Taxon: Urochloa brizantha (Hochst. ex A. Rich.) R. D. Webster

Family: Poaceae

Common Name(s): bread grass
palisade grass
palisade signal grass
signal grass

Synonym(s): Brachiaria brizantha (Hochst. ex A.
Panicum brizanthum Hochst. ex A.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 7 Jan 2022

WRA Score: 15.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Perennial Grass, Environmental Weed, Palatable, Dense Cover, Apomictic

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		
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
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	y=1, n=0	y
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
408	Creates a fire hazard in natural ecosystems		
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	y
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	n
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	y
607	Minimum generative time (years)		
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	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	[Not domesticated] "Native to tropical Africa but now introduced into most tropical countries."

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

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 5 Jan 2022]	"Native Africa NORTHEAST TROPICAL AFRICA: Ethiopia EAST TROPICAL AFRICA: Kenya, Tanzania, Uganda WEST-CENTRAL TROPICAL AFRICA: Cameroon, Democratic Republic of the Congo WEST TROPICAL AFRICA: Côte D'Ivoire, Ghana, Guinea, Nigeria, Sierra Leone SOUTH TROPICAL AFRICA: Mozambique, Malawi, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Namibia, South Africa (n. & e.)"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 5 Jan 2022]	

Qsn #	Question	Answer
203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Optimum temperature for growth. About 30-35°C. Minimum temperature for growth. It grows well into the winter, being green when other tropical grasses are brown and dry. Frost tolerance. It will survive frosts. Latitudinal limits. It can be used in pastures at high altitudes in Burundi (Scaillet, 1965). Altitude range. Sea-level to 3 000 m."

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 5 Jan 2022]	"Native Africa NORTHEAST TROPICAL AFRICA: Ethiopia EAST TROPICAL AFRICA: Kenya, Tanzania, Uganda WEST-CENTRAL TROPICAL AFRICA: Cameroon, Democratic Republic of the Congo WEST TROPICAL AFRICA: Côte D'Ivoire, Ghana, Guinea, Nigeria, Sierra Leone SOUTH TROPICAL AFRICA: Mozambique, Malawi, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Namibia, South Africa (n. & e.) Cultivated Southern America NORTHERN SOUTH AMERICA: Venezuela BRAZIL: Brazil SOUTHERN SOUTH AMERICA: Argentina Naturalized Northern America SOUTH-CENTRAL U.S.A.: United States [Texas] Southern America CARIBBEAN: Trinidad and Tobago CENTRAL AMERICA: Honduras NORTHERN SOUTH AMERICA: French Guiana, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia SOUTHERN SOUTH AMERICA: Argentina"
	Oppenheimer, H. (2008). New Hawaiian plant records for 2007. Bishop Museum Occasional Papers 100: 22-38	[East Maui] "Brachiaria brizantha (Hochst. ex Rich.) Stapf New island record Only recently documented in the Hawaiian Islands from Kahoʻolawe (Starr et al. 2006: 39), this grass also occurs on East Maui. The key to the species of Brachiaria by Herbst & Clayton (1998: 19) includes B. brizantha. Material examined. MAUI: East Maui, Hāna Dist, Pāpaʻaʻeanui, growing near Hana Hwy., 244 m, 7 Sep 2004, Oppenheimer & Hansen H90403 (BISH)."

205	**Does the species have a history of repeated introductions outside its natural range?**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed]	"Cultivated Southern America NORTHERN SOUTH AMERICA: Venezuela BRAZIL: Brazil SOUTHERN SOUTH AMERICA: Argentina Naturalized Northern America SOUTH-CENTRAL U.S.A.: United States [Texas] Southern America CARIBBEAN: Trinidad and Tobago CENTRAL AMERICA: Honduras NORTHERN SOUTH AMERICA: French Guiana, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia SOUTHERN SOUTH AMERICA: Argentina"
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Distribution. Native to tropical Africa but now introduced into most tropical countries."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Oppenheimer, H. (2008). New Hawaiian plant records for 2007. Bishop Museum Occasional Papers 100: 22-38	[East Maui] "Brachiaria brizantha (Hochst. ex Rich.) Stapf New island record. Only recently documented in the Hawaiian Islands from Kahoʻolawe (Starr et al. 2006: 39), this grass also occurs on East Maui. The key to the species of Brachiaria by Herbst & Clayton (1998: 19) includes B. brizantha. Material examined. MAUI: East Maui, Häna Dist, Päpaʻaʻeanui, growing near Hana Hwy., 244 m, 7 Sep 2004, Oppenheimer & Hansen H90403 (BISH)."
	Starr, F., Starr, K. & Loope, L.L. (2006). New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 87: 31-43	[Kahoolawe] "Brachiaria brizantha (Hoch. ex Rich.) Stapf New naturalized record Native to tropical Africa (PIER, 2005), Brachiaria brizantha (beardgrass) was previously known from experimental stations on Oʻahu (Hosaka 2553 BISH) and Molokaʻi (Joy HA- 5222 BISH). On Kahoʻolawe, B. brizantha was found in a small dense clump on the side of the road near the summit. The species can be distinguished by the following characteristics.“Culms erect, 60–120 cm high; leaf blades smooth, markedly nerved, 20–30 cm long, 6–18 mm broad; flowering culms bearing up to 4 racemes, these ascending, recurved, the rachis strong and narrow, usually deep purple in color; spikelets large, purple- tinged on margins, 4–6 mm long, the lower glume purple-tinged, less than half length of spikelet and clasping base of spikelet, the upper glume as long as spikelet, sparsely hairy toward apex” (Smith, 1979). This collection represents a new naturalized record for the state of Hawaiʻi. Material examined. KAHOʻOLAWE: Moaulanui, near K1 where it heads into Lua Makika crater, about5 m from side of road, occurring in an open dry disturbed area with Dodonaea viscosa and Neonotonia wightii, 1300 ft [396 m], 07 Jun 2004, Starr & Starr 040607-4."

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 5 Jan 2022]	Naturalized Northern America SOUTH-CENTRAL U.S.A.: United States [Texas] Southern America CARIBBEAN: Trinidad and Tobago CENTRAL AMERICA: Honduras NORTHERN SOUTH AMERICA: French Guiana, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia SOUTHERN SOUTH AMERICA: Argentina"

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 6 Jan 2022]	"Common weed of disturbed areas in the humid tropics and subtropics." [Disturbance adapted grass with detrimental environmental impacts in the Cerrado of Brazil]

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Cereals, Pastures" [Possibly, but usually intentionally cultivated as a pasture grass for animals]

304	Environmental weed	y
	Source(s)	**Notes**
	Damasceno, G., & Fidelis, A. (2020). Abundance of invasive grasses is dependent on fire regime and climatic conditions in tropical savannas. Journal of Environmental Management, 271, 111016	"First, Urochloa brizantha recovery from fire may be explained by its enhanced invasiveness on post-fire conditions (Gorgone-Barbosa et al., 2016). This results from four complementary mechanisms acting throughout the year: 1) the propagule pressure from neighboring invaded areas (Lockwood et al., 2005); 2) the persistence of its fire-resistant seeds (Gorgone-Barbosa et al., 2020) in the soil seed bank (Dairel, 2018); 3) its quick and efficient resprouting after disturbances (Fisher and Kerridge, 1996); and 4) the microclimatic buffer created by its tussocks (Assis, 2017), which can increase fire temperatures and cause a “kill thy neighbor effect” (Bond and Midgley, 1995)."
	Dairel, M., & Fidelis, A. (2020). The presence of invasive grasses affects the soil seed bank composition and dynamics of both invaded and non-invaded areas of open savannas. Journal of Environmental Management, 276, 111291	"In open savannas of the Cerrado, Urochloa brizantha (Hochst. ex A. Rich.) R.D.Webster– synonym Brachiaria brizantha (Hochst. ex A. Rich.) Stapf – and Melinis minutiflora Beauv. are African invasive species, being both perennial C4 grasses used mostly for pastures (Pivello et al., 1999a; Pivello et al., 1999b). Although they do not change the physiognomy of the herbaceous layer, they affect plant communities, having a negative impact by decreasing species diversity and altering biomass composition (Aires et al., 2014; Damasceno et al., 2018)."

Qsn #	Question	Answer
	Damasceno, G., Souza, L., Pivello, V. R., Gorgone-Barbosa, E., Giroldo, P. Z., & Fidelis, A. (2018). Impact of invasive grasses on Cerrado under natural regeneration. Biological Invasions, 20(12), 3621-3629	"Similar to temperate grasslands, plant invasions by M. minutiflora and Urochloa spp. in the Cerrado can promote the transition from preserved open formations into degraded states (Pivello and Coutinho 1996), ultimately altering the community diversity-stability mechanisms (Wilsey et al. 2014) to a point where a ‘‘degraded land’’ (sensu Pivello and Coutinho 1996) persists. The control or eradication of M. minutiflora and U. brizantha is thus needed to redefine the trajectory towards restoration of a diverse community where mechanisms of diversity-stability are maintained."
	Gorgone-Barbosa, E., Pivello, V. R., Bautista, S., Zupo, T., Rissi, M. N., & Fidelis, A. (2015). How can an invasive grass affect fire behavior in a tropical savanna? A community and individual plant level approach. Biological Invasions, 17(1), 423-431	"The presence of the invasive grass U. brizantha in the Cerrado campo sujo modified fire behavior towards lower fire intensity, lower combustion efficiency, and higher flame height at the community level, and increased the frequency of high temperatures at the IPL." ... "We showed in this study that U. brizantha doubled the height of flames; this may increase the mortality of shrubs and trees by topkill, favoring the dominance of the herbaceous layer, a typical feedback process of savanna environments (Kauffmann et al. 1994). In Cerrado, the presence of U. brizantha will probably lead to increasingly open physiognomies and to vegetation homogenization, and consequently, the diversity of physiognomies, habitats and species would decrease."

Qsn #	Question	Answer
305	**Congeneric weed**	**y**
	Source(s)	**Notes**
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Urochloa mutica is a fast-growing grass associated with wet habitats. It has become invasive in a number of regions and forms dense covers along streams and other water bodies. Stems grow out on the water surface and build up floating rafts. Such mats may grow up to l m thick. Floating stems may become up to 6 m long (Langeland and Craddock Burks, 1998). The dense and monospecific stands of the weed choke out other plant species (Cowie and Werner, 1993). The grass is tolerant of brackish water and withstands periods of drought. It reproduces and spreads primarily vegetatively by stem fragments, which are carried by water. Viable seeds are rarely produced in Florida (Langeland and Craddock Burks, 1998)."
	Smith, C.W. (1985). Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	[Brachiaria mutica = Urochloa mutica] "This perennial grass can reach heights of 2 m. It forms dense monotypic stands by layering from trailing stems. It will overgrow most shrubs and trees in its habitat. It has mild allelopathic activity (Chou and Young 1975). Man is the principal dispersal agent. Fire is rare in its habitat but the dense stands rapidly regenerate from any damage that they suffer. It has not been evaluated for biological control because it is a valued pasture grass in lowland areas."
	Barbosa, E. G., Pivello, V. R., & Meirelles, S. T. (2008). Allelopathic evidence in Brachiaria decumbens and its potential to invade the Brazilian cerrados. Brazilian Archives of Biology and Technology, 51, 625-631	[Urochloa decumbens] "The high dominance of Brachiaria grasses over cerrado native herbs has recently raised investigations on the presence of phytotoxins in some species. In cerrados, B. decumbens (Nees) Stapf. has advanced massively throughout the native vegetation and formed monospecific patches with no other species growing below or close to it. In situ studies in São Paulo State cerrado areas have shown that even M. minutiflora, another East-African grass that invaded the cerrado, could have been displaced by B. decumbens (Pivello et al., 1999a; 1999b), revealing a high competitive advantage of the latter species."

401	**Produces spines, thorns or burrs**	**n**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Perennial up to 120 cm high, with stout erect culms and broadly lanceolate leaf-blades. Two to five racemes, up to 15 cm long, with two rows of almost sessile, overlapping, rounded spikelets, 4-6 mm long on the underside."

402	**Allelopathic**	**y**
	Source(s)	**Notes**
	Senarathne, S. H. S., Dissanayaka, D. N. M., & Arachchi, L. V. (2010). Allelopathic potential of Brachiaria brizantha and B. milliformis on seed germination of selected bioassay species. Pakistan Journal of Weed Science Research, 16(2): 207-216	"B.brizantha and B. milliformis species incorporated root aqueous extracts; root exudates and its rhizosphere soil suppress seed germination of the five bioassay species and suggest that these responses are attributed to allelopathic effects which should be investigated further in the field."

Qsn #	Question	Answer
	Kobayashi, A., & Kato-Noguchi, H. (2015). The seasonal variations of allelopathic activity and allelopathic substances in Brachiaria brizantha. Botanical Studies, 56 (1), 1-7	"Background: Controlling weeds through allelopathy is one strategy to reduce dependency on synthetic herbicides. The plant shoots of the grass Brachiaria brizantha incorporated into the field soil were found to inhibit the growth of several plant species. We investigated the variations of allelopathic activity and allelopathic substances in B. brizantha harvested in June, October and January. Results: All extracts of B. brizantha obtained from June, October and January inhibited the root and shoot growth of cress, lettuce, Phleum pretense and Lolium multiflorum in a concentration dependent manner. However, the inhibitory activity of B. brizantha of June and October was greater than that of B. brizantha of January. Concentrations of three potent allelopathic active substances, (6R,9S)-3-oxo-α-ionol, (6R,9R)-3-oxo-α-ionol and 4 ketopinoresinol were also greater in B. brizantha of June and October than those in B. brizantha of January. Conclusion: The results suggest that the allelopathic activity and the levels of those allelopathic active substances are greater in B. brizantha of June and October than those in B. brizantha of January. It is possible that B. brizantha could be useful for a weed suppressive residue or soil additive materials in the variety of agricultural settings todevelop sustainable agriculture options. The effectiveness of B. brizantha of June and October as a weed suppressive agent may be greater than that of January."
	Kato-Noguchi, H., Kobayashi, A., Ohno, O., Kimura, F., Fujii, Y., & Suenaga, K. (2014). Phytotoxic substances with allelopathic activity may be central to the strong invasive potential of Brachiaria brizantha. Journal of Plant Physiology, 171(7), 525-530	"The grass Brachiaria brizantha, native to eastern Africa, becomes naturalized and dominant quickly in the non-native areas. It was hypothesized that phytotoxic chemical interaction between this plant and native plants may play an important role in the invasion of B. brizantha. However, no potent phytotoxic substance has been reported in this species. Therefore, we investigated possible allelopathic activity and searched for phytotoxic substances with allelopathic activity in B. brizantha. An aqueous methanol extract of B. brizantha inhibited the growth of roots and shoots of garden cress (Lepidium sativum), lettuce (Lactuca sativa), timothy (Phleum pratense) and ryegrass (Lolium multiflorum) seedlings. The extract was purified by several chromatographic runs and three allelopathically active substances were isolated and identified by spectral analysis as (6R,9R)-3-oxo-α-ionol, (6R,9S)-3-oxo-α-ionol and 4-ketopinoresinol. (6R,9R)-3-Oxo-α-ionol and (6R,9S)-3-oxo-α-ionol inhibited root and shoot growth of garden cress at concentrations greater than 30 and 10 μM, respectively. The activity of (6R,9S)-3-oxo-α-ionol was 5.3- to 6.2-fold that of (6R,9R)-3-oxo-α-ionol. The stereochemistry of the hydroxyl group at position C-9 may be important for the inhibitory activities of those compounds. 4-Ketopinoresinol inhibited root and shoot growth of garden cress at concentrations greater than 30 μM. The growth inhibitory activity of (6R,9S)-3-oxo-α-ionol was the greatest and followed by 4-ketopinoresinol and (6R,9R)-3-oxo-α-ionol. These results suggest that those phytotoxic substances may contribute to the allelopathic effect caused by B. brizantha and may be involved in the invasion of B. brizantha."

Qsn #	Question	Answer
403	**Parasitic**	**n**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Perennial up to 120 cm high, with stout erect culms and broadly lanceolate leaf-blades."

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Palatability. It is very palatable, with a good leaf/stem ratio."
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"Palatability/acceptability. Well accepted by grazing stock. Considered to be slightly more palatable than U. decumbens."

405	Toxic to animals	
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"At the Queensland Agricultural College, Lawes, Queensland, Australia, crossbred wether sheep grazing on a vigorous sward of Brachiarta brizantha growing on a black clay soil developed severe photosensitization and icterus, marked by drooping ears, swelling of the subcutis of the face and eyelids, and congested, yellowish mucous membranes. The sheep rapidly lost condition and died. In these animals the skin over the muzzle, ears, and eyelids was necrotic and the conjunctival sac filled with purulent exudate with consequent blindness (Briton & Paltridge, 1941)."
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	[No evidence with 'Marandu'] "Toxicity - Can cause severe photosensitization in sheep, goats and young cattle when used as the main feed. In Brazil however, where the grass (mainly 'Marandu') is particularly widely used, no photosensitization effects have been observed on cattle."

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

Qsn #	Question	Answer
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"U. brizantha is the most resistant of the Urochloa spp. to spittlebugs (Cercopidae), through an antibiotic mechanism. However, the level of resistance varies among accessions. 'Marandú' and a number of bred lines are resistant. Resistance to the spittlebug Deois flavopicta is probably from antinexosis, antibiosis and tolerance. Variable susceptibility to spider mite (Tetranychus urticae Tetranychidae), a particularly important factor in "push-pull" systems. Tolerant of leaf-cutting ants (Atta spp. and Acromyrmex spp.). Brown or burrowing bug (Scaptocoris Hemiptera, Cydnidae) has caused severe damage to commercial 'Marandú' pastures. Foliar leaf blight (Rhizoctonia solani) affects all accessions of U. brizantha except for CIAT 16320, which has low to moderate levels of resistance. Susceptible to rust (Uromyces setariae-italicae) in Colombia. Bacterial root rot (Erwinia chrysanthemi pv. zeae) can be a problem in poorly drained soils. A condition known as Marandu Death Syndrome (síndrome da morte do capim-marandu) occurs in stands growing on even temporarily waterlogged soils or subjected to short periods of inundation, where large patches of the stand die out. "

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	[Potentially harmful to animals in certain situations] "Toxicity. Can cause severe photosensitization in sheep, goats and young cattle when used as the main feed. In Brazil however, where the grass (mainly 'Marandu') is particularly widely used, no photosensitization effects have been observed on cattle."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	Damasceno, G., & Fidelis, A. (2020). Abundance of invasive grasses is dependent on fire regime and climatic conditions in tropical savannas. Journal of Environmental Management, 271, 111016	"Melinis minutiflora and Urochloa brizantha are perennial grass species native to fire-prone tropical savannas in Africa." ... "Both species have similar impacts on Cerrado fires, promoting higher flames and hotter and more intense fires than those burning only native vegetation (Rossi et al., 2014; Gorgone-Barbosa et al., 2015)."

Qsn #	Question	Answer
	Gorgone-Barbosa, E., Pivello, V. R., Bautista, S., Zupo, T., Rissi, M. N., & Fidelis, A. (2015). How can an invasive grass affect fire behavior in a tropical savanna? A community and individual plant level approach. Biological Invasions, 17(1), 423-431	[Possibly Yes] "Abstract Some invasive grasses have been reported to change fire behavior in invaded plant communities. Urochloa brizantha is an aggressive invasive grass in the Brazilian Cerrado, an ecosystem where fire is a common disturbance. We investigated the effects of U. brizantha on fire behavior in an open Cerrado physiognomy in Central Brazil. Using experimental burnings we compared fire behavior at both the community and the individual plant level in invaded (UJ) and non-invaded (NJ) areas burned in July. We also assessed the effect of fire season in invaded areas by comparing July (UJ) and October (UO) burnings. We evaluated the following variables: fuel load, fuel moisture, combustion efficiency, maximum fire temperature, flame height, and fire intensity. Additionally, we evaluated the temperatures reached under invasive and native grass tussocks in both seasons. Fuel load, combustion efficiency, and fire intensity were higher in NJ than in UJ, whilst flame height showed the opposite trend. Fuel amount and fire intensity were higher in October than in July. At the individual plant level, U. brizantha moisture was higher than that of native species, however, temperatures reaching C600 "C at ground level were more frequent under U. brizantha tussocks than under native grasses. At the community level, the invasive grass modified fire behavior towards lower intensity, lower burning efficiency, and higher flame height. These results provide essential information for the planning of prescribed burnings in invaded Cerrado areas." ... "Our results showed that U. brizantha has a great potential to influence fire behavior–both at the community and the IPL and modify the post-fire plant community. This potential seems to be modulated by factors such as the abundance of the invasive grass and the stage of degradation (amount of bare ground) of the area. Thus, the effects of U. brizantha we found in this study can be intensified in places where invasion is more severe. Moreover, this invasive species could increase the risk of fire and alter the frequency of fires in Cerrado at the end of dry season, due to the prolonged production of biomass, extending into the beginning of the dry season, and to the high amount of dead biomass accumulated during this period. Therefore, further studies considering the effects of different levels of U. brizantha infestation on fire regime (frequency, season, intensity) are needed to fully understand the overall role of this species in relation to fire."

409	**Is a shade tolerant plant at some stage of its life cycle**	**y**
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"It has moderate shade tolerance, and has been useful in more open coconut plantations (>60% light transmission). At low N inputs, DM yields have been higher in shade than in full sunlight."
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Response to light. It tolerates shade under coconuts well in Sri Lanka (Bor, 1960)."

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Soil requirements. It tolerates a wide range of soils and is tolerant of acid conditions."
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"U. brizantha grows on a wide range of well-drained, light to heavy textured soils of pH 4–8. It is tolerant of high Al+++ concentrations often found on soils with pH<5.5. Tolerance of Mn varies among ecotypes. Minor response to lime has been obtained on very acid soils. While it can survive on soils of low fertility, it requires medium to high soil fertility to be productive, slightly higher than required by U. decumbens and U. humidicola for good growth."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Perennial up to 120 cm high, with stout erect culms and broadly lanceolate leaf-blades."

412	Forms dense thickets	y
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Main deficiencies. Its tendency to produce monospecific swards."
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"Tends to monospecific sward."

501	Aquatic	n
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	[Terrestrial] "Natural habitat. Grassland valleys and open woodlands."

502	Grass	y
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 5 Jan 2022]	"Family: Poaceae (alt. Gramineae) Subfamily: Panicoideae Tribe: Paniceae Subtribe: Melinidinae"

Qsn #	Question	Answer
503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 5 Jan 2022]	"Family: Poaceae (alt. Gramineae) Subfamily: Panicoideae Tribe: Paniceae Subtribe: Melinidinae"

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Perennial up to 120 cm high, with stout erect culms and broadly lanceolate leaf-blades."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	[No evidence] "Native to tropical Africa but now introduced into most tropical countries." ... "Ability to spread naturally. It can spread slowly by seed as the seed ages to break its dormancy."

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Ability to spread naturally. It can spread slowly by seed as the seed ages to break its dormancy."
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"Large areas are established from seed. Fresh seed will not germinate due to physiological dormancy and must be stored for 6–9 months or acid-scarified before sowing. Seed should be broadcast at 2–4 kg/ha onto a well-prepared seedbed and then lightly harrowed and rolled to incorporate. U. brizantha is readily established vegetatively from rooted tillers."

603	**Hybridizes naturally**	**n**
	Source(s)	**Notes**
	De Souza-Kaneshima, A. M. et al. (2010). Meiotic behaviour in the first interspecific hybrids between Brachiaria brizantha and Brachiaria decumbens. Plant Breeding, 129(2), 186-191	[Artificial hybrids produced, but natural hybrids unlikely due to apomictic breeding system] "Hybridization in the genus Brachiaria is a complex undertaking due to apomixis and polyploidy. The two major species: Brachiaria brizantha and Brachiaria decumbens are predominantly tetraploid and apomictic. Natural sexual compatible genotypes were not identified."

604	**Self-compatible or apomictic**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	". brizantha is primarily an apomictic tetraploid (2n = 4x = 36). Diploid sexual accessions are known, but have no commercial value. Pentaploid and hexaploid types have also been described."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	[Irrelevant, but grasses are generally wind-pollinated] "U. brizantha is primarily an apomictic tetraploid (2n = 4x = 36). Diploid sexual accessions are known, but have no commercial value. Pentaploid and hexaploid types have also been described.".

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Sowing methods. It can be propagated vegetatively by sods, root pieces and stems."
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"U. brizantha is readily established vegetatively from rooted tillers."

607	Minimum generative time (years)	
	Source(s)	**Notes**
	't Mannetje, L. & Jones, R.M. (Eds.). (1992). Plant Resources of South-East Asia. No. 4. Forages. Pudoc Scientific Publishers, Wageningen, Netherlands	"Palisade grass grows quickly, and 3-5 months after sowing, it can be ready for a first, light grazing." [Probably 1-2 years]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	**Notes**
	Veldman, J. W., & Putz, F. E. (2010). Long-distance dispersal of invasive grasses by logging vehicles in a tropical dry forest. Biotropica, 42(6), 697-703	"Alien grass seeds collected from vehicles on log landings included three species known to colonize selectively logged forest (U. maxima, Urochloa brizantha, and Sorghum halapense; Veldman et al. 2009), and another exotic grass, Rottboellia cochinchinensis, not previously documented in INPA." ... "Fertile culms of U. maxima, U. brizantha, S. halepense, and R. cochinchinensis grow 1–3m tall with inflorescences that hang over roadways. When vehicles pass with the windows open, seeds fall into the passenger compartments; when people exit automobiles they presumably carry some of these seeds with them (Wichmann et al. 2009)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Vehicles, Escapee"

Qsn #	Question	Answer
702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Distribution. Native to tropical Africa but now introduced into most tropical countries."

Qsn #	Question	Answer
703	**Propagules likely to disperse as a produce contaminant**	**y**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Ornamental, Pasture"

Qsn #	Question	Answer
704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Cattle, Livestock, Escapee"

Qsn #	Question	Answer
705	**Propagules water dispersed**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Cattle, Livestock, Escapee" [Possibly, but not identified as an important vector]

Qsn #	Question	Answer
706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Cattle, Livestock, Escapee"

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Cattle, Livestock, Escapee" [Possibly adhering to livestock grazing on grass]

Qsn #	Question	Answer
708	**Propagules survive passage through the gut**	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Cattle, Livestock, Escapee" [Probably yes, as are seeds of the related U. decumbens]
	Gardener, C.J., McIvor, J.G. & Jansen, A. (1993). Survival of Seeds of Tropical Grassland Species Subjected to Bovine Digestion. Journal of Applied Ecology 30(1): 75-85	[Probably. Related species survive gut passage] "The perennial grasses with seed which survived digestion (i.e. Brachiaria decumbens, Cynodon dactylon, Axonopus affinis, Paspalum notatum and Pennisetum clandestinum) have similar characteristics. All are creeping rhizomatous or stoloniferous species better adapted to more humid conditions, and all form short dense swards or lawns under heavy grazing or mowing. In the first four species, the seed heads are carried on short stalks above the sward, making it difficult for cattle to reject the seed when grazing the foliage. Similarly, fallen seed tends to lodge in foliage and be eaten later."

801	**Prolific seed production (>1000/m2)**	**y**
	Source(s)	**Notes**
	Dairel, M., & Fidelis, A. (2020). The presence of invasive grasses affects the soil seed bank composition and dynamics of both invaded and non-invaded areas of open savannas. Journal of Environmental Management, 276, 111291	"The seed bank in the study area was mainly dominated by invasive species. In general, for the three plant communities, seeds of Urochloa brizantha corresponded to 55% (830 ± 239 seeds.m -2) of seeds found in the soils and Melinis minutiflora represented 30% (440 ± 127 seeds.m -2) of the total soil seed bank accessed by seed count method." ... "By seed counting method, Urochloa brizantha deposited more seeds in the soil seed bank between April to September peaking in June (1194 seeds.m-2, Fig. 2A)."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**n**
	Source(s)	**Notes**
	Dairel, M., & Fidelis, A. (2020). The presence of invasive grasses affects the soil seed bank composition and dynamics of both invaded and non-invaded areas of open savannas. Journal of Environmental Management, 276, 111291	"Urochloa brizantha seeds dominated the soil seed bank in UB areas, being also observed in the other areas. Although it is known that seeds of Urochloa spp. do not form a persistent seed bank (Dantas-Junior et al., 2018), this species showed to be able to produce a portion of seeds with physiological dormancy and to disperse many seeds in their reproductive phenology period throughout the year (Dantas-Junior et al., 2018)."

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 6 Jan 2022]	"U brizantha is susceptible to glyphosate, even at quite low rates, with minor differences among cultivars."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	"Fire. Burning is not recommended but plants will recover from an occasional, but not annual, fire."
	Skerman, P.J. & Riveros, F. (1990). Tropical Grasses. FAO, Rome	"Response to fire. B. brizantha will not tolerate fire. In Zambia annual burning of dominantly Hyparrhenia grassland for three years reduced the B. brizantha cover from 0.38 to 0.09 percent (Brockington, 1961)."
	Damasceno, G., & Fidelis, A. (2020). Abundance of invasive grasses is dependent on fire regime and climatic conditions in tropical savannas. Journal of Environmental Management, 271, 111016	[Fire may promote recovery of U. brizantha through a variety of ways] "First, Urochloa brizantha recovery from fire may be explained by its enhanced invasiveness on post-fire conditions (Gorgone-Barbosa et al., 2016). This results from four complementary mechanisms acting throughout the year: 1) the propagule pressure from neighboring invaded areas (Lockwood et al., 2005); 2) the persistence of its fire-resistant seeds (Gorgone-Barbosa et al., 2020) in the soil seed bank (Dairel, 2018); 3) its quick and efficient resprouting after disturbances (Fisher and Kerridge, 1996); and 4) the microclimatic buffer created by its tussocks (Assis, 2017), which can increase fire temperatures and cause a “kill thy neighbor effect” (Bond and Midgley, 1995)."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Cook, B.G., et al. (2020). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 5 Jan 2022]	[Unknown but may be resistant to the two-lined spittlebug] "U. brizantha is the most resistant of the Urochloa spp. to spittlebugs (Cercopidae), through an antibiotic mechanism. However, the level of resistance varies among accessions. ‘Marandú’ and a number of bred lines are resistant. Resistance to the spittlebug Deois flavopicta is probably from antinexosis, antibiosis and tolerance."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability and elevation range
• Thrives and spreads in regions with tropical climates
• Naturalized on Maui, possibly Kahoolawe (Hawaiian Islands) and elsewhere
• Common weed of disturbed areas in the humid tropics and subtropics
• An environmental weed in Brazil
• Other Urochloa species are invasive
• Allelopathic
• Potentially toxic or harmful to grazing animals under certain growing conditions
• May modify fire regime and potentially increase fire risk
• Moderate shade tolerance
• Tolerates many soil types
• Forms a dense cover that can exclude other vegetation
• Reproduces by seeds and vegetatively by sods, root pieces and stems
• Apomictic
• Seeds dispersed by vehicles, humans, cattle, other livestock and as a seed contaminant
• Prolific seed production

Low Risk Traits
• Despite naturalization, negative impacts have not been reported from the Hawaiian Islands to date
• Valued as a pasture grass in areas where it may also be regarded as weedy
• Unarmed (no spines, thorns, or burrs)
• Palatable to grazing animals
• Does not form a long-lived seed bank
• Herbicides may provide effective control