

Assessment date 17 August 2016

<i>Momordica charantia</i> ALL ZONES		Answer	Score
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
2.03	Broad climate suitability (environmental versatility)	y	1
2.04	Native or naturalized in habitats with periodic inundation North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	2
3.02	Garden/amenity/disturbance weed	n	0
3.03	Weed of agriculture	y	4
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	y	1
4.05	Toxic to animals	y	1
4.06	Host for recognised pests and pathogens	y	1
4.07	Causes allergies or is otherwise toxic to humans	y	1
4.08	Creates a fire hazard in natural ecosystems	unk	0
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	unk	0
4.11	Climbing or smothering growth habit	y	1
4.12	Forms dense thickets	y	1
5.01	Aquatic	n	0
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	n	0
6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed	y	1

6.03	Hybridizes naturally	unk	-1
6.04	Self-compatible or apomictic	y	1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	0	1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y	1
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	unk	-1
7.04	Propagules adapted to wind dispersal	n	-1
7.05	Propagules water dispersed	unk	-1
7.06	Propagules bird dispersed	y	1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	y	1
8.01	Prolific seed production	n	-1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	unk	-1
8.03	Well controlled by herbicides	y	-1
8.04	Tolerates, or benefits from, mutilation or cultivation	unk	-1
8.05		?	
Total Score		19	
Implemented Pacific Second Screening		No	
Risk Assessment Results		HIGH	

section	# questions answered	satisfy minimum?
A		11 yes
B		10 yes
C		18 yes
total		39 yes

	Reference	Source data
1.01		cultivated, but no evidence of selection for reduced weediness
1.02		
1.03		
2.01	<p>1. PERAL NAPPFAST Global Plant Hardiness (http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20lnd.tif). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?409896 (4-20-2016).</p>	<p>No computer analysis was performed. 1. Global hardiness zone: 9, 10, 11, 12, 13; equivalent to USDA Hardiness zones: USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11a: to USDA Zone (40 °F) USDA Zone 11b: to (45 °F) USDA Zone 12a: to (50 °F) USDA Zone 12b: to (55 °F). . 2. Native to Africa East Tropical Africa: Kenya; Tanzania; Uganda South Tropical Africa: Angola; Malawi; Mozambique; Zambia; Zimbabwe West Tropical Africa: Benin; Cote D'Ivoire; Gambia; Ghana; Liberia; Mali; Nigeria; Senegal; Sierra Leone West-Central Tropical Africa: Burundi; Cameroon; Gabon; Rwanda; Zaire Western Indian Ocean: Madagascar Asia-Tropical Indian Subcontinent: India; Nepal; Pakistan; Sri Lanka Indo-China: Cambodia; Thailand; Vietnam Malesia: Indonesia; Malaysia; Papua New Guinea; Philippines Australasia Australia: Australia - Queensland Pacific South-Central Pacific: French Polynesia Southwestern Pacific: Fiji</p>
2.02		
2.03	<p>1. Köppen-Geiger climate map (http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf). 2. GBIF http://www.gbif.org/species/2874581 (4-20-2016)</p>	<p>1. Distribution in the native/cultivated range occurs in Aw, Am, Af, Bwk, Bwh, Bsh, Cwa, Cwb, Cfa</p>
2.04	<p>1. Climate Charts. World Climate Maps. http://www.climate-charts.com/World-Climate-Maps.html#rain (8-19-2015)</p>	<p>1. native to regions with rainfall from 29 to 196 inches annually.</p>
2.05	<p>Herbyclopedia http://www.herbyclopedia.com/item/health-benefits-of-bitter-melon-momordica-charantia-2 (4-19-2016)</p>	<p>1. Transported to the Americas during the slave trade 2. It appears to be native to the African and Australian continents, but its actual origin has been obscured by its spread as a food crop. 3. Introduced to Hawaii, China, and Central America</p>
3.01	<p>1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. PROTA http://www.prota4u.org/protav8.asp?p=Momordica+charantia (4-19-2016)</p>	<p>The species <i>M. charantia</i> and <i>Momordica balsamina</i> both produce edible fruits, and have been widely distributed as crops becoming naturalized throughout the tropics... Currently it can be found cultivated and naturalized in North, Central and South America, the West Indies and on several islands in the Pacific Ocean 2. It was possibly domesticated in India and southern China and is now found naturalized in almost all tropical and subtropical regions.</p>
3.02		no evidence

3.03	<p>1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York. 3. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.</p>	<p>1. It interferes with the growth of a wide range of vegetables, annual, perennial, orchard and plantation crops by climbing over them, competing for light and possibly for nutrients and water, raising the humidity around their bases, and interfering with access, management and harvesting. <i>M. charantia</i> is a particular problem in sugarcane; in the first three months it may smother all growth, and at all stages, but particularly towards harvest it climbs over the crop and binds stalks together, reducing sugar content and making harvesting very difficult. 2. <i>M. charantia</i> is a weed in 22 crops in over 50 countries...and is frequently reported in sugarcane and other plantation crops. 3. Wild <i>M. charantia</i> can become a troublesome weed in large-scale plantations of e.g. rubber and oil palm in Indonesia and possibly in other South-East Asian countries too.</p>
3.04	<p>1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. PIER http://www.hear.org/pier/species/momordica_charantia.htm (4-20-2016)</p>	<p>1. <i>M. charantia</i> is an aggressive invasive that grows as rapidly forming dense colonies that engulf native vegetation, climbing high into mature tree canopies and shading-out trees and shrubs in the understory. It competes for light and resources with native vegetation and it has the potential to completely out-compete vegetation communities by displacing native species, inhibiting the germination and establishment of seedlings in the understory and by changing community structures and altering ecological functions in invaded areas 2. Invasive in Hawaii, Mexico, central America and across the Pacific</p>
3.05	<p>1. Holm (1979) A Geographical Atlas of World Weeds. John Wiley and Sons.</p>	<p>1. <i>M. balsamina</i> is considered a principal weed of agriculture in Sudan; <i>M. tuberosa</i> is considered a serious weed of agriculture in Sudan.</p>
4.01	<p>Walters, T. W., & Decker-Walters, D. S.. (1988). Balsam-Pear (<i>Momordica charantia</i>, Cucurbitaceae). <i>Economic Botany</i>, 42(2), 286–288. http://www.jstor.org/stable/4255078?seq=1#page_scan_tab_contents</p>	<p>No evidence of these features</p>
4.02		<p>no evidence</p>
4.03	<p>Walters, T. W., & Decker-Walters, D. S.. (1988). Balsam-Pear (<i>Momordica charantia</i>, Cucurbitaceae). <i>Economic Botany</i>, 42(2), 286–288.</p>	<p>No evidence</p>
4.04	<p>1. PROTA http://www.prota4u.org/protav8.asp?p=Momordica+charantia (4-19-2016) 2. PIER http://www.hear.org/pier/species/momordica_charantia.htm (4-20-2016)</p>	<p>1. This weed is a nuisance in pastures as it has an unpleasant odour when bruised and is unpalatable to stock. It may even be harmful to livestock 2. a weed in grazing land, unpalatable to stock.</p>
4.05	<p>1. Burrows and Tyrll (2001) Toxic Plants of North America. Iowa State University Press, Ames.</p>	<p>1. The mature seeds and fruits...are believed to cause severe digestive tract disturbance. They appear to be a particular problem in dogs, which also may exhibit prominent neurologic signs</p>
4.06	<p>1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. Burrows and Tyrll (2001) Toxic Plants of North America. Iowa State University Press, Ames. 3. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.</p>	<p>1. <i>M. charantia</i> is also an alternative host for viruses and leafhoppers that affect celery, pawpaw and watermelon, and is a host for many other pests. 2. Serious diseases of bitter melon are <i>Cercospora</i> leaf spot, downy mildew (caused by <i>Pseudoperonospora cubensis</i>) and bacterial wilt (caused by <i>Pseudomonas solanacearum</i>). Fruit fly (<i>Dacus cucurbitae</i>) is the most destructive insect pest of bitter melon, whereas root-knot nematodes (<i>Meloidogyne incognita</i>) also attack the crop.</p>

4.07	1. Dave's Garden http://davesgarden.com/guides/pf/go/61001/#b (4-13-2016) 2. Morton (1967) The balsam pear - an edible, medicinal and toxic plant. <i>Economic Botany</i> 21: 57-68. 3. NCSU Plant database (https://plants.ces.ncsu.edu/plants/all/momordica-charantia/ accessed 8/17/2016)	1. Parts of plant are poisonous if ingested 2. the juice of the plant caused the death of a child through severe vomiting and purging and there are scattered references in the literature to the poisonous aspects of... <i>M. charantia</i> 3. TOXIC ONLY IF LARGE QUANTITIES EATEN. Headache, salivation, facial redness, pupil dilation, stomach pain, nausea, vomiting, diarrhea, muscular weakness
4.08		no evidence
4.09	1. Dave's Garden http://davesgarden.com/guides/pf/go/61001/#b (4-13-2016)	1. Full Sun
4.10		Lack of evidence
4.11	1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. PIER http://www.hear.org/pier/species/momordica_charantia.htm (4-20-2016) 3. Holm, Doll, Holm, Pancho, and Herberger (1997) <i>World weeds: natural histories and distribution</i> . John Wiley & Sons, New York.	1. <i>M. charantia</i> is an annual and perennial climbing vine 2. climber 3. creeping or climbing, herbaceous vine
4.12	1. Holm, Doll, Holm, Pancho, and Herberger (1997) <i>World weeds: natural histories and distribution</i> . John Wiley & Sons, New York. 2. Morton (1967) The balsam pear - an edible, medicinal and toxic plant. <i>Economic Botany</i> 21: 57-68.	1. "often forming a dense carpet over other plants" 2. "on fertile soil forming a mat a foot deep"
5.01	Walters, T. W., & Decker-Walters, D. S.. (1988). Balsam-Pear (<i>Momordica charantia</i> , Cucurbitaceae). <i>Economic Botany</i> , 42(2), 286–288.	Family: Cucurbitaceae
5.02	Walters, T. W., & Decker-Walters, D. S.. (1988). Balsam-Pear (<i>Momordica charantia</i> , Cucurbitaceae). <i>Economic Botany</i> , 42(2), 286–288.	Family: Cucurbitaceae
5.03	Walters, T. W., & Decker-Walters, D. S.. (1988). Balsam-Pear (<i>Momordica charantia</i> , Cucurbitaceae). <i>Economic Botany</i> , 42(2), 286–288.	Herbaceous vine
5.04	Walters, T. W., & Decker-Walters, D. S.. (1988). Balsam-Pear (<i>Momordica charantia</i> , Cucurbitaceae). <i>Economic Botany</i> , 42(2), 286–288.	These features are not described
6.01		no evidence
6.02	1. Dave's Garden http://davesgarden.com/guides/pf/go/61001/#b (4-13-2016) 2. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016)	1. Propagated by seed 2. <i>M. charantia</i> spreads sexually by seeds and vegetatively by underground stems.
6.03		no evidence
6.04	1. Lenzi, Maurício, Orth, Afonso I., & Guerra, Tânia M.. (2005). <i>Ecologia da polinização de Momordica charantia L. (Cucurbitaceae), em Florianópolis, SC, Brasil</i> . <i>Brazilian Journal of Botany</i> , 28(3), 505-513. 2. Devadas and Ramadas (1992) Seed yield and quality as influenced by the method of pollination in bittergourd (<i>Momordica charantia L.</i>). <i>South Indian Horticulture</i> 40: 277-279.	1. Fruit formation occurred through crossed-pollination and self-pollination. 2. Self-pollinated flowers of <i>M. charantia</i> produced higher seed number per fruit and higher individual seed weight than cross-pollinated flowers, but field emergence and seedling vigor were higher in seeds resulting from cross pollination.
6.05	1. Lenzi, Maurício, Orth, Afonso I., & Guerra, Tânia M.. (2005). <i>Ecologia da polinização de Momordica charantia L. (Cucurbitaceae), em Florianópolis, SC, Brasil</i> . <i>Brazilian Journal of Botany</i> , 28(3), 505-513. 2. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016)	1. All floral visitors collected and observed on the flowers belong to the class Insecta. <i>Diabrotica speciosa</i> (Coleoptera, Chrysomelidae) was the most abundant species (40%) and the main pollinator of <i>Momordica charantia</i> in the study area. Other insects, however, as bees (Apoidea) and butterflies (Hesperiidae and Pieridae), were also observed in the flowers and can contribute as pollinators. 2. Flowers are pollinated by bees and other insects
6.06	1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. Plant Net http://publish.plantnet-project.org/project/plantinvasivekruger/collection/collection/synthese/details/MOMCH (4-20-2016)	1. <i>M. charantia</i> spreads sexually by seeds and vegetatively by underground stems. 2. vegetative spread

6.07	1. PROTA http://www.prota4u.org/protav8.asp?p=Momordica+charantia (4-19-2016) 2. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	1. Flowering starts with male flowers 5–6 weeks after sowing, while female flowers appear 10 days later. 2. Flowering can begin 30 to 35 days after planting and fruits mature 15 to 20 days later
7.01	1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016)	1. <i>M. charantia</i> is a fast-growing vine and quickly covers the supporting vegetation or structure. In general, this species can be found growing in coastal areas, along creeks and rivers, forest edges and disturbed sites... It also occurs as a ruderal in disturbed, uncultivated habitats such as roadsides, gardens, fencelines and around houses and farm buildings.
7.02	1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016)	1. <i>M. charantia</i> may also be grown as an ornamental, although this use is usually combined with the collection of the fruits and shoots for food... This plant can be grown as a cover crop.. <i>M. charantia</i> is grown as a food crop throughout the tropics.
7.03		no evidence
7.04	1. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	1. pendulous, egg-shaped berry covered with small warts, 2 to 7 cm long in wild forms, to 30 cm in cultivated forms
7.05		no evidence
7.06	1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. PIER http://www.hear.org/pier/species/momordica_charantia.htm (4-20-2016) 3. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	1. The arils are attractive to birds and animals which disperse the seeds. 2. Bird- and animal-dispersed seed and underground stems. 3. It is thought...that bird dispersal of the seeds accounts for its spread within South America...Seeds within dehiscent fruits of <i>M. charantia</i> strongly contrast with the large red aril and are thus easily spotted by birds who eat and disperse them.
7.07	1. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	1. pendulous, egg-shaped berry covered with small warts, 2 to 7 cm long in wild forms, to 30 cm in cultivated forms
7.08	1. PIER http://www.hear.org/pier/species/momordica_charantia.htm (4-20-2016) 2. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	1. Bird- and animal-dispersed seed and underground stems. 2. The bright red aril which surrounds the seed may attract birds and mammals which then eat and disperse the seeds
8.01	1. PROTA http://www.prota4u.org/protav8.asp?p=Momordica+charantia (4-19-2016) 2. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	1. Fruit a pendulous broadly ovoid and beaked to attenuate-ellipsoid berry up to 11 cm × 4 cm, but in cultivars up to 45 cm × 9 cm, reddish-orange when ripe, with a paler apex, ornamented with about 8 longitudinal rows of subconical tubercles and many smaller tubercles in between, splitting into 3 valves and exposing the seeds sheathed in sticky red pulp hanging in 2 rows from the faces of each valve; cultivated fruits with smooth to spiny surface, often with rounded knobs in rows between 8–10 lengthwise ridges, but in some cultivars completely spiny without ridges. Seeds oblong, c. 10 mm × 5 mm, flattened, white or brown, testa sculptured, margins grooved.... The number of fruits per plant depends largely on the cultivar used; it can range from around 5 to more than 100 2. 15 to 20 seeds per fruit

8.02	<p>1. PROTA http://www.prota4u.org/protav8.asp?p=Momordica+charantia (4-19-2016) 2. http://www.pestnet.org/SummariesofMessages/Pests/PestsEntities/Weeds/Momordicacharantia,Balsampear,control,PNG.aspx (4-20-2016)</p>	<p>1. Seedlings emerge 5–7 days after sowing, but fresh seed often shows dormancy which is very hard to break and can last for some months. 2. Momordica charantia is a problem weed to some cultivated crops in Guyana e.g. sugar cane. Its life cycle was investigated from germination to the production of matured fruits. Factors such as dormancy, mode of germination, seedling emergence and stages in developmental growth of plant after emergence were examined and recorded, with respect to germination percentage and new plant parts related to time. The weed's response, to four chemicals (Aclonifen, Banvel, Grandstan and oxytril) was tested using a visual method to measure these responses. It was shown that dormancy does exist (55% germination) when compared with seeds treated to break dormancy (80.81% germination). A seed could remain viable for at least 6 months. The mode of emergence is active hypocotyl and this vine emerge best at the planting depth of 1-3 inches. 12-15 days is the time period for maximum emergence after planting, and six weeks later mature fruits are produced.</p>
8.03	<p>1. Invasive Species Compendium http://www.cabi.org/isc/datasheet/34678 (4-19-2016) 2. PIER http://www.hear.org/pier/species/momordica_charantia.htm (4-20-2016) 3. Morton (1967) The balsam pear - an edible, medicinal and toxic plant. Economic Botany 21: 57-68.</p>	<p>Post-emergent chemical control of M. charantia can be obtained with: 2,4-D + ametryne (Tjitrosoedirdjo, 1990) fluroxypyr (Tjitrosoedirdjo, 1990) fluroxypyr + 2,4-D (Tjitrosoedirdjo, 1990) acifluorfen + bentazon (Lorenzi, 1986) ametryn (Lorenzi, 1986) asulam + diuron (Lorenzi, 1986) ametryn + atrazine (Bushundial, 1991) betazone + MCPA (Lorenzi, 1986) bentazon + paraquat (Lorenzi, 1986) bifenox (Lorenzi, 1986) bifenox + propanil (Lorenzi, 1986) bromacil (Lorenzi, 1986) chlorimuron-ethyl (Lorenzi, 1986) dicamba (Lorenzi, 1986) diquat (Lorenzi, 1986) diuron (Bushundial, 1991) diuron + 2,4-D (Lorenzi, 1986) diuron + MSMA (Lorenzi, 1986) 2,4-D (Lorenzi, 1986) 2,4-D + glyphosate (Lorenzi, 1986) 2,4-D + picloram (Lorenzi, 196) fomesafen (Lorenzi, 1986) glyphosate (Lorenzi, 1986) ioxynil (Lorenzi, 1986) ioxynil + 2,4-D (Henty and Pritchard, 1975) MSMA (Lorenzi, 1986) paraquat (Lorenzi, 1986) prometryne (Lorenzi, 1986) tebuthiuron (Lorenzi, 1986). The authors listed above make no recommendations for the efficacy or suitability of these herbicides against M. charantia in named crops. 2. Herbicides like triclopyr (Garlon 4) or glyphosate (Roundup) can be used 3. Spraying with 2,4-D (500 ppm) kills</p>
8.04		no evidence
8.05		no evidence