

**Australia/New Zealand Weed Risk Assessment adapted for Florida.**

**Data used for analysis published in: Gordon, D.R., D.A. Onderdonk, A.M. Fox, R.K. Stocker, and C. Gantz. 2008. Predicting Invasive Plants in Florida using the Australian Weed Risk Assessment. Invasive Plant Science and Management 1: 178-195.**

<i>Momordica charantia (balsam pear)</i>			
Question number	Question	Answer	Score
1.01	Is the species highly domesticated?	?	
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)	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	n	0
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	0
3.02	Garden/amenity/disturbance weed	n	0
3.03	Weed of agriculture	y	0
3.04	Environmental weed	n	0
3.05	Congeneric weed	y	0
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	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.1	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils)	y?	1
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		
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	?	
6.04	Self-compatible or apomictic	y	1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative fragmentation	n	-1
6.07	Minimum generative time (years)	1	1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n	-1
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	n	-1
7.04	Propagules adapted to wind dispersal	n	-1
7.05	Propagules water dispersed	n	-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)		
8.03	Well controlled by herbicides	y	-1
8.04	Tolerates, or benefits from, mutilation or cultivation		
8.05	Effective natural enemies present in Florida, or east of the continental divide		
<b>Total Score</b>			<b>14</b>

<b>Outcome</b>	<b>Reject*</b>
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\*Used secondary screen from: Daehler, C. C., J.L. Denslow, S. Ansari, and H. Kuo. 2004. A risk assessment system for screening out harmful invasive pest plants from Hawaii's and other Pacific islands. *Conserv. Biol.* 18: 360-368.

section	# questions answered	satisfy minimum?
A	7	yes
B	12	yes
C	19	yes
total	38	yes

Data collected 2006-2007

Question number	Reference	Source data
1.01	1. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden. 2. Walters and Decker-Walters (1988) Notes on economic plants: Balsam-pear ( <i>Momordica charantia</i> , Cucurbitaceae). Economic Botany 42: 286-288.	1. " <i>M. charantia</i> was probably first domesticated in eastern India and southern China" 2. "Wild and cultivated populations of <i>M. charantia</i> are pantropical in distribution....the regions of eastern India and southern China have been suggested as possible centers of domestication...Mature fruits of the wild balsam-pear are 2-7 cm in length and 1.4-2 cm in width...Mature fruits of the domesticate may be 10-35 cm long and 4-8 cm in width...Aside from fruit characters, the domesticate retains a remarkable resemblance to wild forms." [so does not exist only in domestication, and the main difference between wild and domesticated forms is the bigger fruits of the domesticate, which would likely only make it more weedy]
1.02		
1.03		
2.01	1. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York. 2. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	1. "It grows...where mean temperatures are as low as 12.5°C to as high as 25°C". 2. " <i>M. charantia</i> grows well in tropical and subtropical climates."
2.02		
2.03	Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	"It is adapted to a wide range of environments"
2.04	Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1.	"It is sensitive to waterlogging."

	Backhuys Publishers, Leiden.	
2.05	1. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden. 2. Wagner, Herbst, and Sohmer (1999) Manual of the flowering plants of Hawai'i. University of Hawai'i Press/Bishop Museum Press, Honolulu.	1. "It is thought to have been introduced into Brazil from Africa with the slave trade" 2. Introduced in Hawaii.
3.01	1. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York. 2. Morton (1967) The balsam pear - an edible, medicinal and toxic plant. Economic Botany 21: 57-68.	1. " <i>M. charantia</i> is native to the old world tropics but is now a weed in the tropical and subtropical regions in most of Latin America, all of Asia and parts of Africa." 2. "It is now found naturalized in nearly all tropical and subtropical regions."
3.02		no evidence
3.03	1. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York. 2. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	1. " <i>M. charantia</i> is a weed in 22 crops in over 50 countries...and is frequently reported in sugarcane and other plantation crops." 2. "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."
3.04		no evidence
3.05	Holm (1979) A Geographical Atlas of World Weeds. John Wiley and Sons.	<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.
4.01	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	no description of these traits
4.02		no evidence
4.03	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	no description of this
4.04	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	"cattle seemed to avoid eating this weed, probably due to its offensive odor"
4.05	Burrows and Tyrl (2001) Toxic Plants of North America. Iowa State University Press, Ames.	"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".
4.06	Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	"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."
4.07	1. Morton (1967) The balsam pear - an edible, medicinal and toxic plant. Economic Botany 21: 57-68. 2. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	1. "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> ". BUT 2. "Leaves or fruit are eaten in several Asian and Latin American countries."
4.08		no evidence
4.09	Hortiscopia 4.0	exposure: full sun
4.1	Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	"It tolerates a wide range of soils but it thrives in a well-drained sandy loam, rich in organic matter."
4.11	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	creeping or climbing, herbaceous vine
4.12	1. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York. 2. Morton (1967) The balsam pear - an edible, medicinal and toxic plant. Economic Botany 21: 57-68.	1. "often forming a dense carpet over other plants" 2. "on fertile soil forming a mat a foot deep"
5.01		terrestrial
5.02	USDA, NRCS. 2005. The PLANTS Database, Version 3.5 ( <a href="http://plants.usda.gov">http://plants.usda.gov</a> ). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	Cucurbitaceae
5.03	USDA, NRCS. 2005. The PLANTS Database, Version 3.5 ( <a href="http://plants.usda.gov">http://plants.usda.gov</a> ). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	Cucurbitaceae
5.04	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	root a taproot
6.01		
6.02	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	"the plant propagates only by seed"
6.03	Morton (1967) The balsam pear - an edible, medicinal and toxic plant. Economic Botany 21: 57-68.	"The balsam pear has also been successfully crossed with <i>M. cochinchinensis</i> and with the snake gourd ( <i>Tricosanthes anguina</i> Linn.)." [artificial hybrids]
6.04	Devadas and Ramadas (1992) Seed yield and quality as influenced by the method of pollination in bittergourd ( <i>Momordica charantia</i> L.). South Indian Horticulture 40: 277-279.	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	Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	"Flowers of <i>Momordica</i> are pollinated by insects, especially bees."
6.06	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	"the plant propagates only by seed"
6.07	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	"Flowering can begin 30 to 35 days after planting and fruits mature 15 to 20 days later".
7.01		unlikely with such large fruits and seeds
7.02	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	"The most widespread use of <i>M. charantia</i> is as a vegetable and occasionally as an ornamental."
7.03		no evidence
7.04	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	fruit a "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. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York. 2. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	1. "The bright red aril which surrounds the seed may attract birds and mammals which then eat and disperse the seeds". 2. "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	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	fruit a "pendulous, egg-shaped berry covered with small warts, 2 to 7 cm long in wild forms, to 30 cm in cultivated forms" [no evidence of any means of attachment]
7.08	Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York.	"The bright red aril which surrounds the seed may attract birds and mammals which then eat and disperse the seeds".
8.01	1. Holm, Doll, Holm, Pancho, and Herberger (1997) World weeds: natural histories and distribution. John Wiley & Sons, New York. 2. Padua, Bunyaphatsara, and Lemmens, eds. (1999) Plant Resources of South-East Asia. No. 12. Medicinal and poisonous plants 1. Backhuys Publishers, Leiden.	1. 15 to 20 seeds per fruit 2. "The number of fruits per plant may reach 20-25 during the cropping period." [gives 300-500 seeds per plant]
8.02		
8.03	Morton (1967) The balsam pear - an edible, medicinal and toxic plant. Economic Botany 21: 57-68.	"Spraying with 2,4-D (500 ppm.) kills the vine and its roots, but seedlings may spring up and completely shroud the trees anew within three to four weeks

		unless spraying is repeated."
8.04		
8.05		