

Taxon: <i>Eleusine indica</i> (L.) Gaertn.	Family: Poaceae
Common Name(s): crabgrass crowfoot grass goose grass manienie ali`i wire grass yard grass	Synonym(s): <i>Cynodon indicus</i> (Gaertn.) Raspail <i>Cynosurus indicus</i> L. <i>Eleusine gracilis</i> Salisb. <i>Eleusine japonica</i> Steud. <i>Eleusine polydactyla</i> Steud.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 6 Aug 2021
WRA Score: 24.0	Designation: H(Hawai'i)	Rating: High Risk

Keywords: Annual Grass, Disturbance Weed, Self-Fertile, Prolific Seeder, Seed Bank

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	n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	y
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	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	y
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	y=1, n=-1	y
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)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	n
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Lim, T.K. (2016). Edible Medicinal And Non-Medicinal Plants. Volume 11, Modified Stems, Roots, Bulbs. Springer, Dordrecht	[Not domesticated] "The plant is indigenous to Africa, but long naturalised elsewhere, including South America, Asia, Micronesia, American Samoa and most of the rest of the Pacific Islands from the tropical to subtemperate regions."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2021). 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, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 6 Aug 2021]	"Native Africa NORTHERN AFRICA: Egypt NORTHEAST TROPICAL AFRICA: Ethiopia, Sudan (s.) EAST TROPICAL AFRICA: Kenya, Tanzania, Uganda WEST-CENTRAL TROPICAL AFRICA: Burundi, Cameroon, Democratic Republic of the Congo, Congo, Equatorial Guinea, Rwanda WEST TROPICAL AFRICA: Benin, Burkina Faso, Côte D'Ivoire, Ghana, Guinea, Gambia, Guinea-Bissau, Liberia, Nigeria, Senegal, Sierra Leone, Togo SOUTH TROPICAL AFRICA: Angola, Mozambique, Malawi, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Namibia, Eswatini, South Africa [KwaZulu-Natal, Eastern Cape] WESTERN INDIAN OCEAN: Madagascar Asia-Temperate ARABIAN PENINSULA: Oman, Yemen CHINA: China EASTERN ASIA: Korea, Japan, Taiwan Asia-Tropical INDIAN SUBCONTINENT: Bhutan, India, Nepal, Pakistan INDO-CHINA: Indochina, India [Andaman and Nicobar Islands], Myanmar"

202	Quality of climate match data	High
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Qsn #	Question	Answer
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 6 Aug 2021]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Lim, T.K. (2016). Edible Medicinal And Non-Medicinal Plants. Volume 11, Modified Stems, Roots, Bulbs. Springer, Dordrecht	"It is found from near sea level to 2000-m elevation. It grows best in moist, fertile, cultivated soil in full sunlight. It is prevalent in disturbed areas, especially in sandy soil. It is quick growing, long lived and partial to wetter locations."

204	Native or naturalized in regions with tropical or subtropical climates	y
	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.	"Native to the Old World but long-naturalized in warm regions of the New World; in Hawai'i naturalized in shallow or compacted soil, 0-760 m, on Kure and Midway atolls, French Frigate Shoals, and all of the main islands except Ni'ihau and Kaho'olawe."
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Pantropics and subtropics, origin paleotropics."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica has probably been repeatedly introduced in most countries where it is now present, making it very difficult to determine its history of introduction into new habitats. In the USA, this species was introduced around the 1800s. In the West Indies, it was first recorded in 1815 in Cuba, 1867 in Martinique, 1876 in US Virgin islands, and 1885 in Jamaica (US National Herbarium). "

301	Naturalized beyond native range	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 6 Aug 2021]</p>	<p>"Adventive Europe NORTHERN EUROPE: Norway MIDDLE EUROPE: Belgium EASTERN EUROPE: Russian Federation [Volgogradskaja oblast] Naturalized Africa MACARONESIA: Spain [Canarias], Portugal [Azores, Madeira Islands] NORTHERN AFRICA: Algeria, Libya, Morocco WESTERN INDIAN OCEAN: Mauritius, Seychelles Asia-Temperate WESTERN ASIA: Egypt [Sinai], Iran, Turkey CAUCASUS: Armenia, Azerbaijan, Georgia Asia-Tropical PAPUASIA: Papua New Guinea MALESIA: Indonesia, Malaysia, Philippines Australasia AUSTRALIA: Australia NEW ZEALAND: New Zealand Europe MIDDLE EUROPE: Austria, Switzerland, Czech Republic, Germany, Hungary, Netherlands EASTERN EUROPE: Ukraine SOUTHEASTERN EUROPE: Albania, Bulgaria, Greece (incl. Crete), Croatia, Italy (incl. Sardinia, Sicily), Romania, Serbia, Slovenia SOUTHWESTERN EUROPE: Spain, France (incl. Corsica), Portugal Northern America REGION: Mexico, United States Pacific NORTH-CENTRAL PACIFIC: United States [Hawaii] NORTHWESTERN PACIFIC: Micronesia, Marshall Islands, Palau, United States [Guam, Northern Mariana Islands] SOUTH-CENTRAL PACIFIC: Cook Islands, Pitcairn, French Polynesia SOUTHWESTERN PACIFIC: Fiji, New Caledonia, Niue, Nauru, Tonga, United States [American Samoa], Wallis and Futuna Islands, Samoa Southern America CARIBBEAN: Anguilla, Netherlands Antilles, Antigua and Barbuda, Bahamas, Barbados, Cuba, Cayman Islands, Dominica, Guadeloupe, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, Montserrat, Martinique, United States [Puerto Rico, Virgin Islands, U.S.], St. Vincent and Grenadines, Virgin Islands (British) CENTRAL AMERICA: Belize, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador NORTHERN SOUTH AMERICA: French Guiana, Guyana, Suriname, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Colombia, Ecuador, Peru SOUTHERN SOUTH AMERICA: Argentina, Chile [Easter Island], Paraguay, Uruguay"</p>

Qsn #	Question	Answer
	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.	"Native to the Old World but long-naturalized in warm regions of the New World; in Hawai'i naturalized in shallow or compacted soil, 0-760 m, on Kure and Midway atolls, French Frigate Shoals, and all of the main islands except Ni'ihau and Kaho'olawe. First collected on O'ahu in 1864-1865 (Mann & Brigham 311, BISH)"
	Starr, F., Martz, K., & Loope, L.L. (2001). Botanical inventory of Kure Atoll. United States Geological Survey, Biological Resources Division, Haleakala Field Station, HI	[Kure Atoll] "Eleusine indica -- Wiregrass -- (Poaceae) -- [Non-Native] Occasional to common near quarters and in open areas. Lamoureux (1961) reported finding it in "disturbed areas near quarters"."
	Starr, F. & Martz, K. (1999). S. S. Midway Expedition. A botanical survey of Pearl & Hermes Atoll, Lisianski, Laysan, Gardner Pinnacles, and French Frigate Shoals. Trip report prepared for U. S. Fish and Wildlife Service, Honolulu, Hawai'i	[Tern Island] "Eleusine indica - goosegrass Alien. This grass is common throughout the island."

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). (1983) Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Found in all areas; thrives in poor soil and areas exposed to trampling. A problem weed in cultivated areas, lawns, pastures, and waste places."
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Disturbance and crop weed with potential detrimental environmental impacts] "E. indica is primarily listed as an agricultural and environmental weed (Randall, 2012) and is considered a "serious weed" in at least 42 countries (Holm et al., 1979). This species is described as a "dominant weed" especially in farming systems and annual row-crops where it grows vigorously and produces abundant seedlings (Holm et al., 1979). A single plant may produce more than 50,000 small seeds, which can be easily dispersed by wind and water, attached to animal fur and machinery and as a contaminant in soil (Waterhouse, 1993). E. indica invades disturbed habitats in natural areas and the margins of natural forests and grasslands, marshes, stream banks and coastal areas. It is also a common weed along roads, pavements, and powerline corridors (Queensland Department of Primary Industries and Fisheries, 2011)."

Qsn #	Question	Answer
303	Agricultural/forestry/horticultural weed	y
	Source(s)	Notes
	San Cha, T., Anne-Marie, K., & Chuah, T. S. (2014). Identification and characterization of RAPD–SCAR markers linked to glyphosate-susceptible and-resistant biotypes of <i>Eleusine indica</i> (L.) Gaertn. <i>Molecular Biology Reports</i> , 41 (2), 823-831	" <i>Eleusine indica</i> (L.) Gaertn. (goosegrass) is an annual herbaceous and self-pollinating grass species that belongs to the family of Poaceae [1]. It is one of the top ten worst weeds in the world that causes major problem in almost all forms of agriculture lands, including orchards, vegetable farms, nurseries and young oil palm plantation in Malaysia [2, 3]."
	Lim, T.K. (2016). <i>Edible Medicinal And Non-Medicinal Plants. Volume 11, Modified Stems, Roots, Bulbs</i> . Springer, Dordrecht	"It is a major invasive weed of disturbed places, irrigated fields and canals, including cultivated crops, pastures, gardens and roadsides, and also occurs in plantations and nurseries in the tropics and subtropics"
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Bananas, Carrots, Cereals, Cotton, Cucurbits/Melons, Forestry, Grapevines, Nursery Production, Orchards & Plantations, Pastures, Pome Fruits, Potatoes, Vegetables"

304	Environmental weed	
	Source(s)	Notes
	Queensland Government. (2021). <i>Weeds of Australia. Eleusine indica</i> . https://keyserver.lucidcentral.org . [Accessed 6 Aug 2021]	"Though crowsfoot grass (<i>Eleusine indica</i>) is primarily regarded as a weed of agricultural areas and habitation, it is also seen as an environmental weed in parts of Queensland and New South Wales. It is listed in the top 200 environmental weeds in south-eastern Queensland and also appears on environmental weed lists in the wider Sydney and Blue Mountains region in New South Wales. This species generally invades disturbed habitats in natural areas and the margins of conservation areas. For example, it is present along roads and powerline corridors that traverse the wet tropics world heritage areas in northern Queensland. It is also a weed of marshes, stream banks and coastal environs and has recently invaded the Five Islands Nature Reserve, a group of five small islands clustered off the coast of Port Kembla in south-eastern New South Wales."
	Wood, K. R. (2008). <i>Notes on the Conservation Status of Scaevola coriacea</i> Nutt. (Goodeniaceae). National Tropical Botanical Garden, Biological Report	[May threaten coastal habitat of <i>Scaevola coriacea</i>] "The Moku Ho'oniki, Moloka'i site has three plants. The islet is a relic tuff cone located in the Pailolo channel, east of Halawa Valley. It is 5.71 hectares in area and represents a dry coastal shrubland. Associated plants include <i>Sesuvium portulacastrum</i> , <i>Sida fallax</i> , <i>Melanthera integrifolia</i> , <i>Heliotropium curassavicum</i> , <i>Jacquemontia ovalifolia</i> subsp. <i>sandwicensis</i> , <i>Chamaesyce celastroides</i> var. <i>amplectens</i> , <i>Portulaca lutea</i> , <i>Boerhavia repens</i> , <i>Scaevola coriacea</i> , <i>Scaevola taccada</i> , <i>Fimbristylis cymosa</i> subsp. <i>umbellato-capitata</i> , <i>Panicum fauriei</i> var. <i>fauriei</i> , and <i>Panicum torridum</i> . The main threats to this ecosystem include competition with non-native plant taxa such as <i>Atriplex semibaccata</i> , <i>Chenopodium murale</i> , <i>Sonchus oleraceus</i> , <i>Lantana camara</i> , <i>Portulaca oleracea</i> , <i>Portulaca pilosa</i> , <i>Cenchrus ciliaris</i> , <i>Cenchrus echinatus</i> , <i>Cynodon dactylon</i> , <i>Dactyloctenium aegyptium</i> , <i>Digitaria ciliaris</i> , and <i>Eleusine indica</i> ."
	WRA Specialist. (2021). Personal Communication	Primarily a disturbance and crop weed, but may have negative impacts on natural environment

Qsn #	Question	Answer
305	Congeneric weed	y
	Source(s)	Notes
	De Wet, J., K. E. Prasada Rao, Brink, D., & Mengesha, M. (1984). Systematics and Evolution of <i>Eleusine coracana</i> (Gramineae). <i>American Journal of Botany</i> , 71(4), 550-557	"Finger millet (<i>Eleusine coracana</i> (L.) Gaertn. subsp. <i>coracana</i>) is cultivated in eastern and southern Africa and in southern Asia. The closest wild relative of finger millet is <i>E. coracana</i> subsp. <i>africana</i> (Kennedy-O'Byrne) Hilu & de Wet. Wild finger millet (subsp. <i>africana</i>) is native to Africa but was introduced as a weed to the warmer parts of Asia and America. Derivatives of hybrids between subsp. <i>coracana</i> and subsp. <i>africana</i> are companion weeds of the crop in Africa."
	De Wet, J.M.J. (2006). <i>Eleusine coracana</i> (L.) Gaertn. [Internet] Record from PROTA4U. Brink, M. & Belay, G. (Editors). PROTA, Wageningen, Netherlands. < http://www.prota4u.org . [Accessed 6 Aug 2021]	"The probable wild ancestor of finger millet is <i>Eleusine africana</i> Kenn.-O'Byrne (wild finger millet), commonly considered as a subspecies of <i>Eleusine coracana</i> (subsp. <i>africana</i> (Kenn.-O'Byrne) Hilu & de Wet) because it is also tetraploid (2n = 36) and crosses with finger millet produce fertile hybrids. It is an aggressive colonizer and forms large continuous populations in disturbed habitats, from where it is still harvested as a wild cereal in times of scarcity. It is a noxious weed of agriculture in Africa and invades fields of finger millet where, although predominantly self-fertilized, it occasionally crosses with the cereal to form extensively variable, weedy hybrid swarms."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	<i>Eleusine coracana</i> and some other species have been identified as weeds in some situations

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Annuals; culms pale green, prostrate or ascending, 25-60 cm tall, glabrous, conspicuously compressed, usually profusely branched at base. Sheaths 3-9 cm long, conspicuously compressed .. striate, keeled, sparsely long-pilose at throat and along margins; ligule 0.2-0.5 mm long, membranous, truncate or fimbriate; blades 15-25 cm long, 4-10 mm wide, conspicuously keeled, scabrous on keel and on margins near apex, upper surface sparsely long-pilose with a conspicuous translucent yellow band 2-3 mm long arising from base, apex acute. Racemes 2-6, umbelliform, one raceme often borne 2-5 cm below others, 4-10 cm long; spikelets 3-8-flowered, 5-7 mm long, glabrous; glumes broad, keeled, margins hyaline or purpletinged, first glume 2-3 mm long, 2-4-nerved, second glume 3-4 mm long, 6-9-nerved; lemmas 3-3.5 mm long, keel scabrous, often with 1-2 indistinct nerves, apex acute; palea 2.5- 3 mm long, apex acute. Caryopsis dark reddish brown, 1-2 mm long, ridged longitudinally, striated with concentric rings."

402	Allelopathic	
	Source(s)	Notes
	CABI. (2021). <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	"Allelopathic activity has been also reported for this species (Ampong-Nyarko and Datta, 1992)."

403	Parasitic	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annuals; culms pale green, prostrate or ascending, 25-60 cm tall, glabrous, conspicuously compressed, usually profusely branched at base." [Poaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Wickens, G.E., Haq, N. & Day, P.R. (1989). New Crops for Food and Industry. Chapman and Hall Ltd, London, UK	"The second species mentioned, <i>Eleusine indica</i> , has different but equally interesting properties. In southern Africa it is known as ox-grass and with good reason. It is a very palatable annual grass which produces abundant seed with well developed dormancy. This has unfortunate consequences for the farmer who uses farmyard or kraal manure since he thereby introduces an abundance of a very effective weed to his land."
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Palatable when young. Unpalatable when old, and can be toxic] "generally unpalatable to stock, eaten when young, when mature foliage is very tough, cyanogenic or HCN toxic, can be poisonous to stock, has been recorded as causing the deaths of calves and sheep"

405	Toxic to animals	y
	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	"Cyanogenic or hydrogen cyanide toxic, can be poisonous to stock, has been recorded as causing the deaths of calves and sheep."
	Vanangamudi, K., Bhaskaran, M., Balavidhya, S. & Arthanari, M. (2013). Weed Seed Biology. Scientific Publishers, Jodhpur	"Effect of crop production : The seed heads may contain high levels of cyanogenic glycosides and are believed to be responsible for occasional cases of stock poisoning."
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"generally unpalatable to stock, eaten when young, when mature foliage is very tough, cyanogenic or HCN toxic, can be poisonous to stock, has been recorded as causing the deaths of calves and sheep"
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"While there are no estimates of losses caused, there are reports of stock poisoning where the grass is grazed (Wapshere, 1990a)."

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Furthermore, although the presence of <i>E. indica</i> in crops has occasionally been shown to reduce pest or disease incidence, it may act as an alternate host of important crop pests or diseases, including <i>Pratylenchus zeae</i> on maize (Jordaan and de Waele, 1988); rice ragged stunt (Salamat et al., 1987); rice yellow mottle virus (Okioma et al., 1983); sorghum shoot fly (Granados et al., 1972); and others listed by Holm et al. (1977). There are also reports of increased incidences of <i>Spodoptera frugiperda</i> in maize where the weed is not controlled (van Huis, 1981). Again there is a lack of any quantification of these losses."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Lim, T.K. (2016). Edible Medicinal And Non-Medicinal Plants. Volume 11, Modified Stems, Roots, Bulbs. Springer, Dordrecht	"The small seed is used as famine food and it can be cooked whole or ground into a flour and used in making cakes, gruels and alcoholic beverages (Kunkel 1984 ; Facciola 1990 ; Harris 1995). Young plants are eaten raw or cooked and used as a side dish with rice (Uphof 1968 ; Tanaka 1976 ; Kunkel 1984 ; Facciola 1990). Roots are edible raw (Kunkel 1984 ; Facciola 1990)."
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Reported to be toxic to animals in certain situations. Medicinal uses for humans] "Cyanogenic or hydrogen cyanide toxic, can be poisonous to stock, has been recorded as causing the deaths of calves and sheep. Plant used by women in childbirth, pound the leaves and give the juice to drink to promote the discharge of the afterbirth. Whole plant uprooted, washed and chewed for the treatment of diarrhea and dysentery; entire plant boiled and used to treat sprains, fevers. Roots with pepper and ginger given to cure snakebite; roots infusion for diarrhea; leaf paste of <i>Uncaria macrophylla</i> mixed with the rhizome of <i>Eleusine indica</i> applied externally in bone fracture. Infusion of macerated leaves drunk as a remedy for urine retention, infusion eases vaginal bleeding; leaf infusion for dysentery."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i naturalized in shallow or compacted soil, 0-760 m" [May contribute to fuel load, but probably not a significant fire risk relative to other abundant, invasive non-native grasses]
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	Fire risk not listed among negative impacts

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

Qsn #	Question	Answer
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica has C4 physiology and makes extremely rapid growth in full sunlight, but growth is much reduced (and more erect) under shade (Ampong-Nyarko and de Datta, 1992). Shading of this weed severely reduced plant dry weight: 50% shading caused 60% reduction and 80% shading caused 90% reduction (Bantilan et al., 1974). Photoperiod is not critical and flowering can occur at all daylengths between 6 and 16 hours (Nakatani and Kusagani, 1991). The optimum for vegetative growth is 14 hours (Holm et al., 1977). Drought and low temperature delay flowering. Emerged plants are killed by frost."
	Plants for a Future. (2021). <i>Eleusine indica</i> . https://pfaf.org . [Accessed 6 Aug 2021]	"It cannot grow in the shade."
	Lim, T.K. (2016). Edible Medicinal And Non-Medicinal Plants. Volume 11, Modified Stems, Roots, Bulbs. Springer, Dordrecht	"It grows best in moist, fertile, cultivated soil in full sunlight."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica is a typical weedy species of the tropics and sub-tropics, flourishing in cultivated and other disturbed situations on a wide range of soil types, though generally favoured by high fertility."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annuals; culms pale green, prostrate or ascending, 25-60 cm tall, glabrous, conspicuously compressed, usually profusely branched at base."

412	Forms dense thickets	n
	Source(s)	Notes
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). (1983) Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Found in all areas; thrives in poor soil and areas exposed to trampling. A problem weed in cultivated areas, lawns, pastures, and waste places."
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Competes with crops, but not reported to form dense, monotypic stands] "Competitive effects of pure populations of E. indica have rarely been measured, but in groundnut a range of densities of 2 to 32 plants per 10 m of row reduced yield by 2 to 25% and it was estimated that each weed plant per 10 m row reduced yield by 41 kg/ha. "

Qsn #	Question	Answer
501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "in Hawai'i naturalized in shallow or compacted soil, 0-760 m"

502	Grass	y
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 6 Aug 2021]	Family: Poaceae (alt. Gramineae) Subfamily: Chloridoideae Tribe: Cynodonteae Subtribe: Eleusininae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 6 Aug 2021]	Family: Poaceae (alt. Gramineae) Subfamily: Chloridoideae Tribe: Cynodonteae Subtribe: Eleusininae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Annual or short-lived perennial, rather coarse, vigorous, slender to robust, compact, glabrous, smooth, stoloniferous, extensive root system, forming thick clumps"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Lim, T.K. (2016). Edible Medicinal And Non-Medicinal Plants. Volume 11, Modified Stems, Roots, Bulbs. Springer, Dordrecht	[No evidence] "The plant is indigenous to Africa, but long naturalised elsewhere, including South America, Asia, Micronesia, American Samoa and most of the rest of the Pacific Islands from the tropical to subtemperate regions."

602	Produces viable seed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Boyd, N. S., Fnu, K., Marble, S. C., Steed, S. T., & MacRae, A. W. (2016). Biology and Management of Goosegrass (<i>Eleusine indica</i> (L.) Gaertn.) in Tomato, Pepper, Cucurbits, and Strawberry. HS1178. UF/IFAS Extension, Gainesville, FL. https://edis.ifas.ufl.edu . [Accessed 6 Aug 2021]	"It is considered an invasive weed due to its vigorous growth and abundant seed production. Seeds germinate near the surface of moist soils with temperatures above 65°F (Chauhan and Johnson 2008). Seed germination completely ceases if seeds are buried deeper than 3 inches (Chauhan and Johnson 2008; Odero et al. 2013). Persistence in the field is due to abundant seed production and tolerance to close mowing. Goosegrass can grow up to 3 feet tall (Uva et al. 1997) and spreads by reseeding itself."
	Hawton, D., & Drennan, D. S. H. (1980). Studies on the longevity and germination of seed of <i>Eleusine indica</i> and <i>Crotalaria goreensis</i> . <i>Weed Research</i> , 20(4), 217-223	"The longevity of seed of <i>Eleusine indica</i> (L.) Gaertn. and <i>Crotalaria goreensis</i> Guill. & Perr. stored at various depths in a krasnozem soil in pots was studied over 3 years under natural climatic conditions on the Atherton Tableland of Queensland, Australia. In the first year the maximum percentage of seed which emerged was 68% for <i>E. indica</i> and 48.3% for <i>C. goreensis</i> . In the second year the percentages were 2.0 and 19.3. respectively and in the third year they were 0.2 and 1.4. In the case of both species emergence was greater from the 0–5 cm depth than from the 5–10 cm depth. Some of the seed buried at the 5–10 cm depth germinated but failed to emerge. Significantly more hard seed of <i>C. goreensis</i> remained at the 5–10 cm depth (25.7%) than at the 0–5 cm depth (9.8%) after 3 years. However, much of this seed was either dead or moribund and the percentage of truly viable seed (c. 5%) was the same at both depths. In depth of emergence experiments the emergence of seed of both species did not vary significantly in the 0–4 cm depth ranges. At depths greater than 4 cm emergence declined. No <i>E. indica</i> seed emerged from 8 cm or deeper and no <i>C. goreensis</i> seed emerged from 12 cm or deeper."

603	Hybridizes naturally	y
	Source(s)	Notes
	Bisht, M. S., & Mukai, Y. (2002). Genome organization and polyploid evolution in the genus <i>Eleusine</i> (Poaceae). <i>Plant Systematics and Evolution</i> , 233(3), 243-258	"The average genome size in these four diploid species ranges from 2.9 pg in <i>E. indica</i> and <i>E. tristachya</i> to 3.3 pg in <i>E. floccifolia</i> and <i>E. intermedia</i> (Hiremath and Salimath 1991a). These four diploid species are reported to cross with each other and produce viable hybrids (Salimath et al. 1995b). The hybrids of <i>E. tristachya</i> and <i>E. floccifolia</i> showed bivalent formation in 69% pollen mother cells (Chennaveeraiah and Hiremath 1973), and the hybrids of <i>E. indica</i> with <i>E. floccifolia</i> and <i>E. tristachya</i> showed bivalent formation in 81 and 90% of pollen mother cells, respectively (Salimath et al. 1995b)"

604	Self-compatible or apomictic	y
	Source(s)	Notes
	San Cha, T., Anne-Marie, K., & Chuah, T. S. (2014). Identification and characterization of RAPD–SCAR markers linked to glyphosate-susceptible and-resistant biotypes of <i>Eleusine indica</i> (L.) Gaertn. <i>Molecular Biology Reports</i> , 41 (2), 823-831	" <i>E. indica</i> is an autogamous species that self-fertilized, where cross-fertilization is rare in the fields [1]. Therefore, most of the individuals in the fields are homogzygous."

605	Requires specialist pollinators	n
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Qsn #	Question	Answer
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica is a monoecious species (individual flowers are either male or female, but both types can be found on the same plant) and flowers are pollinated by wind. "

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"As an annual weed which does not root at the nodes, E. indica is relatively easily removed by hoeing at the early growth stages. Once established, however, the very strong root system makes it difficult to uproot manually."

607	Minimum generative time (years)	1
	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.	"Annuals; culms pale green, prostrate or ascending, 25-60 cm tall, glabrous, conspicuously compressed, usually profusely branched at base."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Vanangamudi, K., Bhaskaran, M., Balavidhya, S. & Arthanari, M. (2013). Weed Seed Biology. Scientific Publishers, Jodhpur	"E. indica grows and flowers well in all seasons and a single plant may produce more than 50000 small seeds, which move readily by wind, in mud on the feet of animals and in the tread of machinery."
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica spreads by seeds. A single plant has the potential to produce more than 50,000 seeds which can be easily dispersed by wind and water, as a contaminant in crop seeds and soils, and attached to animal furs, mud and machinery. Seeds are also eaten by wild animals and by cattle (Waterhouse, 1994)."

702	Propagules dispersed intentionally by people	n
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Unintentionally spread] "The risk of introduction of E. indica into new habitat is very high. This species is one of the most common agricultural and environmental weeds in tropical and subtropical regions of the world. It has ecophysiological and genetic traits that, coupled with the high number of seeds produced for each individual plant, give it a high score for successful invasion in almost any ecosystem (Holm et al., 1979; Waterhouse, 1994)."

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes

Qsn #	Question	Answer
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica spreads by seeds. A single plant has the potential to produce more than 50,000 seeds which can be easily dispersed by wind and water, as a contaminant in crop seeds and soils, and attached to animal furs, mud and machinery. Seeds are also eaten by wild animals and by cattle (Waterhouse, 1994). "
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Herbal, Ornamental, Pasture Dispersed by: Humans, Animals, Cattle, Horse, Livestock, Vehicles, Water, Escapee"

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica spreads by seeds. A single plant has the potential to produce more than 50,000 seeds which can be easily dispersed by wind and water, as a contaminant in crop seeds and soils, and attached to animal furs, mud and machinery. Seeds are also eaten by wild animals and by cattle (Waterhouse, 1994)."
	Vanangamudi, K., Bhaskaran, M., Balavidhya, S. & Arthanari, M. (2013). Weed Seed Biology. Scientific Publishers, Jodhpur	"Seed dispersal : E. indica grows and flowers well in all seasons and a single plant may produce more than 50000 small seeds, which move readily by wind, in mud on the feet of animals and in the tread of machinery."

705	Propagules water dispersed	y
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica spreads by seeds. A single plant has the potential to produce more than 50,000 seeds which can be easily dispersed by wind and water, as a contaminant in crop seeds and soils, and attached to animal furs, mud and machinery. Seeds are also eaten by wild animals and by cattle (Waterhouse, 1994). "
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Herbal, Ornamental, Pasture Dispersed by: Humans, Animals, Cattle, Horse, Livestock, Vehicles, Water, Escapee"

706	Propagules bird dispersed	n
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica spreads by seeds. A single plant has the potential to produce more than 50,000 seeds which can be easily dispersed by wind and water, as a contaminant in crop seeds and soils, and attached to animal furs, mud and machinery. Seeds are also eaten by wild animals and by cattle (Waterhouse, 1994). "

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. indica spreads by seeds. A single plant has the potential to produce more than 50,000 seeds which can be easily dispersed by wind and water, as a contaminant in crop seeds and soils, and attached to animal furs, mud and machinery."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Yamashiro, A., & Yamashiro, T. 2006. Seed Dispersal by Kerama Deer (<i>Cervus nippon keramae</i>) on Aka Island, the Ryukyu Archipelago, Japan. <i>Biotropica</i> , 38(3): 405-413	"APPENDIX. The number of seeds, germination rate, size, and fruit type at each site." [Eleusine indica seeds present in and germinate from deer dung]
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Seeds are also eaten by wild animals and by cattle (Waterhouse, 1994)."
	Wickens, G.E., Haq, N. & Day, P.R. (1989). <i>New Crops for Food and Industry</i> . Chapman and Hall Ltd, London, UK	"The second species mentioned, <i>Eleusine indica</i> , has different but equally interesting properties. In southern Africa it is known as ox-grass and with good reason. It is a very palatable annual grass which produces abundant seed with well developed dormancy. This has unfortunate consequences for the fanner who uses farmyard or kraal manure since he thereby introduces an abundance of a very effective weed to his land."

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"As an annual weed, E. indica depends on propagation by seed. Individual plants have been recorded producing up to 135,000 seeds (Holm et al., 1977) and the average may be 40,000 seeds per plant."
	Hawton, D., & Drennan, D. S. H. (1980). Studies on the longevity and germination of seed of <i>Eleusine indica</i> and <i>Crotalaria goreensis</i> . <i>Weed Research</i> , 20(4), 217-223	"E. indica is a prolific seed producer. In Zimbabwe a dense stand of E. indica produced approximately 5000 x 10 ⁶ seeds/ha (Schwerzel, 1970) and this has been confirmed for the Atherton Tableland in work reported in another paper. Even though only 0.2% of E. indica seed will germinate in the third season after seed formation this still represents a possible 10 x 10 ⁶ plants/ha."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Masin, R., Zuin, M. C., Otto, S., & Zanin, G. (2006). Seed longevity and dormancy of four summer annual grass weeds in turf. <i>Weed Research</i> , 46(5), 362-370	[3+ years] "Seed viability in <i>S. glauca</i> , <i>S. viridis</i> and <i>D. sanguinalis</i> decreased significantly after almost 1 year of burial (to about 70%), with practically no seeds surviving after 3 years. However, E. indica lost viability very slowly, with a high percentage survival even after around 1200 days of burial." ... "The number of <i>S. viridis</i> plants germinating is reduced by 50% in the second year, while it remains high for <i>S. glauca</i> and <i>D. sanguinalis</i> . In the third year, the risk of infestation by these species substantially disappears. In contrast, the seeds of E. indica represent a potential infestation for >3 years."

Qsn #	Question	Answer
	<p>Hawton, D., & Drennan, D. S. H. (1980). Studies on the longevity and germination of seed of <i>Eleusine indica</i> and <i>Crotalaria goreensis</i>. <i>Weed Research</i>, 20(4), 217-223</p>	<p>[Some seeds remain viable for 3 years] "The longevity of seed of <i>Eleusine indica</i> (L.) Gaertn. and <i>Crotalaria goreensis</i> Guill. & Perr. stored at various depths in a krasnozem soil in pots was studied over 3 years under natural climatic conditions on the Atherton Tableland of Queensland, Australia. In the first year the maximum percentage of seed which emerged was 68% for <i>E. indica</i> and 48.3% for <i>C. goreensis</i>. In the second year the percentages were 2.0 and 19.3, respectively and in the third year they were 0.2 and 1.4. In the case of both species emergence was greater from the 0–5 cm depth than from the 5–10 cm depth. Some of the seed buried at the 5–10 cm depth germinated but failed to emerge. Significantly more hard seed of <i>C. goreensis</i> remained at the 5–10 cm depth (25.7%) than at the 0–5 cm depth (9.8%) after 3 years. However, much of this seed was either dead or moribund and the percentage of truly viable seed (c. 5%) was the same at both depths."</p>

Qsn #	Question	Answer
803	Well controlled by herbicides	y
	Source(s)	Notes
	<p>San Cha, T., Anne-Marie, K., & Chuah, T. S. (2014). Identification and characterization of RAPD–SCAR markers linked to glyphosate-susceptible and-resistant biotypes of <i>Eleusine indica</i> (L.) Gaertn. <i>Molecular Biology Reports</i>, 41 (2), 823-831</p>	<p>"Goosegrass populations have been reported to have evolved resistance towards several groups of herbicides, such as trifluralin [4], glyphosate [5], paraquat [6], and fluazifop butyl [7] and glufosinate [8]. The glyphosate-resistant biotype of <i>E. indica</i> was first reported in 1997 at a guava orchard in Teluk Intan, state of Perak, Malaysia. The biotype was found to develop between 8- and 12-fold resistant to glyphosate within 3 years of repeated and overusage of glyphosate to control the weed [5]."</p>
	<p>CABI. (2021). <i>Invasive Species Compendium</i>. Wallingford, UK: CAB International. www.cabi.org/isc</p>	<p>[Herbicide resistance may make chemical control ineffective in some populations] "<i>E. indica</i> is susceptible to virtually all groups of standard grass-killing herbicides, including arsenicals, substituted ureas (diuron, etc.), uracils (bromacil), triazines (atrazine, etc.), dinitroanilines (trifluralin, etc.), thiolcarbamates (EPTC, etc.), dimethylethers (oxyfluorfen, etc.), graminicides (fluazifop, sethoxydim, etc.), imidazolinones (imazaquin, etc.), propanil, oxadiazon, clomazone, quinclorac, diphenamid, paraquat, glufosinate, glyphosate and flumioxazin. Where broad-spectrum weed control requires the use of herbicide mixtures such as a graminicide with a broad-leaf weed killer, there are risks of antagonism in many combinations, e.g. with 2,4-DB (York et al., 1993). In most cases the antagonism can be avoided by applying the broad-leaf herbicide a day or two later than the graminicide. Thanks to the wide range of effective compounds, control with herbicide should normally be possible in any broad-leaved or perennial crop and in most cereal crops, with the possible exception of finger millet. This can, however, be compromised by development of resistance to some herbicides. Biotypes with resistance to some groups of herbicide have already occurred and are likely to become increasingly important. Resistance to trifluralin was the first to be detected, in the USA, and there is shown to be cross-resistance to most if not all other herbicides in this group (Vaughn et al., 1990). Baird et al. (1996) and Zeng and Baird (1997) have published comprehensive accounts of trifluralin resistance in <i>E. indica</i>. Anthony and Hussey (1999) have studied the molecular basis of the resistance of <i>E. indica</i> to dinitroaniline herbicides."</p>

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc</p>	<p>[Difficult to remove once roots are established] "Tolerates, or benefits from, cultivation, browsing pressure, mutilation, fire etc" ... "As an annual weed which does not root at the nodes, <i>E. indica</i> is relatively easily removed by hoeing at the early growth stages. Once established, however, the very strong root system makes it difficult to uproot manually. Solarization has been shown to kill seeds of <i>E. indica</i> down to 5 cm (Standifer et al., 1984). Shredded and chopped newspaper has shown potential as a mulching material for control of <i>Echinochloa crus-galli</i>, <i>Chenopodium album</i>, <i>Eleusine indica</i> and <i>Digitaria album</i> in tomato (Monks et al., 1997). However, the effect may vary in different environments and other vegetable crops. <i>E. indica</i> is favoured by zero-tillage techniques but is well suppressed by residues of a rye cover crop (Teasdale et al., 1991). <i>E. indica</i> and the total grass population were higher in fields receiving no tillage in a 5 year study in Honduras. There was a more heterogeneous distribution of species under no tillage suggesting that tillage reduces the diversity of weeds"</p>

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	n
	Source(s)	Notes
	<p>CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc</p>	<p>"Biological control of <i>E. indica</i> has been considered in great detail in Australia, where the related finger millet (<i>E. coracana</i>) does not occur (e.g. Wapshere, 1990a, b; Waterhouse, 1994). For classical biocontrol, potential organisms include the smut fungus <i>Melanopsichium eleusinis</i>, the nematode <i>Heterodera delvii</i>, and certain cecidomyiid gall midges (<i>Contarinia</i> sp.) but all require further study before they could be used. Fungi which might be developed as mycoherbicides include <i>Bipolaris</i> [<i>Cochliobolus</i>] <i>setariae</i> and <i>Pyricularia</i> [<i>Magnaporthe</i>] <i>grisea</i> (Figliola et al., 1988) but no active programme of development of these has yet been reported."</p>
	<p>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.</p>	<p>[No evidence. Widely distributed with no apparent limiting biotic factors] "in Hawai'i naturalized in shallow or compacted soil, 0-760 m, on Kure and Midway atolls, French Frigate Shoals, and all of the main islands except Ni'ihau and Kaho'olawe."</p>

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability
- Grows, and able to spread, in regions with tropical climates
- Naturalized on Kure and Midway atolls, French Frigate Shoals, and all of the main islands except Ni'ihau and Kaho'olawe; widely naturalized elsewhere
- A disturbance adapted weedy grass of cultivated areas, lawns, pastures, and waste places
- An agricultural weed of orchards, vegetable farms, nurseries and young oil palm plantations
- A potential environmental weed impacting coastal vegetation
- Other Eleusine species are invasive weeds
- Potentially allelopathic
- Cyanogenic or hydrogen cyanide toxic, can be poisonous to stock, particularly calves and sheep
- Potential host of other crop pests and pathogens
- Tolerates many soil types
- Reproduces by prolific seed production
- Hybridizes with other Eleusine species
- Autogamous and self-fertilized
- Reaches maturity in one growing season
- Seeds dispersed by wind and water, as a contaminant in crop seeds and soils, and attached to animal furs, mud and machinery
- Viable seeds also dispersed by grazing livestock
- Seeds may remain viable in the soil for 3+ years
- Some populations develop tolerance of or resistance to herbicides
- Tolerates mowing and browsing

Low Risk Traits

- Unarmed (no spines, thorns, or burrs)
- Palatable to grazing animals, especially at younger stages of growth
- Thrives in sun and high light environments (dense shade may limit spread)
- Not reported to spread vegetatively
- Herbicides may provide effective control (if resistance has not developed)

