

Taxon: <i>Eryngium foetidum</i> L.	Family: Apiaceae
Common Name(s): culantro false coriander fitweed long coriander Mexican coriander sawtooth coriander shadow beni spiny coriander spiritweed stinkweed	Synonym(s): <i>Eryngium antihystericum</i> Rottler

Assessor: No Assessor	Status: Assessor Approved	End Date: 30 Apr 2018
WRA Score: 15.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Biennial Herb, Spiny, Edible, Disturbance Weed, Shade-Tolerant

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		

Qsn #	Question	Answer Option	Answer
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	n
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	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
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	y=1, n=-1	y
705	Propagules water dispersed		
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y

Qsn #	Question	Answer Option	Answer
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
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	"The indigenous people of Northeast India use the plant for food [7] some having domesticated the plant in their kitchen gardens and orchards [8,9]." [Domestication in this sense appears to refer to cultivation, as there is no evidence that the plant has been selected for traits that substantially differ from wild plants]

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

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

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 29 Apr 2018]	"Native Northern America Mexico Southern America CARIBBEAN: Antigua and Barbuda, Barbados, Cuba, Dominica, Grenada, Guadeloupe, Jamaica, Martinique, Montserrat, Puerto Rico, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Trinidad and Tobago CENTRAL AMERICA: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama NORTHERN SOUTH AMERICA: French Guiana, Guyana, Suriname, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Peru"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 29 Apr 2018]	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2005. Flora of China. Vol. 14 (Apiaceae through Ericaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Elevation range in China exceeds 1000 m, demonstrating environmental versatility] "Forests, stream banks, moist places, roadsides; 100–1500 m. Guangdong, Guangxi, Guizhou, Yunnan"
	Tropicos.org. 2018. Missouri Botanical Garden. http://www.tropicos.org/ . [Accessed 29 Apr 2018]	Collected from 0 - 200 m 13°09'00"N, to 2300 m 17°05'05"S. Within native range, collected at elevation from sea level to over 2000 m, demonstrating environmental versatility

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 29 Apr 2018]	"Native Northern America Mexico Southern America CARIBBEAN: Antigua and Barbuda, Barbados, Cuba, Dominica, Grenada, Guadeloupe, Jamaica, Martinique, Montserrat, Puerto Rico, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Trinidad and Tobago CENTRAL AMERICA: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama NORTHERN SOUTH AMERICA: French Guiana, Guyana, Suriname, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Peru"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/ . [Accessed 29 Apr 2018]	" <i>Eryngium foetidum</i> Linnaeus (Confirmed) Common Names: Saw-leaf herb, Thorny-coriander; Chinese (Cantonese): Jia yuan qian; Laotian: Hom tay; Thai: Pak chi farang; Vietnamese: Cay ngo tan, Ngo gai First Collected: 1946"
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	"The plant is indigenous to Tropical America and the West Indies where it is used as medicine and food [1]. It has become naturalized and often is cultivated across South Asia, the Pacific islands, Tropical Africa and the warmer southern parts of Europe [1–6]. The indigenous people of Northeast India use the plant for food [7] some having domesticated the plant in their kitchen gardens and orchards [8,9]."

301	Naturalized beyond native range	y
-----	--	----------

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.	"Eryngium joetidum L., a perennial herb with flowers in bracted heads and spinose leaves, is widely cultivated in Hawai'i and may be naturalized near Kane'ohe, O'ahu."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2005. Flora of China. Vol. 14 (Apiaceae through Ericaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Forests, stream banks, moist places, roadsides; 100–1500 m. Guangdong, Guangxi, Guizhou, Yunnan [native to Central America; now a widespread weed in tropical and subtropical regions]."
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	"The plant is indigenous to Tropical America and the West Indies where it is used as medicine and food [1]. It has become naturalized and often is cultivated across South Asia, the Pacific islands, Tropical Africa and the warmer southern parts of Europe [1–6]. The indigenous people of Northeast India use the plant for food [7] some having domesticated the plant in their kitchen gardens and orchards [8,9]."
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. 2018. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/ . [Accessed 29 Apr 2018]	No recent records, despite mention in Wagner et al. (1999): "Eryngium joetidum L., a perennial herb with flowers in bracted heads and spinose leaves, is widely cultivated in Hawai'i and may be naturalized near Kane'ohe, O'ahu."

Qsn #	Question	Answer
302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY	"Habitat: common weed of open habitats in wet regions, lawns, edges. Altitude: Sea level to 1200 m." ... "Invasive on some Pacific islands."
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"In Fiji, a naturalized weed in waste places, cultivated areas, and along roadsides, considered a troublesome weed because of its spiny leaves"
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2005. Flora of China. Vol. 14 (Apiaceae through Ericaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"native to Central America; now a widespread weed in tropical and subtropical regions"
	Vijayan, J., Sasi, R., & Ramachandran, V. (2010). Additions to the flora of Tamilnadu. Journal of Economic and Taxonomic Botany 34(4): 782-784	"Occurring as a weed in open wastelands in the hills above 850m."
	Dave's Garden. 2018. Eryngium Species, Culantro, Mexican Coriander, Spiritweed, Fitweed - Eryngium foetidum. https://davesgarden.com/guides/pf/go/94023/ . [Accessed 29 Apr 2018]	"On Apr 13, 2012, BarbaraParis from Comerio, PR (Zone 11) wrote: I hate hate this plant... it is invasive here. You could plant one plant and months later there are hundreds of culantros everywhere. It is very hard to eradicate. The roots are like carrots and a tiny piece of root is enough to make another plant grow... The flowers are very sharp and the leaves have pointy edges that can be sharp too. I wold like it if it wasn't so invasive and sharp. I think that thing would grow even in herbicide LOL."
	Reddy, C. S., & Raju, V. S. (2002). Additions to the weed flora of Andhra Pradesh, India. Journal of Economic and Taxonomic Botany, 26(1), 195-198	[Along railway tracks. Disturbed site] "Seven species of Magnoliopsida are reported from Andhra Pradesh as naturalized alien weeds of gardens (Chamaesyce hyssopifolia (L.) Small, Phyllanthus tenellus Roxb. of Euphorbiaceae, Peperomia pellucida (L.) Kunth of Piperaceae, Pilea microphylla (L.) Liebm. of Urticaceae and Talinum triangulare (Jacq.) Willd. of Portulacaceae), cultivated fields (Heliotropium subulatum (Hochst.ex DC.) Vatke of Boraginaceae), Railway tracks (Eryngium foetidum L. of Apiaceae)."

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	"Eryngium foetidum ... Weed of: Bananas, Nursery Production, Orchards and Plantations"
	Moody, K. 1989. Weeds Reported in Rice in South and Southeast Asia. International Rice Research Institute, Manila, Philippines	Reported as a weed of rice crops. Impacts unspecified

Qsn #	Question	Answer
304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Eryngium foetidum ... Weed of: Bananas, Nursery Production, Orchards and Plantations" [No evidence]
	Liu, J., Dong, M., Miao, S. L., Li, Z. Y., Song, M. H., & Wang, R. Q. 2006. Invasive alien plants in China: role of clonality and geographical origin. Biological Invasions, 8(7): 1461-1470	"The third group (Group III) contains those species that occupied a relatively small area and/or had relatively small harmful impacts." [Appendix A. Eryngium foetidum - Invasiveness = Group III]

305	Congeneric weed	y
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Eryngium campestre ... Weed of: Cereals, Pastures, Sunflowers" ... "Eryngium horridum ... Weed of: Pastures" ... "Eryngium ilicifolium ... Weed of: Carrots, Cereals, Vegetables" ... "Eryngium planum ... Weed of: Cereals" ... "Eryngium tricuspidatum ... Weed of: Cereals" ... "Eryngium triquetrum ... Weed of: Cereals"
	Fidelis, A., Overbeck, G., Pillar, V. D., & Pfadenhauer, J. (2008). Effects of disturbance on population biology of the rosette species Eryngium horridum Malme in grasslands in southern Brazil. Plant Ecology, 195(1), 55-67	"Eryngium horridum is such a species: where fire and grazing are intense, its individuals become a nuisance plant, invading great areas and decreasing the quality of pastures (Mathias et al. 1972)." ... "Our results show that farmers, who frequently burn their lands in order to improve forage quality and avoid the invasion of undesirable plants should reevaluate their management practices. In fact they are stimulating vegetative propagation of E. horridum populations, not destroying them. Therefore, the use of fire with these purposes should be reviewed and new management approaches should be offered if the objective is to avoid this species in these grasslands"
	Nasif, A., Pastoriza, A., Pulido, L. M., Chaila, S., & Budeguer, C. J. (2012). Karyotypes in Species of Eryngium in Argentina. Cytologia, 77(3), 369-372	"It is suggested that the studied species had great adaptation to diverse environmental conditions reaching a great invasive power and aggressiveness as weeds, keeping their karyotype through the evolution." ... "In the Argentinean northwest, especially in Tucumán province, several species of the genus acquired importance as weeds with great invasive power, affecting economically important crops, like sugarcane (Chaila and Sobrero 2009)." ... "E. elegans Cham & Schlecht, E. ebracteatum Lam., E. coronatum Hook. & Arn. and E. horridum Malme are noted species because they represent important weeds for the Argentinean northwest (Rochi and Lallana, 1996, Nasif et al. 2001, 2003, Andrada et al. 2001a, Lorenzi 2000)."

401	Produces spines, thorns or burrs	y
	Source(s)	Notes
	Munz, P. (1959). Flora of Panama. Part VII. Fascicle IV. Annals of the Missouri Botanical Garden, 46(3), 195-256	"the leaves mostly petiolate, entire to lobed or divided, usually spinose"
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). Eryngium foetidum L.: a review. Fitoterapia, 82(3), 302-308	"The oblanceolate leaves have toothed margins, a yellowish spine, are 8–20 cm long, and grow in a basal rosette pattern."

Qsn #	Question	Answer
402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence of allelopathy found

403	Parasitic	n
	Source(s)	Notes
	Munz, P. (1959). Flora of Panama. Part VII. Fascicle IV. Annals of the Missouri Botanical Garden, 46(3), 195-256	"Low herb, the stems solitary to several, decumbent to erect, 0-25 cm. tall" [Apiaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Lowry, J.B., Petheram, R.J., & Tangendjaja, B. (1992). Plants Fed to Village Ruminants in Indonesia. Notes on 136 species. their composition, and significance in village farming systems. ACIAR Technical Reports No. 22	"Eryngium foetidum ... Plant used as flavouring herb because of pungent smell. Occasionally fed to rabbits."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Palatable to cattle & people] "Eryngium foetidum ... weedy, cattle fodder, young leaves eaten and used as a flavoring similar to Coriandrum sativum"

405	Toxic to animals	n
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence. Palatable to cattle & people] "Eryngium foetidum ... weedy, cattle fodder, young leaves eaten and used as a flavoring similar to Coriandrum sativum"

406	Host for recognized pests and pathogens	n
	Source(s)	Notes
	Ramcharan, C. 1999. Culantro: A much utilized, little understood herb. p. 506–509. In: J. Janick (ed.), Perspectives on new crops and new uses. ASHS Press, Alexandria, VA	"Culantro is relatively pest- and disease-free but the author has seen root knot nematodes on plants that have been grown for 2–3 years in box containers. A leaf spot problem which appears to be bacterial black rot (<i>Xanthomonas</i> sp.) has also been observed on such long-lived plants. Anecdotal reports mention that the flower heads are attractive to ladybugs, green lacewings, and other beneficial insects. Plants around the garden have also reportedly provided excellent defense against aphids."
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"Minor host of: <i>Chrysodeixis includens</i> (soybean looper); <i>Leveillula taurica</i> (powdery mildew of cotton); <i>Meloidogyne incognita</i> (root-knot nematode); <i>Phenacoccus solani</i> ; <i>Spodoptera exigua</i> (beet armyworm); <i>Spodoptera frugiperda</i> (fall armyworm)"

Qsn #	Question	Answer
	PlantUse contributors. 2018. <i>Eryngium foetidum</i> (PROSEA). PlantUse English. https://uses.plantnet-project.org/en/Eryngium_foetidum_(PROSEA) . [Accessed 30 Apr 2018]	"No serious diseases and pests are known. In India <i>Cladosporium oxysporum</i> has been identified from leaf spots. In Indonesia sawtooth coriander is a common weed in cocoa plantations and the insect <i>Helopeltis theivora</i> has often been found on it. Ants may eat the broadcast seed."
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	"Reports by Morales and O Campo et al. [54,55] suggest that the plant is easy to cultivate and hardly affected by diseases and pests."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Quattrocchi, U. 2012. <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	[Edible & medicinal uses for people & animals] " <i>Eryngium foetidum</i> ... weedy, cattle fodder, young leaves eaten and used as a flavoring similar to <i>Coriandrum sativum</i> " ... Antisnake plant, snakes said to avoid the places where this plant grows. Leaves decoction anticonvulsant, antiinflammatory, antimalarial, pectoral, carminative, antispasmodic, for epilepsy, flatulence, infantile vomiting and diarrhea. Leaf infusion taken for fever, flu, headache, diabetes; leaves taken for pinworms, food allergy and poisoning; young leaves stuffed in the ear for earache; baths for heat, cough; leaves poultice applied to gland swellings, abscesses, boils. Root decoction for fever, cold, cough, pneumonia, malarial fever, constipation, stomachache; crushed roots taken for stomachache. Magico-religious beliefs, ritual, leaves crushed and rubbed on the face of the victim."
	Ramcharan, C. 1999. <i>Culantro: A much utilized, little understood herb</i> . p. 506–509. In: J. Janick (ed.), <i>Perspectives on new crops and new uses</i> . ASHS Press, Alexandria, VA	[No evidence] "The plant is used in traditional medicines for fevers and chills, vomiting, diarrhea, and in Jamaica for colds and convulsions in children (Honeychurch 1980). The leaves and roots are boiled and the water drunk for pneumonia, flu, diabetes, constipation, and malaria fever. The root can be eaten raw for scorpion stings and in India the root is reportedly used to alleviate stomach pains. The leaves themselves can be eaten in the form of a chutney as an appetite stimulant (Mahabir 1991)."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	" <i>E. foetidum</i> is a biennial, pungently smelling, tropical herb which grows best in wet or moist conditions on open banks or in pastures."
	Ramcharan, C. 1999. <i>Culantro: A much utilized, little understood herb</i> . p. 506–509. In: J. Janick (ed.), <i>Perspectives on new crops and new uses</i> . ASHS Press, Alexandria, VA	[No evidence. Generally does not grow in fire prone areas] "The herb is also commonly found along moist or shaded pathways and near cultivated areas where heavy soils predominate (Seaforth et al. 1983; Morean 1988)."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes

Qsn #	Question	Answer
	World Crops. 2018. Culantro - <i>Eryngium foetidum</i> . https://worldcrops.org/crops/culantro . [Accessed 30 Apr 2018]	"Although cultivation of culantro is possible in full sun, the plants tend to flower sooner than shade-grown plants and have an inferior quality due to decreased leaf size and a loss of succulence. Flowering occurs at the expense of continued vegetative growth. Plants grown under shade produce larger and greener leaves that are more marketable because of their better appearance, texture, and pungent aroma. Owing to the increased production costs of pruning the flower heads frequently, it is in the interest of grower to reduce the level of flowering."
	Hossain, M. A., Jashimuddin, M., Nath, T. K., & O'Reilly, P. (2017). Spiny coriander (<i>Eryngium foetidum</i> L.) cultivation in the Chittagong Hill Tracts of Bangladesh: Sustainable agricultural innovation by indigenous communities. <i>Indian Journal of Traditional Knowledge</i> 16(1): 59-67	"Spiny coriander (<i>Eryngium foetidum</i> L.) is a shade tolerant plant suited to climatic conditions found in the Chittagong Hill Tracts (CHT) of Bangladesh"
	Ramcharan, C. 1999. Culantro: A much utilized, little understood herb. p. 506–509. In: J. Janick (ed.), <i>Perspectives on new crops and new uses</i> . ASHS Press, Alexandria, VA	"The herb is also commonly found along moist or shaded pathways and near cultivated areas where heavy soils predominate (Seaforth et al. 1983; Morean 1988). Although the plant grows well in full sun most commercial plantings occur in partially shaded moist locations. Shaded areas produce plants with larger and greener leaves that are more marketable because of their better appearance and higher pungent aroma."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Ramcharan, C. 1999. Culantro: A much utilized, little understood herb. p. 506–509. In: J. Janick (ed.), <i>Perspectives on new crops and new uses</i> . ASHS Press, Alexandria, VA	"Although culantro grows in a wide variety of soils, it does best in moist well drained sandy loams high in organic matter particularly under full light. Precise fertilizer recommendations have not been made but high nitrogen fertilizers or manures promote leaf growth."
	Mozumder, S. N., Rahaman, M. M., & Hossain, M. M. (2013). Variability And Character Association In Bangladhonia (<i>Eryngium foetidum</i> L.). <i>Bangladesh Journal of Agricultural Research</i> , 38(1), 77-84	"Its cultivation and popularity in several parts of the world are increasing due to its attractive strong aroma, medicinal and nutritional values, versatile use and wide adaptability with temperature, soil condition and water stress."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Munz, P. (1959). <i>Flora of Panama</i> . Part VII. Fascicle IV. <i>Annals of the Missouri Botanical Garden</i> , 46(3), 195-256	"Low herb, the stems solitary to several, decumbent to erect, 0-25 cm. tall"

412	Forms dense thickets	n
	Source(s)	Notes
	PlantUse contributors. 2018. <i>Eryngium foetidum</i> (PROSEA). PlantUse English. https://uses.plantnet-project.org/en/Eryngium_foetidum_(PROSEA) . [Accessed 30 Apr 2018]	"Plants do not usually grow close together but appear as individual weeds."

501	Aquatic	n
------------	----------------	----------

Qsn #	Question	Answer
	Source(s)	Notes
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	[Terrestrial] "E. foetidum is a biennial, pungently smelling, tropical herb which grows best in wet or moist conditions on open banks or in pastures."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 29 Apr 2018]	Family: Apiaceae (alt.Umbelliferae) Subfamily: Apioideae Tribe: Saniculeae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 29 Apr 2018]	Family: Apiaceae (alt.Umbelliferae) Subfamily: Apioideae Tribe: Saniculeae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	"E. foetidum is a biennial, pungently smelling, tropical herb which grows best in wet or moist conditions on open banks or in pastures. The roots are fleshy, the stems solitary and frequently branched." [Fleshy-roots, but a biennial. Not a true geophyte]
	Ramcharan, C. 1999. Culantro: A much utilized, little understood herb. p. 506–509. In: J. Janick (ed.), <i>Perspectives on new crops and new uses</i> . ASHS Press, Alexandria, VA	" <i>Eryngium foetidum</i> is a tap-rooted biennial herb with long, evenly branched roots "

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Ramcharan, C. 1999. Culantro: A much utilized, little understood herb. p. 506–509. In: J. Janick (ed.), <i>Perspectives on new crops and new uses</i> . ASHS Press, Alexandria, VA	[No evidence] "Culantro is native to continental tropical America and the West Indies (Adams 1971). It grows naturally throughout many Caribbean islands including Trinidad and Tobago, where it is abundant in forests particularly in disturbed areas as in slash and burn sites."
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	[No evidence] "The plant is indigenous to Tropical America and the West Indies where it is used as medicine and food [1]. It has become naturalized and often is cultivated across South Asia, the Pacific islands, Tropical Africa and the warmer southern parts of Europe [1–6]."

602	Produces viable seed	y
-----	----------------------	---

Qsn #	Question	Answer
	Source(s)	Notes
	Ramcharan, C. 1999. Culantro: A much utilized, little understood herb. p. 506–509. In: J. Janick (ed.), Perspectives on new crops and new uses. ASHS Press, Alexandria, VA	"Plants are usually started from seed which germinate in about 30 days, and for home or backyard gardens can be cultivated in containers or wooden boxes. For such cultivation, a slow release fertilizer such as Osmocote (14–14–14) can be incorporated in the soil mix at the rate of 1.8 kg/m ³ ."
	PlantUse contributors. 2018. <i>Eryngium foetidum</i> (PROSEA). PlantUse English. https://uses.plantnet-project.org/en/Eryngium_foetidum_(PROSEA) . [Accessed 30 Apr 2018]	"Sawtooth coriander can easily be propagated by seed. The seed, preferably freshly harvested, is sown directly in the field or first in a nursery. Propagation by stem cuttings is also possible. Sawtooth coriander can be relatively closely spaced at 12.5 cm × 12.5 cm. "
	Shavandi, M. A., Haddadian, Z., & Ismail, M. H. S. (2012). <i>Eryngium foetidum</i> L. <i>Coriandrum sativum</i> and <i>Persicaria odorata</i> L.: a review. <i>Journal of Asian Scientific Research</i> , 2 (8), 410-426	"Wild coriander is a biennial herb, by intense coriander like smelling grows naturally in shaded wet or moist conditions near cultivated areas. And propagate by means of seeds."

603	Hybridizes naturally	
	Source(s)	Notes
	Calvino, C. I., Martínez, S. G., & Downie, S. R. (2008). The evolutionary history of <i>Eryngium</i> (Apiaceae, Saniculoideae): Rapid radiations, long distance dispersals, and hybridizations. <i>Molecular Phylogenetics and Evolution</i> , 46(3), 1129-1150	[Unknown. Past hybridization may account for diversity of genus] "The evolution of <i>Eryngium</i> combines a history of long distance dispersals, rapid radiations, and hybridization, culminating in the taxonomic complexity observed today in the genus."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Croat, T.B. 1978. <i>Flora of Barro Colorado Island</i> . Stanford University Press, Stanford, CA	[Family description] "The flowers of most species are self-compatible, but protandrous, and are pollinated by insects, especially Diptera and unspecialized Hymenoptera (Bell, 1971). Self-pollination is believed to be effected by thrips, which are found in great abundance on the inflorescences."
	Quintana-Ascencio, P. F., Weekley, C. W., & Menges, E. S. (2007). Comparative demography of a rare species in Florida scrub and road habitats. <i>Biological Conservation</i> , 137(2), 263-270	[Related species is self-compatible] "Flowers are bisexual and self-compatible, though rates of autogamy are low, probably due to the spatial separation of male and female reproductive organs (Evans et al., 2003)."
	Molano-Flores, B. (2001). Reproductive Biology of <i>Eryngium yuccifolium</i> (Apiaceae), a Prairie Species. <i>The Journal of the Torrey Botanical Society</i> , 128(1), 1-6	[Related species self-compatible] "As a temporary dioecious species, <i>E. yuccifolium</i> exhibits the following characteristics: 1) an extended pistillate phase, with stigmas becoming receptive only after the anthers have shed pollen and dehisced, 2) synchronized flower heads, 3) numerous flower heads visited by generalist pollinators, and 4) some degree of self-compatibility as indicated by hand pollinations."

605	Requires specialist pollinators	n
	Source(s)	Notes

Qsn #	Question	Answer
	Mader, E., Shepherd, M., Vaughan, M., Hoffman Black, S. & LeBuhn, G. (2011). Attracting Native Pollinators: The Xerces Society Guide to Conserving North American Bees and Butterflies and Their Habitat. The Xerces Society. Storey Publishing, North Adams, MA	" <i>Eryngium</i> spp." ... A group of plants with white or pale blue globelike blossoms that attract an abundance of small bees and syrphid flies."
	Munz, P. (1959). Flora of Panama. Part VII. Fascicle IV. Annals of the Missouri Botanical Garden, 46(3), 195-256	"inflorescence trifurcate, the lateral branches usually continuing to form a monochasium, the heads numerous, 7-11 mm. long, 3-5 mm. broad; bracts 5 or 6, 1-4 cm. long, 2-10 mm. broad, entire or nearly so, green on both surfaces, greatly exceeding the head, the bractlets linear to lanceolate, 2-3 mm. long, exceeding the fruit, the coma conspicuous or lacking; calyx-teeth lanceolate to ovate, acute, weakly mucronate; styles slightly exceeding the calyx"
	Useful Tropical Plants Database. 2018. <i>Eryngium foetidum</i> . http://tropical.theferns.info/viewtropical.php?id=Eryngium+foetidum . [Accessed 29 Apr 2018]	"Pollinators - Insects"
	Croat, T.B. 1978. Flora of Barro Colorado Island. Stanford University Press, Stanford, CA	[Family description] "The flowers of most species are self-compatible, but protandrous, and are pollinated by insects, especially Diptera and unspecialized Hymenoptera (Bell, 1971). Self pollination is believed to be effected by thrips, which are found in great abundance on the inflorescences."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Dave's Garden. 2018. <i>Eryngium</i> Species, Culantro, Mexican Coriander, Spiritweed, Fitweed - <i>Eryngium foetidum</i> . https://davesgarden.com/guides/pf/go/94023/ . [Accessed 29 Apr 2018]	"On Apr 13, 2012, BarbaraParis from Comerio, PR (Zone 11) wrote: I hate hate this plant... it is invasive here. You could plant one plant and months later there are hundreds of culantros everywhere. It is very hard to eradicate. The roots are like carrots and a tiny piece of root is enough to make another plant grow"
	PlantUse contributors. 2018. <i>Eryngium foetidum</i> (PROSEA). PlantUse English. https://uses.plantnet-project.org/en/Eryngium_foetidum_(PROSEA) . [Accessed 30 Apr 2018]	"Sawtooth coriander can easily be propagated by seed. The seed, preferably freshly harvested, is sown directly in the field or first in a nursery. Propagation by stem cuttings is also possible. Sawtooth coriander can be relatively closely spaced at 12.5 cm x 12.5 cm."
	Singh, B. K., Ramakrishna, Y., & Ngachan, S. V. (2014). Spiny coriander (<i>Eryngium foetidum</i> L.): a commonly used, neglected spicing-culinary herb of Mizoram, India. Genetic Resources and Crop Evolution, 61(6), 1085-1090	"The plants are easily propagated by seeds (germinates in 20–25 days) in spring or suckers during monsoon." ... "Harvesting should be done by picking vigorous plants, leaving side suckers, at 15–20 days interval."

607	Minimum generative time (years)	2
	Source(s)	Notes
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. Fitoterapia, 82(3), 302-308	" <i>E. foetidum</i> is a biennial, pungently smelling, tropical herb which grows best in wet or moist conditions on open banks or in pastures."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Smith, A.C. 1985. Flora Vitiensis Nova: A New Flora of Fiji (Spermatophytes Only). Volume 3. National Tropical Botanical Garden, Lawai, HI	"In Fiji, a naturalized weed in waste places, cultivated areas, and along roadsides, considered a troublesome weed because of its spiny leaves"

Qsn #	Question	Answer
	Calvino, C. I., Martínez, S. G., & Downie, S. R. (2008). The evolutionary history of <i>Eryngium</i> (Apiaceae, Saniculoideae): Rapid radiations, long distance dispersals, and hybridizations. <i>Molecular Phylogenetics and Evolution</i> , 46(3), 1129-1150	[Generic description. Spines may aid in external dispersal to clothing, footwear, & possibly vehicles if attached by mud] "The fruits are small and light and can also be wind dispersed, and its spiny sepals can attach to feathers of birds. These upward-pointing spines can also anchor the fruits in the sand, as they are blown in the wind (Ridley, 1930)."
	WRA Specialist. 2018. Personal Communication	Possibly. Occurs in heavily trafficked areas & fruits have spines which may aid in external attachment

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Paul, J. H., Seaforth, C. E., & Tikasingh, T. (2011). <i>Eryngium foetidum</i> L.: a review. <i>Fitoterapia</i> , 82(3), 302-308	"The plant is indigenous to Tropical America and the West Indies where it is used as medicine and food [1]. It has become naturalized and often is cultivated across South Asia, the Pacific islands, Tropical Africa and the warmer southern parts of Europe [1–6]. The indigenous people of Northeast India use the plant for food [7] some having domesticated the plant in their kitchen gardens and orchards [8,9]."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	[A weed of crops. Seeds could potentially become a soil or crop contaminant] " <i>Eryngium foetidum</i> ... Major Pathway/s: Contaminant, Crop, Herbal, Ornamental" ... "Weed of: Bananas, Nursery Production, Orchards and Plantations"

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. <i>A Field Guide to Plants of Costa Rica</i> . Oxford University Press US, New York, NY	"Fruit dry, 0.2 cm, spiny, 2-seeded."
	Calvino, C. I., Martínez, S. G., & Downie, S. R. (2008). The evolutionary history of <i>Eryngium</i> (Apiaceae, Saniculoideae): Rapid radiations, long distance dispersals, and hybridizations. <i>Molecular Phylogenetics and Evolution</i> , 46(3), 1129-1150	"The fruits are small and light and can also be wind dispersed, and its spiny sepals can attach to feathers of birds. These upward-pointing spines can also anchor the fruits in the sand, as they are blown in the wind (Ridley, 1930)."

705	Propagules water dispersed	
	Source(s)	Notes
	Calvino, C. I., Martínez, S. G., & Downie, S. R. (2008). The evolutionary history of <i>Eryngium</i> (Apiaceae, Saniculoideae): Rapid radiations, long distance dispersals, and hybridizations. <i>Molecular Phylogenetics and Evolution</i> , 46(3), 1129-1150	[Generic description. Possibly Yes] "The morphology of <i>Eryngium</i> facilitates dispersal through water. Its fruits are covered with vesicles and can float, and in <i>E. maritimum</i> it has been reported that 55% of seeds kept in sea-water for 40 days remained viable (Ridley, 1930)."

706	Propagules bird dispersed	
-----	---------------------------	--

Qsn #	Question	Answer
	Source(s)	Notes
	Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY	"Fruit dry, 0.2 cm, spiny, 2-seeded." [Spiny fruits may aid in external attachment to birds & other animals]
	Calvino, C. I., Martínez, S. G., & Downie, S. R. (2008). The evolutionary history of Eryngium (Apiaceae, Saniculoideae): Rapid radiations, long distance dispersals, and hybridizations. Molecular Phylogenetics and Evolution, 46(3), 1129-1150	"The fruits are small and light and can also be wind dispersed, and its spiny sepals can attach to feathers of birds. These upward-pointing spines can also anchor the fruits in the sand, as they are blown in the wind (Ridley, 1930)." [Possibly dispersed externally by birds. Generic description]

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	Gargiullo, M.B., Magnuson, B.L & Kimball, L.D. 2008. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY	"Fruit dry, 0.2 cm, spiny, 2-seeded." [Spiny fruits may aid in external attachment to birds & other animals]
	Calvino, C. I., Martínez, S. G., & Downie, S. R. (2008). The evolutionary history of Eryngium (Apiaceae, Saniculoideae): Rapid radiations, long distance dispersals, and hybridizations. Molecular Phylogenetics and Evolution, 46(3), 1129-1150	[Generic description. Spines may aid in external dispersal to animals] "The fruits are small and light and can also be wind dispersed, and its spiny sepals can attach to feathers of birds. These upward-pointing spines can also anchor the fruits in the sand, as they are blown in the wind (Ridley, 1930)."

708	Propagules survive passage through the gut	
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Unknown. Seeds may be incidentally ingested when animals feed on foliage. No data on survival after gut passage found] "Eryngium foetidum ... weedy, cattle fodder"

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Mozumder, S. N., Haque, M. I., Kamal, M. M., Akter, S., & Banik, B. R. (2017). Effect of storage, growth regulator treatment and seed priming on germination of Eryngium foetidum. Int. J. Adv. Multidiscip. Res, 4(7), 16-21	[Densities unknown] "Asynchronized and ununiform seed germinations as well as very low germination rate (6-10%) are the major problems for popularizing Eryngium cultivation throughout the country (Mozumder et al., 2010). In addition to this, unavailability of adequate amounts of seeds also limits its cultivation. On the other hand, all these criteria influence higher seed rate (40 kg/ha) of Eryngium which negatively affects the cost of cultivation (Moniruzzaman set al., 2000)."
	Singh, B. K., Ramakrishna, Y., & Ngachan, S. V. (2014). Spiny coriander (<i>Eryngium foetidum</i> L.): a commonly used, neglected spicing-culinary herb of Mizoram, India. Genetic Resources and Crop Evolution, 61(6), 1085-1090	[Densities unknown] "The plants are easily propagated by seeds (germinates in 20–25 days) in spring or suckers during monsoon." ... "The fruit is globose-ovoid in shape and covered with rounded protrusions of 1–2 mm long."

802	Evidence that a persistent propagule bank is formed (>1 yr)	

Qsn #	Question	Answer
	Source(s)	Notes
	Mozumder, S. N., Haque, M. I., Kamal, M. M., Akter, S., & Banik, B. R. (2017). Effect of storage, growth regulator treatment and seed priming on germination of <i>Eryngium foetidum</i> . <i>Int. J. Adv. Multidiscip. Res</i> , 4(7), 16-21	" <i>Eryngium</i> seed is storable under low temperature (4- 60C) with air tight packaging for one year. 12 hours priming with GA3 500 ppm plus Kientin 50ppm treatment gave good germination on of one year stored seeds."
	De Gusmao, S. A., de Gusmao, M. T., de Padua, J. G., & Braz, L. T. (2000). Behavior of the wild coriander (<i>Eryngium foetidum</i> L.) in subtropical conditions. In <i>I Latin-American Symposium on the Production of Medicinal, Aromatic and Condiments Plants</i> 569 (pp. 209-212)	"In the Amazon region, the gardens are maintained in small yards without great cultural care. The plant has cycles in which the plant dies and the remaining seeds germinate a few months later." ... "The event of having a large interval of time between the start and end of seed germination indicates the occurrence of a factor that inhibits germination. Work effectuated by Saikia et al. (1996), refers to levels of germination greater than 80 %. Problems of dormancy were not cited. As the quality control of the utilized seeds was not evaluated and seeds of different phases could have been used, justifying the difference in germination"
	Royal Botanic Gardens Kew. (2018) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/ . [Accessed 30 Apr 2018]	"Storage Behaviour: No data available for species. Of 28 known taxa of genus <i>Eryngium</i> , 92.86% Orthodox(p/?), 7.14% Uncertain"

803	Well controlled by herbicides	
	Source(s)	Notes
	Amaral, J., & Carvalho, L. R. (1960). <i>Eryngo</i> (<i>Eryngium</i> spp.) and its chemical control. <i>Lavoura Arrozeira</i> , 14(157), 23-26	[Possibly Yes] "Abstract : Information is given on <i>eryngo</i> , a serious weed of pastures in Brazil. The results from herbicidal trials on infested land showed that one application of 3% 2, 4, 5-T gave satisfactory control and that 2 applications of 2, 4, 5-T (the first at a concentration of not less than 2%, and the second at 1 % 3-5 months later) gave excellent control. The herbicide was applied in aqueous solutions at the rate of 2 l of solution per 25 m ² plot. The native grasses were not damaged by these treatments.-E.B.O."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	World Crops. 2018. Culantro - <i>Eryngium foetidum</i> . https://worldcrops.org/crops/culantro . [Accessed 30 Apr 2018]	"The flower stalks must be pruned regularly in order to maintain vegetative growth and maximize yields"
	Singh, B. K., Ramakrishna, Y., & Ngachan, S. V. (2014). Spiny coriander (<i>Eryngium foetidum</i> L.): a commonly used, neglected spicing-culinary herb of Mizoram, India. <i>Genetic Resources and Crop Evolution</i> , 61(6), 1085-1090	"The plants are easily propagated by seeds (germinates in 20–25 days) in spring or suckers during monsoon." ... "Harvesting should be done by picking vigorous plants, leaving side suckers, at 15–20 days interval."
	Fidelis, A., Overbeck, G., Pillar, V. D., & Pfadenhauer, J. (2008). Effects of disturbance on population biology of the rosette species <i>Eryngium horridum</i> Malme in grasslands in southern Brazil. <i>Plant Ecology</i> , 195(1), 55-67	[Congener resprouts after fire] "Our results show that farmers, who frequently burn their lands in order to improve forage quality and avoid the invasion of undesirable plants should reevaluate their management practices. In fact they are stimulating vegetative propagation of <i>E. horridum</i> populations, not destroying them. Therefore, the use of fire with these purposes should be reviewed and new management approaches should be offered if the objective is to avoid this species in these grasslands"

Qsn #	Question	Answer
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Widely naturalized, including possibly Oahu (Hawaiian Islands)
- Disturbance-adapted weed
- Potential crop weed (impacts unspecified)
- Other *Eryngium* species are invasive
- Spiny leaves
- Shade tolerant
- Tolerates many soil types
- Reproduces by seeds & vegetatively by suckers
- Reaches maturity between 1st and 2nd year
- Seeds small & dispersed by wind, potentially by animals (externally), & intentionally planted by people
- Able to resprout after repeated pruning

Low Risk Traits

- Despite widespread reports of weediness, negative impacts generally unspecified
- Provides fodder for livestock
- Valued as a food & medicinal plant