TAXON: *Cleome houtteana Schltdl.* **SCORE:** *11.0* **RATING:** *High Risk*

Taxon: Cleome houtteana Schltdl.

Family: Cleomaceae

Common Name(s): giant spider flower
grandfather's whiskers
pink queen
spider flower
spider plant
spider's legs

Synonym(s): Cleome hassleriana Chodat
Cleome sesquiorygalis Naudin ex
Tarenaya hassleriana (Chodat) Iltis

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 22 Sep 2022

WRA Score: 11.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Annual Herb, Naturalized Elsewhere, Weedy, Spiny, Self-Seeds

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

Qsn #	Question	Answer Option	Answer
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
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	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	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal		
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)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[Not domesticated] "Tarenaya hassleriana is native to Argentina, Brazil, and Paraguay. It is often cultivated and has sometimes escaped and naturalized. In cultivation and various floras, it has long been treated under the name Cleome spinosa; that name properly applies to the next species."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2022). 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**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"[native to South America (Argentina, Brazil, and Paraguay); widely cultivated and occasionally naturalized in tropical and warm-temperate regions]."
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Tarenaya hassleriana is native to Argentina, Brazil, and Paraguay."

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"[native to South America (Argentina, Brazil, and Paraguay); widely cultivated and occasionally naturalized in tropical and warm-temperate regions]."

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"USDA Plant Hardiness Zone: 10b, 10a, 11b, 11a"

Qsn #	Question	Answer
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Broad elevation range] "Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m. Introduced and sparingly escaped in Guangdong, Hainan, Jiangsu, Sichuan, Yunnan, and Zhejiang [native to South America (Argentina, Brazil, and Paraguay)"
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[Broad latitudinal distribution] "Flowering late spring-late summer. Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds; 0-200(-800) m; introduced; Que.; Ala., Ark., Conn., D.C., Fla., Ga., Ill., Ind., Iowa, Ky., La., Md., Mass., Mich., Miss., Mo., Nebr., N.J., N.Y., N.C., Ohio, Okla., Pa., R.I., S.C., Tenn., Tex., Va., W.Va., Wis. South America; introduced also in Mexico, West Indies, Central America. "

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m. Introduced and sparingly escaped in Guangdong, Hainan, Jiangsu, Sichuan, Yunnan, and Zhejiang [native to South America (Argentina, Brazil, and Paraguay); widely cultivated and occasionally naturalized in tropical and warm-temperate regions]."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Tarenaya hassleriana is native to Argentina, Brazil, and Paraguay. It is often cultivated and has sometimes escaped and naturalized. In cultivation and various floras, it has long been treated under the name Cleome spinosa; that name properly applies to the next species."
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Tarenaya hassleriana is a synonym of Cleome houtteana] "widely cultivated and occasionally naturalized in tropical and warm-temperate regions]."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Flowering late spring-late summer. Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds; 0-200(-800) m; introduced; Que.; Ala., Ark., Conn., D.C., Fla., Ga., Ill., Ind., Iowa, Ky., La., Md., Mass., Mich., Miss., Mo., Nebr., N.J., N.Y., N.C., Ohio, Okla., Pa., R.I., S.C., Tenn., Tex., Va., W.Va., Wis.; South America; introducec also in Mexico, West Indies, Central America. Tarenaya hassleriana is native to Argentina, Brazil, and Paraguay. It is often cultivated and has sometimes escaped and naturalized. In cultivation and various floras, it has long been treated under the name Cleome spinosa; that name properly applies to the next species."

Qsn #	Question	Answer
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m. Introduced and sparingly escaped in Guangdong, Hainan, Jiangsu, Sichuan, Yunnan, and Zhejiang [native to South America (Argentina, Brazil, and Paraguay); widely cultivated and occasionally naturalized in tropical and warm-temperate regions]."
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Wisconsin Horticulture. (2022). Spider flower, Cleome hassleriana. https://hort.extension.wisc.edu/articles/spider-flower-cleome-hassleriana/. [Accessed 21 Sep 2022]	"Although this plant self-seeds prolifically and has naturalized in some areas, it is generally not considered invasive as it rarely persists in undisturbed areas."
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds" [Occurs in disturbed habitats]
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"The plant re-seeds freely but is not considered invasive."
	Dave's Garden. (2022). Cleome houtteana. https://davesgarden.com/guides/pf/go/6/. [Accessed 21 Sep 2022]	[Regarded as a nuisance and invasive in gardens] "On Feb 25, 2006, catcollins from West Friendship, MD (Zone 6b) wrote: This plant can easily become invasive in central Maryland. When we moved into this house the entire north side was a thick field of spider flowers that had apparently been allowed to self seed for several years. They were lovely, but we soon discovered they were choking out some very nice plants, including azalea, hosta, liriope, butterfly weed, allium, and lillies. Since we moved in during late summer and the plants were already seeding out, we had no choice but to try to cut and individually bag this field of flowers to prevent another thicket next year. The thorns and foul smelling foliage made this a very unpleasant task. The following spring through summer, I ripped out hundreds of seedlings. The flowers are truly striking on bouquets, but I'm all done with these." ... "On Jan 16, 2006, Gabrielle from (Zone 5a) wrote: These get a bit too tall and like to lean, and when trying to handle them, they are sharp. It takes a bit of time keeping the volunteers weeded back. Blooms July - September in my garden." ... "On Sep 22, 2005, Biker1 from McLean, VA (Zone 7a) wrote: Beautiful, but INVASIVE in McLean, Virginia. Just plant them where you will want them forever, and ever. "

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Vegetables" [Impacts on crop yields have not been corroborated in literature]

304	Environmental weed	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	White, M., Cheal, D., Carr, G. W., Adair, R., Blood, K. and Meagher, D. (2018). Advisory list of environmental weeds in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Series No. 287. Department of Environment, Land, Water and Planning, Heidelberg, Victoria	"Tarenaya hassleriana - Impact on natural systems = Currently insignificant; Potential for invasion = Currently non-invasive"
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"The plant re-seeds freely but is not considered invasive."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric 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	"C. gynandra 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."
	Waterhouse, B. M. (2003). Know your enemy: recent records of potentially serious weeds in northern Australia, Papua New Guinea and Papua (Indonesia). Telopea, 10(1): 477-485	"Cleome rutidosperma 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)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Multiple species listed as naturalized and/or weeds

401	Produces spines, thorns or burrs	y
	Source(s)	**Notes**
	Wisconsin Horticulture. (2022). Spider flower, Cleome hassleriana. https://hort.extension.wisc.edu/articles/spider-flower-cleome-hassleriana/. [Accessed 21 Sep 2022]	"Because the plants are somewhat spiny and sticky, you may want to wear gloves when handling the plants."
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Plants (50-)100-200 cm. Stems sparsely branched; glandular-pubescent. Leaves: stipular spines 1-3 mm; petiole 2.5-7.5 cm, glandular-pubescent, with scattered spines 1-3 mm"

Qsn #	Question	Answer
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Plants (50-)100-200 cm. Stems sparsely branched; glandular-pubescent. Leaves: stipular spines 1-3 mm; petiole 2.5-7.5 cm, glandular-pubescent, with scattered spines 1-3 mm"

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	Unknown. Other species demonstrate allelopathic potential in experimental conditions

403	Parasitic	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Plants (50-)100-200 cm." [Cleomaceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	**Notes**
	Wisconsin Horticulture. (2022). Spider flower, Cleome hassleriana. https://hort.extension.wisc.edu/articles/spider-flower-cleome-hassleriana/. [Accessed 21 Sep 2022]	"Cleome has few insects or disease problems and is generally not favored by deer or rabbits."
	Hilty, J. (2022). Weedy Weedy Wildflowers of Illinois - Spider Flower. Cleome hassleriana. http://www.illinoiswildflowers.info. [Accessed 21 Sep 2022]	"The fetid foliage is rejected by cattle when there is more palatable food available."
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"This plant is seldom damaged by deer or rabbits. Cleome has a musky fragrance which some may find unpleasant, It is attractive as a cut flower but is short-lived once picked."

405	Toxic to animals	n
	Source(s)	**Notes**
	ASPCA. (2022). Toxic and Non-Toxic Plants - Spider Flower. https://www.aspca.org/pet-care/animal-poison-control/toxic-and-non-toxic-plants/spider-flower. [Accessed 21 Sep 2022]	"Toxicity: Non-Toxic to Dogs, Non-Toxic to Cats, Non-Toxic to Horses Toxic Principles: Non-toxic Clinical Signs: No records of toxic ingestion from this plant."
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wisconsin Horticulture. (2022). Spider flower, Cleome hassleriana. https://hort.extension.wisc.edu/articles/spider-flower-cleome-hassleriana/. [Accessed 21 Sep 2022]	"Because the plants are somewhat spiny and sticky, you may want to wear gloves when handling the plants. Cleome has few insects or disease problems and is generally not favored by deer or rabbits. Occasionally flea beetles or imported cabbageworm (Pieris rapae) caterpillars will feed on the foliage."
	PictureThis. (2022). Spider flower (Tarenaya hassleriana) Care Guide. www.picturethisai.com/care/Tarenaya_hassleriana.html	"Pests and Diseases Spider Mites Spider mites may be a problem on your spider flower. If spotted, make sure that the plant has plenty of air circulating around it. Spider mites can be identified by tell-tale webbing around the plants and associated yellowing of leaves. If the plant is heavily infested, the use of an insecticidal soap should help to solve the problem. White Butterflies The caterpillars of the imported cabbageworm enjoy feeding on the foliage of the spider flower. It is important to treat them as quickly as possible before the caterpillars destroy the entire plant. These caterpillars can be identified easily; they are about 2.5 cm long, pale-yellow, and fuzzy-textured. They are generally found in sheltered parts of the plant, such as on the undersides of leaves. From here, they will chew holes into the foliage. If left unchecked, they will chew entire leaves, leaving only the veins. The easiest treatment is to simply flick the caterpillars off with your hand. However, if this is not possible, two environmentally-friendly options are available. Certain types of wasps lay their eggs inside the larvae of these caterpillars. Encouraging wasps in the garden can therefore help to keep them in check. Also, any insecticide containing Bacillus Thuringiensis will kill these caterpillars easily. Flea Beetles If vulnerable to any insect, your spider flower is most likely to be targeted by flea beetles. These can be identified by peppered holes in leaves. Damage is not fatal to plants, but is unsightly. They may also target younger plants, which can lead to poor development. Organic contact insecticides containing pyrethrins, such as “Bug Clear Gun for Fruit and Veg”, are some of the best options. Several applications of these products may be required to fully eradicate the flea beetles. Other Uncommon Pests or Diseases Listed below are some less common pests and diseases of the spider flower that may also need your attention: Aphids Whiteflies Powdery mildew Rust"

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	ASPCA. (2022). Toxic and Non-Toxic Plants - Spider Flower. https://www.aspca.org/pet-care/animal-poison-control/toxic-and-non-toxic-plants/spider-flower. [Accessed 21 Sep 2022]	"Toxic Principles: Non-toxic Clinical Signs: No records of toxic ingestion from this plant."

Qsn #	Question	Answer
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[May occur in some fire prone areas, but no evidence that it contributes significantly to fuel loads or fire risk] "Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds"
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[May occur in some fire prone areas, but no evidence that it contributes significantly to fuel loads or fire risk] "Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"It prefers sun but will tolerate light shade and well-drained soil with consistent moisture through the growing season."
	Hilty, J. (2022). Weedy Weedy Wildflowers of Illinois - Spider Flower. Cleome hassleriana. http://www.illinoiswildflowers.info. [Accessed 21 Sep 2022]	"Spider Flower adapts to full or partial sun, moist to slightly dry conditions, and different kinds of soil, including those containing loam, clay-loam, or gravel."
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[Mostly occurs in open, presumably high light environments] "Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds; 0-200(-800) m"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"It prefers sun but will tolerate light shade and well-drained soil with consistent moisture through the growing season."
	Flora Fauna Web. (2022). Cleome hassleriana. https://www.nparks.gov.sg/florafaunaweb/flora/3/3/3313. [Accessed 21 Sep 2022]	"Plant & Rootzone Preference - Tolerance: Fertile Loamy Soils, Well-Drained Soils, Easy to Grow, Dry Soils / Drought"
	Hilty, J. (2022). Weedy Weedy Wildflowers of Illinois - Spider Flower. Cleome hassleriana. http://www.illinoiswildflowers.info. [Accessed 21 Sep 2022]	"Spider Flower adapts to full or partial sun, moist to slightly dry conditions, and different kinds of soil, including those containing loam, clay-loam, or gravel."

411	Climbing or smothering growth habit	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Plants (50-)100-200 cm. Stems sparsely branched; glandular-pubescent. Leaves: stipular spines 1-3 mm; petiole 2.5-7.5 cm, glandular-pubescent, with scattered spines 1-3 mm; leaflets 5 or 7, blade elliptic to oblanceolate, 2-6(-12) × 1-3 cm, margins serrulate-denticulate, apex acute, surfaces glandular-pubescent abaxially, glandular adaxially."

412	Forms dense thickets	
	Source(s)	**Notes**
	Wisconsin Horticulture. (2022). Spider flower, Cleome hassleriana. https://hort.extension.wisc.edu/articles/spider-flower-cleome-hassleriana/. [Accessed 21 Sep 2022]	"Although this plant self-seeds prolifically and has naturalized in some areas, it is generally not considered invasive as it rarely persists in undisturbed areas." [No evidence]
	Dave's Garden. (2022). Cleome houtteana. https://davesgarden.com/guides/pf/go/6/. [Accessed 21 Sep 2022]	[May exclude other plants in some cultivated settings] "On Feb 25, 2006, catcollins from West Friendship, MD (Zone 6b) wrote:" ... "They were lovely, but we soon discovered they were choking out some very nice plants, including azalea, hosta, liriope, butterfly weed, allium, and lillies. "
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[No evidence] "Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds"
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[No evidence] "Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m. Introduced and sparingly escaped in Guangdong, Hainan, Jiangsu, Sichuan, Yunnan, and Zhejiang [native to South America (Argentina, Brazil, and Paraguay); widely cultivated and occasionally naturalized in tropical and warm-temperate regions]."

501	Aquatic	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[Terrestrial] "Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds; 0-200(-800) m"
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Terrestrial] "Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m."

502	Grass	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	Cleomaceae

Qsn #	Question	Answer
503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	Cleomaceae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Flora Fauna Web. (2022). Cleome hassleriana. https://www.nparks.gov.sg/florafaunaweb/flora/3/3/3313. [Accessed 21 Sep 2022]	"Root Type: Underground (Fibrous Root)"

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Tarenaya hassleriana is native to Argentina, Brazil, and Paraguay. It is often cultivated and has sometimes escaped and naturalized."

602	**Produces viable seed**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Raboteaux, N. G., & Anderson, N. O. (2010). Germination of Cleome hassleriana and Polanisia dodecandra seed lots in response to light, temperature and stratification. Research Journal of Seed Science, 3(1), 1-17	"Abstract : Cleome and Polanisia germination is non-uniform, requiring plug growers to continuously manipulate germination conditions. Germination and yield potentials remain significantly lower than bedding plant standards. However, cleomes have been reported to germinate prolifically in gardens, escape cultivation and naturalize. The overarching objective was to compare germination of Cleome and Polanisia seed lots in response to planting depth, stratification, temperature and photoperiod regimes that simulate field and greenhouse conditions. Three experiments were conducted. First, field germination of P. dodecandra fresh and one-year-old seed (0, 1 cm below soil surface) was evaluated (Expt. 1). Second, the effect of stratification (0, 3, 6, 9, 12 weeks at 4°C), photoperiod (0/24, 12/12 and 14/10 h light/dark) and temperature (21/17°C and 19/15°C day/night) regimes on P. dodecandra germination were studied (Expt. 2). Third, the effect of stratification (0, 6 weeks), photoperiod (0/24, 12/12, 14/10 h light/dark) and temperature (21/17°C, 19/15°C) on germination of 11 seed lots of Polanisia and Cleome were compared (Expt. 3). In Expt. 1, buried seeds had significantly greater germination (66%) than non-buried (5%). In Expt. 2, higher germination was observed in stratified seeds (16%) incubated in complete darkness (35%) and at warmer temperature regimes (21%). Expt. 3 confirmed these findings with greater germination in darkness (32%) and warmer temperature (41%), but the effect of stratification varied among seed lots. Significant three-way interactions among seed lotxagexdepth (Expt. 1), duration of stratificationxtemperaturexphotoperiod (Expt. 2) and seed lot (Expt. 3) confirms lack of uniformity in commercial production and may contribute to spread in non-cultivated environments."
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	" Capsules (25-)40-80 × 2.5-4 mm, glabrous (in straight alignment with gynophore and pedicel). Seeds 10-20, 1.9-2.1 × 1.9-2.1 mm, tuberculate."
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"Recommended Propagation Strategy: Seed"

603	Hybridizes naturally	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Plaschil, S., Wagner, H., & Budahn, H. (2021). Hybridisation of Tarenaya. Acta Horticulturae 1327: 25-34	[Possibly. Used to create artificial hybrids] "The spider flower, Tarenaya hassleriana (syn. Cleome hassleriana), belonging to the family Cleomaceae, originates from South America and is used as an ornamental plant. Cultivars like the 'Señorita' series show low genetic variation. Interspecific hybridisation should create new genetic variability. Therefore, tetraploid plants of the cultivar 'Señorita Blanca'® were open pollinated with Tarenaya hassleriana. In a second step, the hybrid T 8015 from this cross was open pollinated with Tarenaya boliviensis (syn. C. boliviensis). Forty-seven seedlings that arose from 100 seeds of mature capsules were cultivated directly under greenhouse conditions and showed intermediary morphological traits. To overcome insufficient seed development in the hybridisation process, in vitro cultivation of immature seeds was tested. Thus, 14 immature capsules were collected and surface sterilised by a diluted sodium hypochlorite solution (3% active chlorine) followed by threefold rinsing with autoclaved distilled water. Seeds were dissected under sterile conditions. Blind seeds were clearly discriminated and discarded. Remaining 74 seeds were cultivated on Murashige/Skoog medium supplemented with 5 g L-1 polyvinyl pyrrolidone 10 in Petri dishes at 24°C and in dark conditions. After one week, a light exposure of 16 h alternated by 8 h darkness per day was applied. Seed germination started two weeks after sowing obtaining 30 seedlings. Twenty-two seedlings grew well and could be established as in vitro clone, four seedlings still remained in the callus phase and four seedlings died. Interspecific hybridisation was verified by RAPD analysis for the progeny in the greenhouse and in vitro culture. Flow cytometric analysis was applied to determine the ploidy level of the genotypes. Diploid and tetraploid genotypes were detected as well as genotypes with 2C values between diploid and tetraploid."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Gao, S., et al. (2017). Identification and characterization of miRNAs in two closely related C4 and C3 species of Cleome by high-throughput sequencing. Scientific Reports, 7(1), 1-11	"C. gynandra and C. hassleriana. Moreover, these two species have small statures and short life cycles, are self-fertile and produce a large amount of seed."
	Flora Fauna Web. (2022). Cleome hassleriana. https://www.nparks.gov.sg/florafaunaweb/flora/3/3/3313. [Accessed 21 Sep 2022]	"Propagate by seeds - plant also freely self-seeds."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Hilty, J. (2022). Weedy Weedy Wildflowers of Illinois - Spider Flower. Cleome hassleriana. http://www.illinoiswildflowers.info. [Accessed 21 Sep 2022]	"In its native tropical habitat, the pollinators of the flowers are primarily bats (Machado et al., 2006), which seek nectar. Sphingid moths also visit the flowers, but they are regarded as nectar thieves. In Illinois and other temperate areas, the pollinators of the flowers are currently unknown. Various beetles appear to be attracted to the flowers, and flies or small bees probably seek nectar or pollen from them. However, the mouthparts and body size of these insects are too small to function as effective pollinators."

Qsn #	Question	Answer
	Flora Fauna Web. (2022). Cleome hassleriana. https://www.nparks.gov.sg/florafaunaweb/flora/3/3/3313. [Accessed 21 Sep 2022]	"Pollination Method(s): Biotic (Fauna) (Insects (Bee), Insects (Butterfly, Moth), Insects (Ant, Beetle, Fly, Thrip, Wasp), Vertebrates (Bird), Vertebrates (Bat))"
	Gao, S., et al. (2017). Identification and characterization of miRNAs in two closely related C4 and C3 species of Cleome by high-throughput sequencing. Scientific Reports, 7(1), 1-11	"the vast molecular data and well-annotated genome resources available for A. thaliana can be applied to C. gynandra and C. hassleriana. Moreover, these two species have small statures and short life cycles, are self-fertile and produce a large amount of seed. These advantages make C. gynandra and C. hassleriana potential C4 and C3 models for identifying the differences in leaf development and physiological processes between C3 and C4 plants."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Herbs, annual, (0.5-)1-1.5 m tall." [No evidence]
	Flora Fauna Web. (2022). Cleome hassleriana. https://www.nparks.gov.sg/florafaunaweb/flora/3/3/3313. [Accessed 21 Sep 2022]	"Propagation Method: Seed"

607	Minimum generative time (years)	1
	Source(s)	**Notes**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Herbs, annual, (0.5-)1-1.5 m tall."
	NC State Extension. (2022). Cleome houtteana. https://plants.ces.ncsu.edu/plants/cleome-houtteana/. [Accessed 21 Sep 2022]	"Life Cycle: Annual"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[Possibly yes. Common along roadsides, and small size may allow for dispersal in mud stuck to vehicles, equipment or shoes] "Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds; 0-200(-800) m"
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Possibly yes. Common along roadsides, and small size may allow for dispersal in mud stuck to vehicles, equipment or shoes] "Seeds 10-20 per capsule, dark brown to black, triangular to subspherical, 1.9-2.1 × 1.9-2.1 mm, tuberculate. " ... "Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m."

702	Propagules dispersed intentionally by people	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Roadsides, vacant lots, dry hillsides; near sea level to 800(-2000) m. Introduced and sparingly escaped in Guangdong, Hainan, Jiangsu, Sichuan, Yunnan, and Zhejiang [native to South America (Argentina, Brazil, and Paraguay); widely cultivated and occasionally naturalized in tropical and warm-temperate regions]."
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Tarenaya hassleriana is native to Argentina, Brazil, and Paraguay. It is often cultivated and has sometimes escaped and naturalized. In cultivation and various floras, it has long been treated under the name Cleome spinosa; that name properly applies to the next species."

703	**Propagules likely to disperse as a produce contaminant**	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	Possible, but no direct evidence found. A self-seeding annual often cultivated with other ornamental plants

704	**Propagules adapted to wind dispersal**	
	Source(s)	**Notes**
	Flora Fauna Web. (2022). Cleome hassleriana. https://www.nparks.gov.sg/florafaunaweb/flora/3/3/3313. [Accessed 21 Sep 2022]	"Seed or Spore Dispersal: Abiotic (Explosive Dehiscence)"
	Vanangamudi, K., Bhaskaran, M., Balavidhya, S. & Arthanari, M. (2013). Weed Seed Biology. Scientific Publishers, Jodhpur	[Description for Cleome viscosa. Likely similar for Cleome houtteana] "Seed dispersal: No specialised means of dispersal. Seeds drop to the ground close to, or beneath the parent plant. The wind may subsequently move seed short distances."

705	**Propagules water dispersed**	**y**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	"Disturbed roadsides, vacant lots, waste areas, gravel pits, lakeshores, streambeds" [Proximity to aquatic habitats and presence in streambeds suggests water likely facilitates dispersal of seeds]
	Jain, S., Banaś, K., Salamon, M., & Płachno, B. J. (2021). Invasive alien plants in Bangladesh: taxonomic inventory, impact assessment and management issues. Biological Invasions preprint	[Cleome houtteana present in marshy habitat. Likely dispersed by water] "Grows dominantly in marshy areas of the northeastern part of the country, where it was introduced as long ago as 200 years or so, following tea cultivations."

706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**
	Hilty, J. (2022). Weedy Weedy Wildflowers of Illinois - Spider Flower. Cleome hassleriana. http://www.illinoiswildflowers.info. [Accessed 21 Sep 2022]	"According to some observations in western United States, the Ring-Necked Pheasant and Mourning Dove eat the seeds of Cleome spp. to a limited extent." [Viable seeds might be dispersed, but birds are likely acting as seed predators]

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2010). Flora of North America: North of Mexico, Volume 7. Magnoliophyta: Salicaceae to Brassicaceae. Oxford University Press, Oxford, UK	[Small size may allow for occasional dispersal in mud stuck to animals, but seeds otherwise lack means of external attachment] "Capsules (25-)40-80 × 2.5-4 mm, glabrous (in straight alignment with gynophore and pedicel). Seeds 10-20, 1.9-2.1 × 1.9-2.1 mm, tuberculate."

708	**Propagules survive passage through the gut**	**n**
	Source(s)	**Notes**
	Hilty, J. (2022). Weedy Weedy Wildflowers of Illinois - Spider Flower. Cleome hassleriana. http://www.illinoiswildflowers.info. [Accessed 21 Sep 2022]	"According to some observations in western United States, the Ring-Necked Pheasant and Mourning Dove eat the seeds of Cleome spp. to a limited extent." [Unlikely and no direct evidence found. Although viable seeds may survive ingestion, birds are likely acting as seed predators]

801	**Prolific seed production (>1000/m2)**	
	Source(s)	**Notes**
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Fruit gynophore 4.5-8 cm; capsule (2.5-)4-8 cm × 2.5-4 mm, in straight alignment with gynophore and pedicel, glabrous. Seeds 10-20 per capsule, dark brown to black, triangular to subspherical, 1.9-2.1 × 1.9-2.1 mm, tuberculate." [Densities unknown]
	Dias, T. P., Topanotti, L. R., Bechara, F. C., Magnago, L. F. S. da Cruz, I. S., & Simonelli, M. (2021). Seed bank from different successional stages in the Fonte Grande State Park, ES, Brazil. Acta Biológica Catarinense, 8(3), 23-33	Tarenaya hassleriana recorded in the seed bank. Seed densities unspecified

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Dias, T. P., Topanotti, L. R., Bechara, F. C., Magnago, L. F. S. da Cruz, I. S., & Simonelli, M. (2021). Seed bank from different successional stages in the Fonte Grande State Park, ES, Brazil. Acta Biológica Catarinense, 8(3), 23-33	Tarenaya hassleriana recorded in the seed bank. Seed bank longevity unspecified
	WRA Specialist. (2022). Personal Communication	Unknown. Seeds of other Cleome species form persistent, long-lived seed banks

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 of Cleome gynandra. Would presumably be effective on Cleome houtteana] "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**	
	Source(s)	**Notes**
	Wisconsin Horticulture. (2022). Spider flower, Cleome hassleriana. https://hort.extension.wisc.edu/articles/spider-flower-cleome-hassleriana/. [Accessed 21 Sep 2022]	"Although this plant self-seeds prolifically and has naturalized in some areas, it is generally not considered invasive as it rarely persists in undisturbed areas."
	Wu, Z.Y., Raven,P.H. & Hong, D.Y. (eds.). (2008). Flora of China. Vol. 7 (Menispermaceae through Capparaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	"Herbs, annual, (0.5-)1-1.5 m tall."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	Unknown. Other Cleome species are established and presumably not limited by natural enemies in the Hawaiian Islands

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability (native to tropical climates and widely naturalized in warm temperate to tropical regions)
• Widely naturalized in North America, China, and elsewhere (but no evidence in the Hawaiian Islands to date)
• A weedy plant of disturbed habitats, and anecdotally reported to be a problem in gardens and landscape settings
• Other Cleome species are invasive weeds
• Leaves with stipular and scattered spines
• Unpalatable to deer, rabbits, and cattle
• Tolerates many soil types
• Reproduces by seeds
• Self-fertile
• Annual life cycle, reaching maturity in one growing season
• Seeds dispersed through dehiscence, and possibly as a soil contaminant, by water, and through intentional cultivation

Low Risk Traits
• Despite widespread naturalization, negative impacts appear to be minor and largely restricted to disturbed environments
• Non-toxic
• Grows best in high light environments (dense shade may inhibit spread)
• Herbicides may provide effective control