

Taxon: Cleome gynandra	Family: Cleomaceae
Common Name(s): spider wisp African spider-flower bastard-mustard cat's-whiskers wild spider flower	Synonym(s): Cleome pentaphylla L. Gynandropsis gynandra (L.) Briq. Gynandropsis pentaphylla (L.) DC.

Assessor: Assessor	Status: Assessor Approved	End Date: 9 Sep 2014
WRA Score: 11.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Tropical Herb, Agricultural Weed, Palatable, Self-Compatible, Annual

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

Qsn #	Question	Answer Option	Answer
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	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	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	n
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal		
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[No evidence for wild type occurring in Hawaiian Islands] "There is also variation among plants for days to seedling emergence and vigour, flowering tendency, position of fruit, fruit length, disease susceptibility and plant lodging. Table 5 summarizes the range of variation for some characters/traits."
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	[No evidence for wild type that occurs in the Hawaiian Islands] "Most farmers use their own local selections. Several seed producers and institutes have made selections from these landraces. The offspring from these selections were found to be rather variable even when self-pollination was applied. AVRDC in Arusha, Tanzania has both a green-stemmed and a purple-stemmed selection and seeds are made available. Similarly, Zambia Seed Company has produced seed for distribution to farmers. In Kenya a cultivar called 'Saget' is sold in seed shops and local selections are sold at rural markets. There is clearly scope for further research here. The focus of genetic improvement is on higher leaf yield, plant uniformity, longer vegetative phase and drought tolerance. The leaf yield is highly influenced by the environment and therefore shows low heritability."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2014. 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
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"The origin of <i>Cleome gynandra</i> is not known. There are claims that it has a southern Asian origin, but others suggest that it originates from Africa or Central America. <i>Cleome gynandra</i> occurs throughout the tropics and subtropics. In Africa, it is mainly found near human settlements, possibly escapes from earlier introductions. It occurs probably in all countries of tropical Africa."

202	Quality of climate match data	High
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Qsn #	Question	Answer
	Source(s)	Notes
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"The species is adapted to a wide range of environmental conditions. It grows well from sea level up to 2400 m asl, and tolerates high and low temperatures, but thrives from 18 to 25°C."
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	[Occurs in tropical climates, but elevation range exceeds 1000 m, demonstrating environmental versatility] " <i>Cleome gynandra</i> occurs from sea level up to 2400 m altitude and requires warm conditions; growth is hampered below 15°C. It is less common in areas with a very humid climate. It tolerates some drought, but water stress hastens maturity and senescence. It is insensitive to daylength."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"The origin of <i>Cleome gynandra</i> is not known. There are claims that it has a southern Asian origin, but others suggest that it originates from Africa or Central America. <i>Cleome gynandra</i> occurs throughout the tropics and subtropics. In Africa, it is mainly found near human settlements, possibly escapes from earlier introductions. It occurs probably in all countries of tropical Africa."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"The species has been introduced to such Caribbean islands as the Bahamas and Bermuda, Cuba, southeastern USA (Florida, Kentucky and Louisiana), southern, midwestern and southwestern USA, Mexico, Puerto Rico, Colombia, Venezuela, Bolivia, Peru, Brazil, Paraguay, Argentina, Uruguay, Chile, the Iberian Peninsula, Italy, France, Central and Northern Europe (including Great Britain), the former USSR, China, Japan, Korea, Philippines, Australia, New Zealand and the Pacific islands (Kuhn 1988)."

301	Naturalized beyond native range	y
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Qsn #	Question	Answer
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 9 Sep 2014]	"Naturalized: NORTHERN AMERICA Mexico United States SOUTHERN AMERICA Caribbean: West Indies Mesoamerica: Central America South America"
	Smith, A.C. 1981. Flora Vitiensis Nova - A New Flora of Fiji (Spermatophytes Only). Volume 2. Pacific Tropical Botanical Garden, Lawai, HI	[Fiji] "a naturalized weed near sea level, in cultivated fields, especially canefields, and along roadsides"
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Kauai, Oahu, Molokai, Lanai, Maui, Hawaii] "naturalized in low elevation, dry areas, especially along roadsides and in pastures"

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[An agricultural weed] "Cat's whiskers is still regarded as a weed, or 'volunteer' crop. Its leaves are gathered for use, and some ethnic groups in Africa do cultivate the crop as a vegetable in home gardens, or near homesteads."

303	Agricultural/forestry/horticultural weed	y
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. World weeds: natural histories and distribution. John Wiley and Sons, Inc., New York, NY	" <i>C. gynandra</i> is a weed of 19 crops in over 40 countries (Figure 26-1). It is a principal weed of cotton and pastures in Colombia and maize in Tanzania. It is a common weed of cotton in the Philippines and Sudan; cowpeas, millet, and upland rice in Senegal; maize in the Philippines and Senegal; peanuts and sorghum in Senegal and Sudan; sugarcane in Bangladesh and the Philippines; and vegetables in Thailand. It is also a weed of unknown rank in edible beans in Tanzania; cacao, cassava, maize, oil palm, rubber, and tea in Indonesia; cereals in Kenya; coffee in East Africa; cotton in Mozambique; legumes in the Philippines; maize in Cambodia, Indonesia, and India; peanuts in Taiwan; rice in Bangladesh, Burma, Cambodia, India, Laos, Malaysia, Thailand, and Vietnam; upland rice in the Philippines, Senegal, Sri Lanka, and Taiwan; soybeans and sweet potatoes in Taiwan; sugarcane in Hawaii, India, and Taiwan; tobacco in the Philippines; tomatoes in Ghana and Puerto Rico; and vegetables in Laos, Saudi Arabia and Taiwan."

Qsn #	Question	Answer
	<p>Minzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 9 Sep 2014]</p>	"Spiderplant is a weed in crops on fertile well-manured soils."
	<p>Chweya, J. A. and Minzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy</p>	"The cat's whiskers (<i>Cleome gynandra</i> L./ <i>Gynandropsis gynandra</i> (L.) Briq.) is one such vegetable, which grows as a weed in most tropical countries, but is a semicultivated popular tropical leafy vegetable in many parts of sub-Saharan Africa, especially in most countries in eastern and southern Africa."

304	Environmental weed	n
	Source(s)	Notes
	<p>Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. <i>World weeds: natural histories and distribution</i>. John Wiley and Sons, Inc., New York, NY</p>	"C. gynandra is a weed of 19 crops in over 40 countries..."

305	Congeneric weed	y
	Source(s)	Notes
	<p>Waterhouse, B. M. 2003. Know your enemy: recent records of potentially serious weeds in northern Australia, Papua New Guinea and Papua (Indonesia). <i>Telopea</i>, 10(1): 477-485</p>	" <i>Cleome rutidosperma</i> is a perennial herb native to Africa. It has recently become an important weed of crops and disturbed sites throughout South-East Asia, with particularly rapid expansion of its range in Indonesia (Soerjani et al. 1987)."
	<p>Randall, R.P. 2012. <i>A Global Compendium of Weeds</i>. 2nd Edition. Department of Agriculture and Food, Western Australia</p>	Multiple species listed as naturalized and/or weeds

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	<p>Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i>. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.</p>	"Annual herbs 5-15 dm tall; stems unbranched to sparsely branched, glandular pubescent, the hairs of several lengths, but not spiny. Leaflets 3-7, oblanceolate to rhombic, 2-7.5 cm long, 1-3.8 cm wide, margins serrulate to denticulate, petioles 3-9 cm long. Flowers in elongate racemes, each one subtended by 3-foliolate, sessile bracts; sepals 2.5-6 mm long; petals white, spatulate with a long claw, 1-2 cm long, not covering the stamens in bud; stamens 6, inserted on the gynophore 6-22 mm above the petals; filaments 8-22 mm long; gynophore with a visible scar in fruit. Capsules narrowly cylindrical, 3-11 cm long, 4-5 (-6) mm in diameter. Seeds numerous, tuberculate"

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Punjani, B. L., & Patel, U. A. 2006. Allelopathic Potential of <i>Cleome gynandra</i> L. leaf extracts on Germination and Seedling growth of Wheat. <i>Geobios-Jodhpur</i> , 33(1): 101	[Demonstrates allelopathic potential in experimental conditions]
	Rizvi, S.J.H. & Rizvi, V. 1992. Allelopathy: Basic and Applied Aspects. Chapman & Hall, London, UK	Hepperly et. al describe the allelopathic effects of pigeon pea against weeds such as <i>Cleome gynandra</i>

403	Parasitic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Not parasitic] "Annual herbs 5-15 dm tall; stems unbranched to sparsely branched, glandular pubescent, the hairs of several lengths, but not spiny."

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Bovines, camels, equines and game animals graze the leaves as forage."

405	Toxic to animals	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Insecticidal properties, but no evidence of mammalian toxicity] " <i>Cleome gynandra</i> plants have been observed to have insecticidal, antifeedant and repellent characteristics (Verma and Pandey 1981, 1987; Pandey et al. 1983a, 1983b; Singh 1983a; Chandel et al. 1987; Akhtar 1990; Malonza et al. 1992; Pipithsangchan 1993)." ... "The plant has an anti-feedant action against the tobacco caterpillar (<i>Spodoptera litura</i> F.)." ... "Bovines, camels, equines and game animals graze the leaves as forage."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	y
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"A number of factors currently constrain the cultivation and use of the species: <ul style="list-style-type: none"> • it harbours pests (notably pentatomids, locusts and nematodes) • it is a host to diseases such as powdery mildew."
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. World weeds: natural histories and distribution. John Wiley and Sons, Inc., New York, NY	" <i>C. gynandra</i> hosts the root-knot nematode that attacks pineapples in Hawaii (Bendixen et al. 1979) and the insect <i>Crocidolomia binotalis</i> , a pest of oilseed rape in India (Sen 1981)."

Qsn #	Question	Answer
	<p>Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 9 Sep 2014]</p>	<p>"The main fungal diseases are powdery mildew (<i>Sphaerotheca fuliginea</i>, <i>Oidiopsis taurica</i>) and leaf spot (<i>Cercospora uramensis</i>). Cabbage aphid (<i>Brevicoryne brassicae</i>) is a serious pest causing stunted growth and wrinkling of the leaves and growing tips; it possibly spreads virus diseases. This aphid has recently caused total crop failure in Tanzania. The hurricane bug (<i>Bagrada</i> spp.) may similarly affect spiderplant; the attacks are more prevalent during dry periods, but can be effectively controlled with insecticides. Spiderplant can be attacked by many other insects, e.g. pentatomids (<i>Acrosternum gramineum</i> and <i>Agonoselis nubilis</i>) and flea beetles. It is susceptible to root-knot nematodes (<i>Meloidogyne</i> spp.). Young seeds are eaten by weaver birds. Fruits can also harbour insects that consume the young seeds. American bollworms are frequently found inside the fruits. When a crop is grown for leaves and seed, application of insecticides should be considered from the moment that harvesting of leaves has come to an end."</p>

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	<p>Quattrocchi, U.. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL</p>	<p>"Seeds and bruised leaves extremely irritant."</p>
	<p>Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp. [Accessed 9 Sep 2014]</p>	<p>[No evidence] "The tender leaves, young shoots and occasionally flowers are eaten boiled as potherb, relish, stew or side dish. The leaves are utilized in fresh form or dried as powder. Sometimes the leaves are bitter and then cooked with milk and/or with other leafy vegetables such as cowpea leaves, amaranth, nightshades (<i>Solanum</i> spp.) and <i>Cleome monophylla</i> L. In other areas the leaves are boiled and the cooking water is discarded. In several countries, pounded groundnut paste (peanut butter) is added to improve the flavour. The leaves may be blanched, made into small balls and sun- or air-dried. This is a popular product in southern Africa, which finds a ready market when available during the rainy season. These balls or leaf powder can be stored up to a year and are soaked in water before being used in cooking. The seeds may be used as a substitute for mustard. In several communities, boiled spiderplant leaves are traditionally given to mothers before and after delivery of a child, and in other situations where blood has been lost, e.g. to warriors. Similarly, an infusion of the leaves is used to treat anaemia. The leaves and seeds are used medicinally as rubefacient and vesicant, and to treat rheumatism, externally as well as internally. An infusion of the roots is used as a medicine for chest pain, the leaves to treat diarrhoea. Spiderplant seeds thrown in water can kill fish, which then float to the surface. The glands on the stems and leaves have insect repellent properties; cabbage and related crops intercropped with spiderplant suffer less from diamond back moth larvae. Similarly, in French bean intercropped with spiderplant, the beans are less affected by flower thrips and are therefore of better quality for export. The seeds are used to feed birds. The seed contains an edible polyunsaturated oil, which is extracted by simple pressing and does not need refining. The seed cake can be used as animal food."</p>

Qsn #	Question	Answer
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[No evidence] "The uses of <i>Cleome gynandra</i> make it clear that the species has the following important characteristics that call for its conservation and utilization: - it is a highly nutritious leafy vegetable (a rich source of vitamins A and C, and of calcium, iron and protein) - it is known to rural populations, especially in Africa, where the vegetable is sold in rural and urban areas, providing a source of income"

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[May occur in some fire prone areas, but no evidence that it contributes significantly to fuel loads or fire risk] "naturalized in low elevation, dry areas, especially along roadsides and in pastures"
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. World weeds: natural histories and distribution. John Wiley and Sons, Inc., New York, NY	[No evidence] "This tropical and subtropical species is often found in cultivated or fallowed fields, along roadsides, in fence rows, and along irrigation canals and ditches. [It] adapts to moist soils along rivers and irrigation canals and to semi-arid conditions. It grows from sea level to 2400 m in Africa"

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Plants do not grow well under shade, as they require high light intensity."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"It grows well up to about 1000 m asl in semi-arid, subhumid and humid climates, and is adapted to many soil types, but grows luxuriantly around rubbish dumps and soils supplied with organic manure."
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"Spiderplant is found on a wide range of soils, mostly on sandy to clayey loam, provided they are deep and well drained with pH 5.5–7.0. It prefers soils with high organic matter and adequate mineral reserves."

411	Climbing or smothering growth habit	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual herbs 5-15 dm tall; stems unbranched to sparsely branched, glandular pubescent, the hairs of several lengths, but not spiny. "

412	Forms dense thickets	n
	Source(s)	Notes
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"Spiderplants do not form a dense leaf cover, so that weeding is needed especially during the first 6 weeks."
	Ilitis, H. H. 1960. Studies in the Capparidaceae—VII old world <i>Cleomes</i> adventive in the new world. <i>Brittonia</i> , 12 (4), 279-294	[No evidence] "A common weed throughout most of the tropics and subtropics of the world; introduced from Africa into the Caribbean region at an early date probably with the slave trade, occurring now from the southeastern United States (North Carolina to Texas) to Mexico, the West Indies, and Brazil; in waste places, gardens, fields, streets, on roadsides and seashores, in calcareous, sandy or alluvial soils, often so well established as to appear indigenous; at altitudes from sea level to 900 meters."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "naturalized in low elevation, dry areas, especially along roadsides and in pastures"

501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "naturalized in low elevation, dry areas, especially along roadsides and in pastures"

502	Grass	n
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 9 Sep 2014]	Cleomaceae

Qsn #	Question	Answer
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 9 Sep 2014]	Cleomaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"Erect annual herb up to 150 cm tall, strongly branched, with long taproot and few secondary roots; stem densely glandular."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	[Exact area of origin unknown, but widespread & with no signs of reproductive failure throughout range] "The origin of <i>Cleome gynandra</i> is not known. There are claims that it has a southern Asian origin, but others suggest that it originates from Africa or Central America. <i>Cleome gynandra</i> occurs throughout the tropics and subtropics. In Africa, it is mainly found near human settlements, possibly escapes from earlier introductions. It occurs probably in all countries of tropical Africa."

602	Produces viable seed	y
	Source(s)	Notes
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"There are approximately 1250 seeds per g. Traditionally new crops of spiderplant are established spontaneously from natural seed dispersal."

603	Hybridizes naturally	
	Source(s)	Notes

Qsn #	Question	Answer
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Possibly] "As is noted in section 2 above, <i>C. gynandra</i> plants could be both self- and crosspollinated. It is possible, therefore, to produce hybrids. Although the specific mating system is not yet known, inbreeding is possible because the plants are selfpollinating. Interspecific crosses between <i>C. gynandra</i> and its relatives could be possible. However, no cytogenetic studies have been carried out. There is already a debate in the literature regarding the number of chromosomes. Koshy and Mathew (1985) report 2n=34, while Raghavan and Kamble (1979) report 2n=20. Polyploidy has also been shown to occur (Darlington and Wylie 1955; Hanumantha Rao et al. 1978)."

604	Self-compatible or apomictic	y
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Although the pollination characteristics of <i>C. gynandra</i> have not been determined, it has been observed that plants in the species can be both self- and cross-pollinating. Observations on populations indicate uniformity for most characters (Omondi 1990). Such uniformity can only arise from a predominantly self-pollinating species. It is therefore possible that <i>C. gynandra</i> is predominantly self-pollinating, although this needs to be quantified."
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	" <i>Cleome gynandra</i> is both self- and cross-pollinated. In Venezuela plant populations with either male or female flowers were found. Such populations have not been recorded in Africa. In studies carried out in Zimbabwe in 2001 it was observed that some flowers first develop stamens, others first the pistil. A population has been found with a few plants that show male sterility, producing short anthers that do not shed pollen."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"There is likely to be a high rate of outcrossing, owing to diverse phenotypic variability, and the phenomenon of anthers dehiscing when flowers have been open for a long time and their stigmas exposed (Omondi 1990). Pollinators may include insects (especially honey bees), spiders and the wind."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Propagation is by seed. Viable seeds germinate within 4-5 days. Seed germination is erratic, occurring over an extended period, during the rainy season."

607	Minimum generative time (years)	1
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Qsn #	Question	Answer
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Plants tend to flower very early, within 4-6 weeks of growth. Yepes (1978) observed that, under Colombian conditions, the first flowers appear around 30 days after sowing. Fruit development and maturation take the longest time (3-4 months), and flowering may last for at least 2 months."
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"Plants tend to start flowering 4–6 weeks after germination, usually when 60–90 cm tall; stress can trigger flowering even at the seedling stages."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Annual. Able to reach maturity in 1 growing season] "Annual herbs 5-15 dm tall; stems unbranched to sparsely branched, glandular pubescent, the hairs of several lengths, but not spiny."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Possibly yes. Common along roadsides, and small size may allow for dispersal in mud stuck to vehicles, equipment or shoes] "naturalized in low elevation, dry areas, especially along roadsides and in pastures"

702	Propagules dispersed intentionally by people	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Intentionally cultivated in some locations, but regarded as a weed in the Hawaiian Islands] "The cat's whiskers (<i>Cleome gynandra</i> L./ <i>Gynandropsis gynandra</i> (L.) Briq.) is one such vegetable, which grows as a weed in most tropical countries, but is a semicultivated popular tropical leafy vegetable in many parts of sub-Saharan Africa, especially in most countries in eastern and southern Africa."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. World weeds: natural histories and distribution. John Wiley and Sons, Inc., New York, NY	[Probably yes, but no direct evidence found] "C. gynandra is a weed of 19 crops in over 40 countries (Figure 26-1). "

704	Propagules adapted to wind dispersal	
	Source(s)	Notes

Qsn #	Question	Answer
	South African National Biodiversity Institute. 2011. PlantzAfrica.com - <i>Cleome gynandra</i> . http://www.plantzafrica.com/plantcd/cleomegynandra2.htm . [Accessed 9 Sep 2014]	"Seeds are wind-dispersed."
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Wind may increase dispersal distance after dehiscence, but seeds are probably primarily gravity-dispersed] "The fruit is a long-stalked, dry, dehiscent silique, which is a spindle-shaped capsule measuring up to 12 cm long and 8-10 mm wide (Figs. 1, 2d). The capsules are green, turn yellow when ripe, and dehisce easily when dry, to release seeds. Seeds are small, suborbicular and sharply tuberculate, with many concentric ribs and irregular cross-ribs. They are rough and greyish-to-black in colour. The seed cleft is narrow. Each seed measures 1.0-1.5 mm in diameter."

705	Propagules water dispersed	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Small seeds may be secondarily dispersed by water, but habitat and growing conditions suggest that water is not an important dispersal vector] "The natural habitat of <i>C. gynandra</i> is wasteland and arable land with annual species as well as grasslands." ... "When rainfall is inadequate, frequent watering is necessary during the vegetative growth period, with frequency depending on the water-holding capacity of the soil. Care must be taken not to over-water the plants, as they do not withstand flooding."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Possibly, but fruit morphology suggests this is unlikely, and no other evidence or references found] "It is spread by birds, and by seed dispersal, owing to capsule dehiscence."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Small size may allow for occasional dispersal in mud stuck to animals, but seeds otherwise lack means of external attachment] "The fruit is a long-stalked, dry, dehiscent silique, which is a spindle-shaped capsule measuring up to 12 cm long and 8-10 mm wide (Figs. 1, 2d). The capsules are green, turn yellow when ripe, and dehisce easily when dry, to release seeds. Seeds are small, suborbicular and sharply tuberculate, with many concentric ribs and irregular cross-ribs. They are rough and greyish-to black in colour. The seed cleft is narrow. Each seed measures 1.0-1.5 mm in diameter." ... "It is spread by birds, and by seed dispersal, owing to capsule dehiscence."

708	Propagules survive passage through the gut	n

Qsn #	Question	Answer
	Source(s)	Notes
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	[Unknown if seeds would be consumed during browsing, or if they would survive passage through the guts of animals] "Bovines, camels, equines and game animals graze the leaves as forage."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. <i>World weeds: natural histories and distribution</i> . John Wiley and Sons, Inc., New York, NY	"Single plants produce over 500 seeds with an average weight of 1.3 mg each (Pancho 1964)."
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	"There are approximately 1250 seeds per g. Traditionally new crops of spiderplant are established spontaneously from natural seed dispersal."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. <i>World weeds: natural histories and distribution</i> . John Wiley and Sons, Inc., New York, NY	"Seeds remain viable for long periods."
	Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 9 Sep 2014]	"Storage Behaviour: Orthodox Storage Conditions: Long-term storage under IPGRI preferred conditions at RBG Kew, WP. Oldest collection 11 years"
	Chweya, J. A. and Mnzava, N. A. 1997. Cat's whiskers. <i>Cleome gynandra</i> L. Promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy	"Yepes (1978) planted freshly harvested seed at monthly intervals, for 13 consecutive months. It was determined that seeds have a rest period (latency) that extends to the 5th month after collection. Active germination starts 6 months after harvest, and increases to 88% in 3 months. Highest germination occurs after 12 months of storage, but this finding requires investigation, as the authors have observed that seeds from dry capsules germinate immediately after harvest."

803	Well controlled by herbicides	y
	Source(s)	Notes

Qsn #	Question	Answer
	Kannan, S., & Chinnagounder, C. 2014. Effect of glyphosate on weed management and grain yield in Kharif maize of transgenic stacked and conventional maize hybrids for higher productivity. African Journal of Agricultural Research, 9(2): 269-275	[Glyphosate provides effective control] "At 40 and 60 DAS, lower weed density (2.04 and 2.35) was observed under transgenic maize hybrid 30V92 with post emergence application of glyphosate at 1800 g a.e ha-1 resulted in effective control of broad leaved weeds, grasses and sedges due to its broad spectrum action (Wilcut et al., 1996). This may due to more impressive control of broadleaved weeds like T. portulacastrum, D. stramonium, C. gynandra and P. minima. Foliar application of glyphosate was readily and rapidly translocated throughout the actively growing aerial and underground portions at active growing stage of broadleaved weeds might have blocked the 5-Enulpyruvate shikimate-3-phosphate synthase enzyme and arrest the amino acid synthesis which led to complete control (Summons et al., 1995)."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Mnzava, N.A. & Chigumira Ngwerume, F., 2004. <i>Cleome gynandra</i> L. [Internet] Record from PROTA4U. Grubben, G.J.H. & Denton, O.A. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. http://www.prota4u.org/search.asp . [Accessed 9 Sep 2014]	[Ratoon cropping is growing a fresh crop from the stubbles or suckers of the plant crop without replanting. It is also referred to as stubble cropping, re-harvesting, second crop, etc] "Spiderplant is traditionally picked at the beginning of the rainy season when vegetables are scarce. In cultivation, seedlings are thinned when the plants reach a height of 15 cm, which constitutes the first harvest. When adequate space has been created, the top shoot from the remaining plants will be picked, allowing new side shoots to develop. Some farmers just pick the tender leaves and young shoots whilst others wait for the shoots to grow out and harvest these when they are about 25 cm long. This process of ratoon cropping can be repeated several times."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Unknown, but establishment presumably not limited by natural enemies in the Hawaiian Islands] "naturalized in low elevation, dry areas, especially along roadsides and in pastures"

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Widely naturalized (including all main Hawaiian Islands)
- Agricultural crop weed
- Other *Cleome* species are weedy & invasive
- Host for crop pests and pathogens
- Tolerates many soil types
- Self-compatible
- Produces viable seeds that are small & that may be dispersed by a number of different vectors
- Able to reach maturity in one growing season (annual)
- Seeds may form a persistent seed bank
- Tolerates repeated harvesting of leaves

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Palatable to animals and people
- Provides fodder for livestock
- Grows in full sun
- Non-toxic
- Not reported to spread vegetatively
- Herbicides may provide effective control