an average height of 85 cm. However, they differed significantly in terms of basal diameter at first flowering with <i>C. gigantea</i> significantly smaller (31 mm) than <i>C. procera</i> (45 mm). On average, <i>C. gigantea</i> flowered earlier (125 days vs 190 days) and set seed earlier (359 days vs 412 days) than <i>C. procera</i>." ... "Significant differences (<math>P &lt; 0.05</math>) in days to flowering occurred between <i>C. procera</i> and <i>C. gigantea</i> (Fig. 8). Plants of <i>C. gigantea</i> took between 116 and 146 days to flower (average, 125 days) after germination, whereas <i>C. procera</i> took between 125 and 250 days (average, 190 days). Similarly, days to seed production differed significantly (<math>P &lt; 0.05</math>), with <i>C. gigantea</i> producing seed between 352 and 365 days after germination (average, 359 days), compared with 399–425 days for <i>C. procera</i> (average, 412 days)."</p>



Qsn #	Question	Answer
701	<b>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Kumar, P. S., Suresh, E., & Kalavathy, S. (2013). Review on potential herb <i>Calotropis gigantea</i> (L.) R. Br. <i>Scholars Academic Journal of Pharmacy</i> , 2(2), 135-143	[Wind-dispersed, but hairs on seeds may aid in attachment] "Through its wind and animal dispersed seeds, it quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures."

702	<b>Propagules dispersed intentionally by people</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	" <i>C. gigantea</i> is now cultivated as an ornamental in tropical regions worldwide and has become widely naturalized..."

703	<b>Propagules likely to disperse as a produce contaminant</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Because fruit rarely forms, seed is not readily available." [Wind-dispersed seeds rarely formed in Hawaiian Islands, & unlikely to become a contaminant]

704	<b>Propagules adapted to wind dispersal</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Cavalcante, A., & Major, I. (2006). Invasion of alien plants in the Caatinga biome. <i>AMBIO: A Journal of the Human Environment</i> , 35(3), 141-143	"... fruits are greenish, round, filled with air, 8-11 cm long, and they bear several white-haired seeds (Table 1) which are dispersed into remote territories by the fierce winds of September and October."
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 20 Mar 2018]	"Seeds ovoid, 5–6 mm long, with 2–3 cm long coma at one end." ... "The seeds are dispersed by wind and water."

705	<b>Propagules water dispersed</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	"Seeds ovoid, 5–6 mm long, with 2–3 cm long coma at one end." ... "The seeds are dispersed by wind and water." [Although seeds rarely produced in Hawaiian Islands]

706	<b>Propagules bird dispersed</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	"Seeds ovoid, 5–6 mm long, with 2–3 cm long coma at one end." ... "The seeds are dispersed by wind and water."
	Kumar, P. S., Suresh, E., & Kalavathy, S. (2013). Review on potential herb <i>Calotropis gigantea</i> (L.) R. Br. <i>Scholars Academic Journal of Pharmacy</i> , 2(2), 135-143	[No evidence of bird dispersal] "Through its wind and animal dispersed seeds, it quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures."

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	Kumar, P. S., Suresh, E., & Kalavathy, S. (2013). Review on potential herb <i>Calotropis gigantea</i> (L.) R. Br. <i>Scholars Academic Journal of Pharmacy</i> , 2(2), 135-143	[Described as animal-dispersed. Hairs on seeds may aid in external attachment, but direct evidence not provided] "Through its wind and animal dispersed seeds, it quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Jiofack Tafokou, R.B. 2010. <i>Calotropis gigantea</i> (L.) W.T.Aiton. [Internet] Record from PROTA4U. Schmelzer, G.H. & Gurib-Fakim, A. (Editors). PROTA (Plant Resources of Tropical Africa). Wageningen, Netherlands. <a href="http://www.prota4u.org/search.asp">http://www.prota4u.org/search.asp</a> . [Accessed 22 Mar 2018]	"The seeds are dispersed by wind and water." [No evidence of consumption]

801	Prolific seed production (>1000/m <sup>2</sup> )	n
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Because fruit rarely forms, seed is not readily available."
	Whistler, W.A. 2000. <i>Tropical Ornamentals: A Guide</i> . Timber Press, Portland, OR	"FRUIT an oblong to ovoid follicle 7-10 cm long (3-4 in) with silky-tufted seeds but infrequently formed in cultivation." [Seed set apparently low in the Hawaiian islands]
	Bebawi, F. F., Campbell, S. D., & Mayer, R. J. (2015). Seed bank longevity and age to reproductive maturity of <i>Calotropis procera</i> (Aiton) WT Aiton in the dry tropics of northern Queensland. <i>The Rangeland Journal</i> , 37(3), 239-247	"It is also likely that the prolific production of seeds by <i>C. procera</i> (485.7 ± 10.1) compared with <i>C. gigantea</i> (126.5 ± 12.2) may be contributing to the pre-dominance of the former in the Australian rangelands."
	Bufford, J. L., & Daehler, C. C. (2014). Sterility and lack of pollinator services explain reproductive failure in non-invasive ornamental plants. <i>Diversity and Distributions</i> , 20(8), 975-985	"We found that supplemental pollination results in fruit set in the milkweed <i>C. gigantea</i> , a species which otherwise does not produce fruit in Hawai'i, strongly suggesting that lack of pollination services limits seed set and invasiveness of this species in Hawai'i."

Qsn #	Question	Answer
802	<b>Evidence that a persistent propagule bank is formed (&gt;1 yr)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Bebawi, F. F., Campbell, S. D., & Mayer, R. J. (2015). Seed bank longevity and age to reproductive maturity of <i>Calotropis procera</i> (Aiton) WT Aiton in the dry tropics of northern Queensland. <i>The Rangeland Journal</i> , 37(3), 239-247	[Seeds of related species lose viability between 15 & 24 months] "Both seed lots demonstrated a rapid decline in viability over the first 3 months and declined to zero between 15 and 24 months after burial. In Experiment 1, longevity appeared to be most influenced by rainfall patterns and associated soil moisture, burial depth and soil type, but not the level of pasture cover."

803	<b>Well controlled by herbicides</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Weber, E. 2003. <i>Invasive Plant Species of the World. A Reference Guide to Environmental Weeds</i> . CABI Publishing, Wallingford, UK	[Herbicides that are used to control <i>C. procera</i> would likely be effective on <i>C. gigantea</i> ] " <i>Calotropis procera</i> " ... "Actively growing seedlings and larger plants can be treated with a mixture of 2,4-D and picloram. In the case of mature plants, herbicides may also be applied to the basal bark"

804	<b>Tolerates, or benefits from, mutilation, cultivation, or fire</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Tolerates hard pruning] "Crownflower is sometimes used as an informal untrimmed hedge, but more often it is kept pruned short so that the flowers can be harvested easily. A hard pruning back down to the trunk or main branches produces a flush of new shoots and flowers; a light pruning is helpful to shape the plant."

805	<b>Effective natural enemies present locally (e.g. introduced biocontrol agents)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Pests are few, though heavy infestations of the gaudy black-and-white caterpillars of the monarch butterfly may defoliate plants. The caterpillars do not do permanent harm to the plant and are best left alone, though carbaryl dust or a biological control agent (such as a spray containing the bacterium <i>Bacillus thuringensis</i> ) eliminates them."

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Thrives in tropical climates
- Naturalized on Kauai, Oahu, Molokai, Maui (Hawaiian Islands) & several locations worldwide
- A disturbance-adapted weed with potential impacts to agriculture & natural areas
- *Calotropis procera* is an invasive weed
- Unpalatable to browsing & grazing mammals
- Toxic to animals & people
- Tolerates many soil types
- Reproduces by seeds (rarely in Hawaii) & vegetatively by suckering
- Able to reach maturity in <1 year
- Seeds, when produced, dispersed by wind, water & intentionally by people
- Tolerates hard pruning

## Low Risk Traits

- Unarmed (no spines, thorns, or burrs)
- Thrives in full sun & high light environments
- Ornamental & host plant of monarch butterflies
- Limited or absent seed set in Hawaiian Islands reduces risk of inadvertent dispersal or spread
- Herbicides may provide effective control