Taxon: Cucumis metuliferus **Family:** Cucurbitaceae

Common Name(s): African horned cucumber
African horned melon
horny cucumber
jelly melon

Synonym(s): Cucumis tinneanus Kotschy & Peyr.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 6 Jan 2015

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

Keywords: Naturalized, Weedy Vine, Spiny Fruit, Edible, Bird-Dispersed

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

Qsn #	Question	Answer Option	Answer
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	y
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	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	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	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Cultivars selected for improved taste & increased size of fruit, but otherwise, no evidence that cultivation has reduced competitive ability] "In Kenya, New Zealand, France and Israel the fruits of improved cultivars are commercially grown for export." ... "Fruits from wild-growing plants are often bitter and inedible. Traditional medical practitioners in Zimbabwe consider the bitter wild fruits as poisonous if taken by mouth." ... "Specimens with non-bitter fruits, totally lacking spiny protuberances, have been observed both in the wild and under semi-cultivated conditions near Bulawayo (Zimbabwe)." ... "Fruit quality in horned melon is measured by colour, size, taste, acidity and aroma. Original cultigens tested were found somewhat lacking in the taste factor, however these lines were being tested for plant vigour and pest and disease resistances. There is a need to identify sweet-fruited cultivars. More recent studies with germplasm from Botswana and Zimbabwe showed promising results for increased size and improved taste. Within the germplasm being grown in Zimbabwe and South Africa, cultivars are found with large (up to 18 cm) fruits; they are orange when ripe and have pleasantly tasting flesh, used as an attractive ingredient in fruit salads."

102	Has the species become naturalized where grown?	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	**Notes**
	WRA Specialist. 2015. 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**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Cucumis metuliferus occurs naturally throughout the tropical and subtropical sub-Saharan regions of Africa, from Senegal to Somalia and South Africa."

Qsn #	Question	Answer
202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"...occurs naturally throughout the tropical and subtropical sub-Saharan regions of Africa..."

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	"Herbarium specimens of this species have been collected from a wide altitudinal range, from 210–1 800 m above sea level."
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Grows in tropical climates, but elevation range exceeds 1000 m, demonstrating some environmental versatility] "The natural habitat of horned melon ranges from low-altitude riverine semi-evergreen forest to semi-arid highlands and Kalahari sands. Horned melon is a warm-season grower in tropical to subtropical regions, and does not tolerate cold conditions. It occurs at altitudes from near sea level to 1800 m."

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Cucumis metuliferus occurs naturally throughout the tropical and subtropical sub-Saharan regions of Africa, from Senegal to Somalia and South Africa. It has also been recorded in Yemen. In Kenya, New Zealand, France and Israel the fruits of improved cultivars are commercially grown for export. Cucumis metuliferus has become naturalized in Australia, and is reported as adventive in Croatia."

205	**Does the species have a history of repeated introductions outside its natural range?**	**y**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Cucumis metuliferus occurs naturally throughout the tropical and subtropical sub-Saharan regions of Africa, from Senegal to Somalia and South Africa. It has also been recorded in Yemen. In Kenya, New Zealand, France and Israel the fruits of improved cultivars are commercially grown for export."

301	**Naturalized beyond native range**	**y**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Cucumis metuliferus has become naturalized in Australia, and is reported as adventive in Croatia."

Qsn #	Question	Answer
	Morton, J. F. 1987. The Horned Cucumber, alias" Kiwano"(Cucumis metuliferus, Cucurbitaceae). Economic Botany, 41(2): 325-327	"It has been naturalized in Queensland, Australia, for at least 60 yr, as recalled by Gwen Rouse of Miami, who grew up there and, with her friends, ate the fruits as a child. Graham Jamieson, senior horticulturist, Department of Primary Industries, Brisbane, has written me that it is included in Weeds of Queensland (1977) as a weed of sugarcane fields and farms along the Mulgrave and Herbert rivers, one controlled with herbicides and fruit disposal to prevent reseeding."
	Berlingeri, C., & Crespo, M. B. 2012. Inventory of related wild species of priority crops in Venezuela. Genetic Resources and Crop Evolution, 59(5): 655-681	"Table 4 Inventory of major crop relatives in Venezuela" [Cucumis metuliferus - Status = Naturalized]

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	South African National Biodiversity Institute. 2009. PlantzAfrica.com - Cucumis metuliferus. http://www.plantzafrica.com/plantcd/cucumismet.htm. [Accessed 5 Jan 2015]	[Disturbance adapted] "The jelly melon also grows in disturbed areas and abandoned land."
	Maroyi, A. 2013. Use of weeds as traditional vegetables in Shurugwi District, Zimbabwe. Journal of Ethnobiology and Ethnomedicine, 9:60	[Listed as a useful weed] "Of the documented edible weeds, 52.4% are indigenous while 47.6% are exotic to Zimbabwe. With the exception of Cucumis metuliferus and Moringa oleifera which are semi-cultivated, the rest are categorized as agricultural weeds [22,28,30]." ... "According to participants, Cleome gynandra, Cucumis anguria and Cucumis metuliferus are deliberately spared during digging, weeding and land clearing activities for the benefits or usefulness they provide to households as traditional vegetables."
	National Research Council. 2008. Lost Crops of Africa. Volume III: Fruits. The National Academies Press, Washington, D.C.	[Minor weed] "All the new plantings and international movements of a spiky fruit crammed with seeds have caused some observers concern that the horned melon trade is exposing the world to a rampant, vigorous vine that will become an irrepressible weed. So far there have been no reports of serious outbreaks, but for at least 60 years the plant has been naturalized in tropical Australia and is said to be a nuisance, and at odd times a curse. In Queensland, for instance, the plant is a sometime pest of sugarcane fields and farms,8 although it is not regarded as a weed in South Africa or Botswana.9 It is also considered a nuisance weed at one location in South Carolina (the USDA Vegetable Laboratory near Charleston) but has remained very localized. So far at least, there has been no evidence of calamitous outbreaks. “After years of production we see no problems,” the Morrises reported in New Zealand, a country traumatized by disasters with exotic plants. And Israel has not encountered problems with the crop turning pestiferous.10 And one of our contributors writes “Not in Europe,” either."

Qsn #	Question	Answer
	Morton, J. F. 1987. The Horned Cucumber, alias" Kiwano"(Cucumis metuliferus, Cucurbitaceae). Economic Botany, 41(2): 325-327	[Potential weed of agriculture] "Graham Jamieson, senior horticulturist, Department of Primary Industries, Brisbane, has written me that it is included in Weeds of Queensland (1977) as a weed of sugarcane fields and farms along the Mulgrave and Herbert rivers, one controlled with herbicides and fruit disposal to prevent reseeding." ... "Concernedt htaht e kiwano might, throughc asual seed dispersal,b ecome a weed in southern Florida's warm climate, I wrote Harvel L. Ford, deputy administrator, Plant Protection and Quarantine, U.S.D.A., Washington, DC." ... "Also that the plant has been proposed for inclusion under Federal Noxious Weed Regulations, along with about 800 other species. "These are currently under staff review, and provided C. metuliferus is listed as a Federal noxious weed, kiwano fruits will be prohibited entry from New Zealand and all other foreign countries."

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Morton, J. F. 1987. The Horned Cucumber, alias" Kiwano"(Cucumis metuliferus, Cucurbitaceae). Economic Botany, 41(2): 325-327	[Potentially, although impacts unspecified] "Graham Jamieson, senior horticulturist, Department of Primary Industries, Brisbane, has written me that it is included in Weeds of Queensland (1977) as a weed of sugarcane fields and farms along the Mulgrave and Herbert rivers, one controlled with herbicides and fruit disposal to prevent reseeding."

304	Environmental weed	n
	Source(s)	**Notes**
	Werren, G. 2001. Environmental Weeds of the Wet Tropics Bioregion: Risk Assessment & Priority Ranking. Rainforest CRC, Cairns, Australia	"Appendix 2 – List of exotic plants that have naturalised within the Wet Tropics Bioregion" [Includes Cucumis metuliferus, but no impacts listed]

305	Congeneric 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	"Cucumis dipsaceus" ... "Found in arid, sunny regions at lower elevations. A weed in pastures, rangelands, and waste places."
	Grichar, W. J. 2009. Control of smellmelon (Cucumis melo) in soybean with herbicides. Weed Technology, 21(3): 777-779	"Smellmelon is becoming more of a problem in soybean and corn (Zea mays L.) along the Texas Gulf Coast as well as in the south Texas peanut (Arachis hypogaea L.) production area (author's personal observation). The range of smellmelon stretches from Georgia to the southern part of California and as for north as Arkansas (SWSS 1999)."

401	Produces spines, thorns or burrs	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	National Research Council. 2008. Lost Crops of Africa. Volume III: Fruits. The National Academies Press, Washington, D.C.	"The horned melon can also be a seller's nightmare. Anyone who harvests and packs it must wear gloves because the leaves have needly hairs and the piercing horns on the fruit make it hard to handle. Shippers use nylon brushes to quickly and easily grind down the sharp spikes to rounded nubs, so people can then handle the fruits without stabbing themselves."
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Fruits spiny] "Vigorous annual herb with climbing or prostrate stems, having solitary, simple tendrils 4–10.5 cm long; root system strong, fibrous; stems reaching several m in length, grooved, with long stiff spreading hairs. Leaves alternate, simple; stipules absent; petiole 3–12 cm long, setose; blade ovate or pentagonal in outline, 3.5–14 cm × 3.5–13.5 cm, shallowly palmately 3–5-lobed, hispid setulose especially on veins below, becoming scabrid punctate." ... "Fruit an oblong-cylindrical berry 6–16 cm × 3–9 cm, on a stalk 2–7 cm long, rounded at both ends and beset with stout, broad-based, spiny protuberances 1–1.5 cm long, dark mottled green, ripening through yellow to bright orange, many-seeded." ... "Care is needed during picking because the stiff sharp hairs on the stems and the spiny 'horns' on the fruits can easily puncture the skin; it is recommended that gloves be worn for harvesting."

402	Allelopathic	
	Source(s)	**Notes**
	Lockerman, R. H., & Putnam, A. R. 1979. Evaluation of allelopathic cucumbers (Cucumis sativus) as an aid to weed control. Weed Science, 27(1): 54-57	[Unknown. Documented in genus] "Abstract. Cucumber (Cucumis sativus L.) accessions which had demonstrated allelopathy under controlled environmental conditions were evaluated in the field. Plant introduction (PI) 169391 suppressed proso millet (Panicum miliaceum L.) fresh weight and population 58 and 84%, respectively. Total overseeded and volunteer weed population was reduced 54% when grown in association with PI 169391. Plant introduction 169391 was approximately twice as effective as PI 285605 in suppressing proso millet growth. Inhibition of weed species did not occur consistently in the field. The allelopathic effect of cucumbers was suppressed during periods of increased rainfall. However, these tests demonstrated that allelopathic activity could be obtained under certain edaphic and environmental conditions."

403	Parasitic	n
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[No evidence] "Vigorous annual herb with climbing or prostrate stems..." [Cucurbitaceae]

Qsn #	Question	Answer
404	**Unpalatable to grazing animals**	
	Source(s)	**Notes**
	Morton, J. F. 1987. The Horned Cucumber, alias" Kiwano"(Cucumis metuliferus, Cucurbitaceae). Economic Botany, 41(2): 325-327	[Fruit palatable. Palatability of foliage unknown] "In northern Nigeria the fruits are "rather bitter and not eaten," and in the Kalahari region they are "eaten by game animals, and in time of necessity are given to cattle and are even eaten by the Bushmen."

405	Toxic to animals	
	Source(s)	**Notes**
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	[Unknown if toxic compounds could poison animals] "The leaves (like those of most Cucurbitaceae) may be cooked and eaten as spinach (Onderstall 1984; Roodt 1998; Pooley 2005). The foliage, however, contains saponin, an oily glycoside, which is a strong foaming extract when mixed with water. This compound can be toxic, but also has many medicinal uses. According to Roodt (1998), the bitter compounds in the leaves can be neutralised when it is cooked."

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Kiwano is used as a rootstock for disease resistance for cucumber, Cucumis sativus."
	National Research Council. 2008. Lost Crops of Africa. Volume III: Fruits. The National Academies Press, Washington, D.C.	"The plant is notably resistant to disease and pests, including many of other cucurbits. In the wild its only enemy seems to be a caterpillar that eats its way into fruits lying on the ground. In several experiments with other cucurbits, it proved the one most resistant to nematodes (Meloidogyne incognita and M. javanica). It is also ignored by the pumpkin fly (Dacus bivitattus), a fruit fly that is the bane of curcurbit agriculture in Africa. Nonetheless, diseases can be a problem. Israel has encountered several viruses (notably, zucchini virus), and perhaps bacteria causing “water spots” on the fruit. Also, especially in a wetter climate, fungi can be problematic."

Qsn #	Question	Answer
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Potentially] "In southern Africa horned melon plants are seldom affected by diseases or pests in their natural habitat. Cucumis metuliferus is susceptible to cucumber mosaic virus, tobacco ringspot virus, tomato ringspot virus, watermelon mosaic virus 2, and a severe strain of bean yellow mosaic virus. Some accessions are susceptible to Fusarium wilt (Fusarium oxysporum). Plantings in Israel were affected by powdery mildew (Sphaerotheca fuliginea) and squash mosaic virus. Greenhouse plantings in Spain, with high temperatures and humidity, were affected by powdery mildew (Erysiphe cichoracearum) and the greenhouse white fly (Trialeurodes vaporariorum), but field plantings were unaffected. African horned melon is resistant to the musk melon yellow virus. Some accessions are highly resistant to watermelon mosaic virus 1, due to a single completely dominant gene, and hypersensitive-resistant to squash mosaic virus. An orange and black cucurbit beetle, Sonchia pectoralis, has been observed damaging the leaves of young plants, but not to the extent of harming overall growth. The ubiquitous pumpkin fly, which ravages other cucurbit crops in southern Africa, does not attack horned melon. Horned melon is highly resistant to root-knot nematodes (Meloidogyne spp.). Resistance to powdery mildew, melon aphid (Aphis gossypii), greenhouse white fly and Fusarium wilt has been recorded in several accessions."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Kiwano fruit was reported to be more nutritious than cucumbers, having notably higher values for most nutrient components."
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	[Foliage possibly toxic if eaten raw] "The leaves (like those of most Cucurbitaceae) may be cooked and eaten as spinach (Onderstall 1984; Roodt 1998; Pooley 2005). The foliage, however, contains saponin, an oily glycoside, which is a strong foaming extract when mixed with water. This compound can be toxic, but also has many medicinal uses. According to Roodt (1998), the bitter compounds in the leaves can be neutralised when it is cooked. The root is used for birth pains. It is also cooked and applied externally to the genitalia for treatment of gonorrhoea."
	South African National Biodiversity Institute. 2009. PlantzAfrica.com - Cucumis metuliferus. http://www.plantzafrica.com/plantcd/cucumismet.htm. [Accessed 5 Jan 2015]	[Fruit from bitter forms possibly poisonous] "As is the case in C. africanus (March 2005 in this series), the fruits of C. metuliferus occur in very bitter forms, grading to non-bitter forms. The bitter forms are unpalatable and probably poisonous, but there is no way of distinguishing between them except by tasting." ... "Only the bitter forms of the fruit are toxic. According to Roodt, the toxicity can usually be neutralized by cooking the fruits."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Unknown, but unlikely. Annual, so unlikely to contribute significant biomass to fuel load] "Vigorous annual herb with climbing or prostrate stems ... " ... "The natural habitat of horned melon ranges from low-altitude riverine semi-evergreen forest to semi-arid highlands and Kalahari sands." ... "Stems of horned melon die back at the end of the growing season while the fruits remain attached and continue ripening to a bright orange colour."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	**Notes**
	Morton, J. F. 1987. The Horned Cucumber, alias" Kiwano"(Cucumis metuliferus, Cucurbitaceae). Economic Botany, 41(2): 325-327	"In 1984 two Floridians brought seeds from New Zealand to ECHO (Educational Concers for Hunger Organization) in North Fort Myers, FL. In July one seed was planted in shade, one in full sun. The shade plant died. The sun plant flourished, covering about 14 sq m, and fruited heavily, finally succumbing to disease."
	Plants for a Future. 2014. Cucumis metuliferus. http://www.pfaf.org/user/Plant.aspx?LatinName=Cucumis+metuliferus. [Accessed 5 Jan 2015]	"It cannot grow in the shade."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Kiwano thrives in full sun and will grow on most soil types including rocky slopes but does best on well-drained, sandy loam, alluvial soils rich in organic matter."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Plants tolerate a wide range of soil types throughout their natural distribution area."

411	Climbing or smothering growth habit	y
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Vigorous annual herb with climbing or prostrate stems, having solitary, simple tendrils 4–10.5 cm long; root system strong, fibrous; stems reaching several m in length, grooved, with long stiff spreading hairs." ... "Vegetative stem growth, either climbing or sprawling, exhibits typical cucurbit exuberance and the plants are capable of smothering nearby plant growth."

Qsn #	Question	Answer
412	**Forms dense thickets**	**n**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[No evidence] "The natural habitat of horned melon ranges from low-altitude riverine semi-evergreen forest to semi-arid highlands and Kalahari sands. Horned melon is a warm-season grower in tropical to subtropical regions, and does not tolerate cold conditions. It occurs at altitudes from near sea level to 1800 m."

501	**Aquatic**	**n**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Terrestrial] "The natural habitat of horned melon ranges from low-altitude riverine semi-evergreen forest to semi-arid highlands and Kalahari sands."

502	**Grass**	**n**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	Cucurbitaceae

503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Cucurbitaceae] "Vigorous annual herb with climbing or prostrate stems, having solitary, simple tendrils 4–10.5 cm long; root system strong, fibrous; stems reaching several m in length, grooved, with long stiff spreading hairs."

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Stems of horned melon die back at the end of the growing season while the fruits remain attached and continue ripening to a bright orange colour."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"In the wild Cucumis metuliferus is widespread and occurs in a variety of habitats, so there is no reason to consider it liable to genetic erosion."

Qsn #	Question	Answer
602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Cucumis metuliferus is propagated by seed."

603	Hybridizes naturally	n
	Source(s)	**Notes**
	Deakin, J. R., Bohn, G. W., & Whitaker, T. W. 1971. Interspecific hybridization in Cucumis. Economic Botany, 25(2): 195-211	"The uniquely thick-spined, monoecious, mesophytic, diploid cultivar Cucumis metuliferus, Homed Cucumber" failed to set fruits from reciprocal cross-pollinationsw ith 15 other species and C. anguria var. longipes (Table II)." ... "The breeding results confirmed this view; no fruits were set from cross-pollinations with C. metuliferus as either the male or female parent. Cucumis metuliferus is therefore set apart with no close relatives among the other species."
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Attempts at hybridization unsuccessful] "Cucumis metuliferus possesses important genes for disease and pest resistance that would be of benefit to the gene pool of other commercially important Cucumis species, i.e. musk melon and cucumber, if they could be transferred. However, many attempts by various research groups to introduce these genes using traditional sexual hybridization methods have not been successful due to strong incompatibility barriers. Neither embryo culture nor somatic hybridization by protoplast fusion has produced successful results to date."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"Flowers are unisexual, monoecious, male and female flowers on the same plant. Male flowers solitary or 2–10 in usually sessile fascicles, pedicellate, with lobed receptacle tube and yellow petals. Female flowers are solitary, pedicellate, sometimes co-axillary with male, with ellipsoid ovary covered with large soft spines, perianth is similar to that of the male flower."
	Plants for a Future. 2014. Cucumis metuliferus. http://www.pfaf.org/user/Plant.aspx?LatinName=Cucumis+metuliferus. [Accessed 5 Jan 2015]	"The flowers are monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and are pollinated by Insects. The plant is self-fertile. "
	Chen, J.F., & Adelberg, J. 2000. Interspecific hybridization in Cucumis-progress, problems, and perspectives. HortScience, 35(1): 11-15	[Self-fertility documented in Cucumis species] "Fig. 7. Polygon of crossability in Cucumis species (modified from Nijs and Visser, 1985). Arrows point to the female parent. Moderately to strongly self-fertile and cross-fertile hybrids (thick solid line); sparingly self-fertile and moderately cross-fertile hybrids (thin solid line); self-fertile, usually not cross-fertile hybrids (dashed and dotted line); inviable seeds or seedlings (dashed line); self-sterile and cross-sterile hybrids (thick dashed line); self-sterile and cross-fertile hybrids (long dashed line). Absence of a line indicates that seeded fruits were not obtained; question mark means that the information needs to be confirmed."

Qsn #	Question	Answer
	Fassuliotis, G. 1977. Self-fertilization of Cucumis metuliferus Naud. and its cross-compatibility with Cucumis melo L. Journal of the American Society for Horticultural Science. 102(3): 336-339	Self-fertile

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Flowers unisexual, regular, 5-merous; sepals filiform, 2–4 mm long; petals united at base, 0.5–1.5 cm long, yellow; male flowers in 1–10 -flowered fascicles, with pedicel 2–18 mm long, stamens 3; female flowers solitary, with pedicel 5–35 mm long, ovary inferior, ellipsoid, 1–2.5 cm long, covered with large soft spines, stigma 3-lobed." ... "Pollination is by insects."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[No evidence] "Fruits of horned melon in southern Africa continue ripening after the cessation of the rainy season, long after the stems have died back." ... "Cucumis metuliferus is propagated by seed."

607	Minimum generative time (years)	1
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	"Flowering starts about 8 weeks after sowing, with male flowers appearing first, followed after several days by female flowers."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	National Research Council. 2008. Lost Crops of Africa. Volume III: Fruits. The National Academies Press, Washington, D.C.	[Occurs along roadsides, but fruit relatively large, & lack means of external attachment] "It is a resilient plant, found especially clambering along roadsides and gully fringes as well as on fallowed and abandoned lands. It seems to prefer life among the weeds, and it is commonly overlooked by passersby."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	"The crop is commercially grown as an export crop in Kenya, New Zealand, France and Israel. It has become naturalized in Australia, and is reported as adventive in Croatia."

703	Propagules likely to disperse as a produce contaminant	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Hobdy, R. 2014. District Manager, Hawaii Division of Forestry & Wildlife (retired). Pers. Comm. 19 December	Seedling appeared in a potted plant. Frequency of inadvertent dispersal of seeds in other potted plants unknown

704	Propagules adapted to wind dispersal	n
	Source(s)	**Notes**
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	"Fruits are eaten by a variety of birds when they ripen on the stems; birds are therefore largely responsible for the dispersal of seeds." ... "Fruit ellipsoid-cylindrical, obscurely trigonous, 60–130 × 28–94 mm when ripe, the scattered spines rather stout, broad-based, fleshy, ±6–14 × 2–5 mm and white to brown bristle-tipped; deep green, ripening yellow to orange-red with longitudinal bands of pale markings, rather soft and fleshy; carried on a 20–70 mm long peduncle (Figure 2e & f). Seeds ellipsoid, flattened, hundreds per fruit 6.0–9.0 × 2.0–4.0 × 1.0–1.5 mm embedded in a light green, emerald-green or translucent, jelly-like flesh."

705	Propagules water dispersed	
	Source(s)	**Notes**
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	[Distribution along riverbanks and in river beds suggests movement by water is likely] "This plant usually grows in shallow or deep, well-drained sand or loam soils, mostly in alluvial soil on riverbanks, in river beds or on flood plains."
	Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 2, Fruits. Springer, New York	[Distribution suggests fruit and/or seeds may be moved by water along riverine habitats] "It is also found on abandoned cultivated land, often riverine, in riverbeds or flood plains, on fringes of gullies 200–1,100 m above sea level but nearer the equator the upper limit may reach 1,800 m."

706	Propagules bird dispersed	y
	Source(s)	**Notes**
	South African National Biodiversity Institute. 2009. PlantzAfrica.com - Cucumis metuliferus. http://www.plantzafrica.com/plantcd/cucumismet.htm. [Accessed 5 Jan 2015]	"Birds eat the juicy ripe fruits. Hollowed-out shells are often found on the ground"
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	"Fruits are eaten by a variety of birds when they ripen on the stems; birds are therefore largely responsible for the dispersal of seeds. They eat the juicy ripe fruit easily due to the absence of a tough or hard outer skin."

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	Morton, J. F. 1987. The Horned Cucumber, alias" Kiwano"(Cucumis metuliferus, Cucurbitaceae). Economic Botany, 41(2): 325-327	[Adapted for consumption & internal dispersal] "In northern Nigeria the fruits are "rather bitter and not eaten," and in the Kalahari region they are "eaten by game animals, and in time of necessity are given to cattle and are even eaten by the Bushmen."

708	Propagules survive passage through the gut	y
	Source(s)	**Notes**
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	"Fruit that fall to the ground may further be consumed by rodents, primates and small antelope. It has proportionally much more moisture than commercial cucumbers and is thus a useful source of water for humans and animals in arid areas (Van Wyk & Gericke 2000)."
	South African National Biodiversity Institute. 2009. PlantzAfrica.com - Cucumis metuliferus. http://www.plantzafrica.com/plantcd/cucumismet.htm. [Accessed 5 Jan 2015]	[Animals consuming fruits presumably disperse seeds] "...rodents, primates and small antelopes (e.g. steenbok) nibble on the fruit. Jelly melons lack the layer of firm flesh found in cultivated cucumbers, thus containing proportionately more moisture; therefore providing a useful source of water for humans and animals in arid areas."
	Morton, J. F. 1987. The Horned Cucumber, alias" Kiwano"(Cucumis metuliferus, Cucurbitaceae). Economic Botany, 41(2): 325-327	[Presumably Yes] "In northern Nigeria the fruits are "rather bitter and not eaten," and in the Kalahari region they are "eaten by game animals, and in time of necessity are given to cattle and are even eaten by the Bushmen."

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	Kellerman, M. J. S., & Van Rooyen, M. W. 2007. Seasonal variation in soil seed bank size and species composition of selected habitat types in Maputaland, South Africa. Bothalia, 37(2): 249-258	"APPENDIX 5.—Seasonal variation in seed density (mean number of seeds m-2) o f species in woodland seed bank when examined directly (Dir.) after collection and re-examined (Re.) in September" [Cucumis metuliferus = 17 seeds m-2]
	Bester, S.P. & Condy, G. 2013. Cucumis metuliferus E.Mey. ex Naudin. Flowering Plants of Africa 63: 56–64	"Plants produce many seeds per fruit and these seeds germinate and grow quite easily. As this species is a fast-grower, it can quickly cover a frame, trellis or unsightly compost heap in the garden."

Qsn #	Question	Answer
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/. [Accessed 6 Jan 2015]	"Storage Behaviour: Orthodox Storage Conditions: (R.J. Probert, pers. com.)"
	Baskin, C.C. & Baskin, J.M. 2014. Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination. Second Edition. Academic Press, San Francisco, CA	[Seeds have physiological dormancy. Physiological dormancy prevents embryo growth and seed germination until chemical changes occur.] "TABLE 9.25 Dormancy class or Nondormancy (D/ND) in seeds of lianas and vines of tropical dry woodlands, natural savannas and grasslands. * = type of dormancy is inferred from available information on germination and on characteristics of seeds in that family." [Cucumis metuliferus - PD = physiological dormancy]

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Rehbein, C.A. 1960. Prickly cucumber control. Cane Growers' Quarterly Bulletin, 24: 10-12	"The following treatments were applied with a knapsack spray to African or prickly cucumber (Cucumis metuliferus) growing in sugar cane: (1) 2, 4, 5-T 80% w/v as butyl ester at 1.0 and 0.5 pints/ac in 100 gal water, (2) 2, 4-D 17.8% w/v as ethyl ester + 2, 4, 5-T 16.4%, w/v as butyl ester at 6.67 pints/ac in 100 gal water, and (3) amitrole 50% a.i. at 18.75 and 12.5 pounds per acre. Two weeks after treatment, (1) and (2) had caused complete kill of cucumber. The higher rate of (3) caused death in some cases, but slightly injured the sugar cane; however, after 5 weeks, treatment (3) had also eliminated the cucumber. It was concluded that treatment (1) at 0.5 pounds per acre would give rapid control of cucumber at a cost of approximately 1/ac for material, treatment (2) gave slower control at approximately the same cost; and (3) was too expensive to be satisfactory."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	Wilkins-Ellert, M.H. 2004. Cucumis metuliferus E.Mey. ex Naudin In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands	[Unknown, but an annual plant, so probably does not tolerate mutilation or cultivation] "Vigorous annual herb with climbing or prostrate stems" ... "Stems of horned melon die back at the end of the growing season while the fruits remain attached and continue ripening to a bright orange colour."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m, demonstrating environmental versatility
• Thrives in tropical climates
• Naturalized in Queensland, Australia, Venezuela, and possibly elsewhere
• A minor weed of disturbed areas and agriculture
• Other Cucumis species have become invasive
• Leaves have needly hairs & fruit with stout, broad-based, spiny protuberances
• Raw leaves may contain toxic compounds
• Tolerates many soil types
• Climbing plant may smother other vegetation
• Seeds dispersed by birds, frugivorous animals & intentionally by people
• Self-compatible
• Able to reach maturity in 8 weeks (annual)
• Orthodox seeds may form a persistent seed bank (longevity unknown)

Low Risk Traits
• Fruit edible
• Seedless & spineless cultivars may reduce ability to spread or become a nuisance
• Requires full sun
• Not reported to spread vegetatively
• Herbicides may provide effective control