

**Family:** *Cactaceae*

**Taxon:** *Hylocereus undatus*

**Synonym:** *Cereus undatus* Haw.

**Common Name:** belle of the night  
 dragon fruit  
 moonlight cactus  
 night-blooming cereus  
 queen of the night  
 red pitaya  
 strawberry pear

Questionnaire :	current 20090513	Assessor:	Assessor	Designation:	
Status:	In Progress	Data Entry Person:	Assessor	<b>WRA Score 9</b>	
101	Is the species highly domesticated?		y=-3, n=0		n
102	Has the species become naturalized where grown?		y=1, n=-1		
103	Does the species have weedy races?		y=1, n=-1		
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)		
303	Agricultural/forestry/horticultural weed		n=0, y = 2*multiplier (see Appendix 2)		n
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)		y
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)		
401	Produces spines, thorns or burrs		y=1, n=0		y
402	Allelopathic		y=1, n=0		
403	Parasitic		y=1, n=0		n
404	Unpalatable to grazing animals		y=1, n=-1		n
405	Toxic to animals		y=1, n=0		n
406	Host for recognized pests and pathogens		y=1, n=0		n
407	Causes allergies or is otherwise toxic to humans		y=1, n=0		n
408	Creates a fire hazard in natural ecosystems		y=1, n=0		n

409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	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	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	
603	Hybridizes naturally	y=1, n=-1	
604	Self-compatible or apomictic	y=1, n=-1	
605	Requires specialist pollinators	y=-1, n=0	y
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
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	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)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Designation:

WRA Score 9

## Supporting Data:

101	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Is the species highly domesticated? No. Assessment is of wild type introduced to the Hawaiian Islands]
102	2013. WRA Specialist. Personal Communication.	NA
103	2013. WRA Specialist. Personal Communication.	NA
201	2008. Janick, J./Paull, R.E.. The Encyclopedia of Fruit & Nuts. Cabi Publishing, Wallingford, UK	[Species suited to tropical or subtropical climate(s) 2-High] "...native to tropical regions of Mexico, the Caribbean, Central America and northern South America."
201	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Species suited to tropical or subtropical climate(s) 2-High] "Hylocereus species is endemic to Latin America. Exact origin of dragon fruit is not known but is believed to be in the area from southern Mexico, the Pacific side of Guatemala and Costa Rica, and El Salvador."
202	2008. Janick, J./Paull, R.E.. The Encyclopedia of Fruit & Nuts. Cabi Publishing, Wallingford, UK	[Quality of climate match data 2-High]
203	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Broad climate suitability (environmental versatility)? Yes] "It has a wide range of agroecological adaptability. This cactus is able to tolerate drought, heat, poor soil, and cold. The modification of the stem for water storage, the reduction or absence of leaves, the waxy surfaces, and night-time opening of the tissues for carbon dioxide uptake (the CAM process), enable the plants to tolerate harsh conditions."
204	2008. Janick, J./Paull, R.E.. The Encyclopedia of Fruit & Nuts. Cabi Publishing, Wallingford, UK	[Native or naturalized in regions with tropical or subtropical climates? Yes] "...native to tropical regions of Mexico, the Caribbean, Central America and northern South America."
205	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Does the species have a history of repeated introductions outside its natural range? Yes] "Native to Central America, but extensively cultivated for its flowers and fruit throughout the New and Old World tropics."
301	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Naturalized beyond native range? Yes] "In Hawai'i widely cultivated on all of the main islands, rarely setting fruit, but spreading, often extensively, vegetatively"
301	2010. Wu, S.-H./Yang, T.Y.A./Teng, Y.-C./Chang, C.-Y./Yang, K.-C./Hsieh, C.-F.. Insights of the Latest Naturalized Flora of Taiwan: Change in the Past Eight Years. <i>Taiwania</i> . 55(2): 139-159.	[Naturalized beyond native range? Yes] "Appendix 1. List of naturalized species of Taiwan" [Includes <i>Hylocereus undatus</i> ]
301	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Naturalized beyond native range? Yes] "It is commonly cultivated and naturalized throughout tropical American lowlands, the West Indies, the Bahamas, Bermuda, southern Florida and the tropics of the Old World. It has been widely introduced and escaped in tropical Asia, Australia, and South America."
301	2013. Queensland Government. Weeds of Australia - Night-blooming cactus - <i>Hylocereus undatus</i> . <a href="http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Hylocereus_undatus.htm">http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Hylocereus_undatus.htm</a> [Accessed 29 Nov 2013]	[Naturalized beyond native range? Yes] "This species is becoming widely naturalised in eastern Australia. It has been recorded in south-eastern and central Queensland and in the coastal districts of northern New South Wales. Also naturalised overseas in La R union, Hawaii, New Caledonia, Niue and south eastern USA (i.e. Florida)."
302	2013. Dave's Garden. PlantFiles: Red Pitaya, Dragon Fruit, Strawberry Pear, Night blooming Cereus, Queen of the Night, Honolulu Queen - <i>Hylocereus undatus</i> . <a href="http://davesgarden.com/guides/pf/go/54131/">http://davesgarden.com/guides/pf/go/54131/</a> [Accessed 29 Nov 2013]	[Garden/amenity/disturbance weed? A potential landscaping/maintenance nuisance] "This plant gets so unbelievably huge that it can be annoying." [Comment from a grower in Greece]
303	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Agricultural/forestry/horticultural weed? No] No evidence
304	2001. Langeland, K.A./Stocker, R.K.. Control of Non-native Plants in Natural Areas of Florida. SP 242. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL <a href="http://mrec.ifas.ufl.edu/ldspmgt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.p">http://mrec.ifas.ufl.edu/ldspmgt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.p</a>	[Environmental weed? Controlled as a nuisance weed of natural areas with potential environmental impacts] "Hand pull and remove from site if possible; if removal is not feasible, lay the plants out on a plastic tarp and spray them with 10% Garlon 4; 15% Roundup has been successful but it takes much longer for the plants to die."

304	2003. Erskine, A.. Vegetation Management Plan East Ballina Crown Reserve. Wetland Care Australia, Ballina NSW	[Environmental weed? Yes] "It is semi-epiphytic and xerophytic and can survive in the canopy after the main root had been severed. The weight of this plant can cause serious damage to rainforest trees by breaking limbs."
304	2013. Queensland Government. Weeds of Australia - Night-blooming cactus - <i>Hylocereus undatus</i> . <a href="http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Hylocereus_undatus.htm">http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Hylocereus_undatus.htm</a> [Accessed 29 Nov 2013]	[Environmental weed? Yes] "Night-blooming cactus ( <i>Hylocereus undatus</i> ) is regarded as an environmental weed in Queensland and New South Wales. It has escaped cultivation and is becoming a weed of open woodlands, dry rainforest, riparian areas and coastal vegetation in the warmer parts of eastern Australia. It is usually found growing on trees (i.e. as a climber or epiphyte) and can even climb up into the canopy of very tall trees. Night-blooming cactus ( <i>Hylocereus undatus</i> ) will form massive colonies and the weight of its succulent stems can eventually bring trees down."
305	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Congeneric weed? Potentially] "Naturalized on Kauai, and presumably cultivated as wee is <i>Hylocereus costaricensis</i> ..."
401	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Produces spines, thorns or burrs? Yes] "Sprawling terrestrial or epiphytic vines; stems 3-winged, the wings 2-3 cm wide, thin, crenate with calloused margins. Areoles with 1-4 conical spines 1-3 mm long."
401	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Produces spines, thorns or burrs? Yes] "Areoles about 4–6 cm apart, 2–5 mm diameter, with 1–4 conical spines 1–3 mm long."
402	2013. WRA Specialist. Personal Communication.	[Allelopathic? Unknown]
403	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Parasitic? No] "A climbing or scrambling succulent hemi-epiphytic, cactus reaching heights of 6–10 m with spreading, drooping branches"
404	2007. Andersson, M.. Behaviour & dietary preferences of browse species by sheep on natural pasture in Ninh Thuan province in the south-central region of Vietnam. Animal Science-Exam thesis. Swedish University of Agricultural Sciences, Phan Rang, Vietnam	[Unpalatable to grazing animals? No] "Approximately 53 browse species were found on the pasture, and thirteen of them were once or more often consumed by the sheep, Fig. 5. Two of the consumed browse species; Thanh long ( <i>Hylocereus undatus</i> , dragonfruit) and Thuộc là ( <i>Nicotiana tabacum</i> , tobacco plant) were not grown at the pasture but in a area nearby where the animals went."
404	2013. WRA Specialist. Personal Communication.	[Unpalatable to grazing animals? No] Spines may deter browsing, however.
405	2007. Andersson, M.. Behaviour & dietary preferences of browse species by sheep on natural pasture in Ninh Thuan province in the south-central region of Vietnam. Animal Science-Exam thesis. Swedish University of Agricultural Sciences, Phan Rang, Vietnam	[Toxic to animals? No evidence] "Approximately 53 browse species were found on the pasture, and thirteen of them were once or more often consumed by the sheep, Fig. 5. Two of the consumed browse species; Thanh long ( <i>Hylocereus undatus</i> , dragonfruit)..."
405	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Toxic to animals? No evidence]
406	2010. Pushpakumara, D.K.N.G.. Underutilized Fruit Trees in Sri Lanka. World Agroforestry Center, Peradeniya, Sri Lanka	[Host for recognized pests and pathogens? No. Common pests] "Dragon fruit is comparatively free of pests. The common pests reported are ants, scale insects, mealy bugs, beetles, slugs, snails, borers, caterpillars, termites, nematodes, fruit flies, bats, rats and birds. These pests should be monitored regularly and controlled when observed. Insect infestations of a severe scale have been reported in Florida (Crane and Balerdi, 2004)."
407	2010. Pushpakumara, D.K.N.G.. Underutilized Fruit Trees in Sri Lanka. World Agroforestry Center, Peradeniya, Sri Lanka	[Causes allergies or is otherwise toxic to humans? No evidence] "Dragon fruit possesses medicinal properties." ... "It is known to prevent colon cancer and diabetes, neutralizes toxic substances such as heavy metals, reduce cholesterol and high blood pressure."
407	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Causes allergies or is otherwise toxic to humans? No evidence] "Dragon fruit is highly relished especially if chilled and cut in half so that the flesh can be eaten with a spoon or eaten in fruit salad. The flesh is firm and crisp, with a delicately sweet and lingering flavour. The juice is also enjoyed as a cool, refreshing drink and used as a base for beverages. The juicy flesh can also be mixed with milk or sugar, used in marmalades, jellies, ices and soft drinks. A syrup made of the whole fruit is used to colour pastries and candy. The unopened flower buds are cooked and eaten as a vegetable. The flowers are also harvested before anthesis and dried for subsequent use as vegetables in soups."

408	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Creates a fire hazard in natural ecosystems? No evidence] "A climbing or scrambling succulent hemi epiphytic, cactus reaching heights of 6–10 m with spreading, drooping branches..." [Succulent habit would likely reduce fire risk, although could potentially act as a fuel ladder in extreme fire events]
409	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Dragon fruit is a shade tolerant vine cactus from the tropical forest of Central America."
410	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Tolerates a wide range of soil conditions? Yes] "Dragon fruit is not fastidious of soil type but is intolerant of saline soils or waterlogged conditions." ... "It grows best on well-drained redyellow podzolic, reddish brown earth or lateritic soils especially when supplemented with organic matter at pH of 5.5–6.5."
411	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Climbing or smothering growth habit? Yes] "A climbing or scrambling succulent hemi-epiphytic, cactus reaching heights of 6–10 m with spreading, drooping branches" ... "They scramble over rocks or bushes, climb and form dense masses in trees, and cling to walls, by means of numerous, strong aerial roots."
412	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Forms dense thickets? No. Scrambling and smothering habit] "They scramble over rocks or bushes, climb and form dense masses in trees, and cling to walls, by means of numerous, strong aerial roots."
501	2001. Langeland, K.A./Stocker, R.K.. Control of Non-native Plants in Natural Areas of Florida. SP 242. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL <a href="http://mrec.ifas.ufl.edu/ldspmg/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.p">http://mrec.ifas.ufl.edu/ldspmg/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.p</a>	[Aquatic? No] "Vining cactus that climbs and roots to tree trunks; sometimes epiphytic"
502	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Grass? No] Cactaceae
503	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Nitrogen fixing woody plant? No] Cactaceae
504	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Sprawling terrestrial or epiphytic vines; stems 3-winged, the wings 2-3 cm wide, thin, crenate with calloused margins."
601	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Evidence of substantial reproductive failure in native habitat? No] "Dragon fruit is a shade tolerant vine cactus from the tropical forest of Central America. It has a wide range of agroecological adaptability."
602	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Produces viable seed? Possibly No] "Fruit is rarely produced here because there is only one clone present (or only a few) and no pollinator for the flowers, but the plants spread rampantly by vegetative means."
603	2003. Tel-Zur, N./Abbo, S./Bar-Zvi, D./Mizrahi, Y.. Chromosome doubling in vine cacti hybrids. Journal of Heredity. 94(4): 329-333.	[Hybridizes naturally? Unknown. Artificial hybrids possible] "We performed reciprocal crosses between the tetraploid <i>Selenicereus megalanthus</i> and the diploid <i>Hylocereus</i> species, <i>H. undatus</i> and <i>H. polyrhizus</i> . <i>S. megalanthus</i> x <i>H. undatus</i> gave rise to viable hexaploids and 6x aneuploid hybrids rather than to the expected triploids. No genuine hybrids were obtained in the reciprocal cross. The pollen diameter of the tetraploid <i>S. megalanthus</i> varied widely, indicating the occurrence of unreduced gametes, while that of <i>H. undatus</i> pollen was very uniform, indicating an extremely low frequency of unreduced gametes. This finding suggests that the hexaploids were formed by chromosome doubling after the formation of the hybrid triploid zygote rather than by fusion of unreduced gametes of the two species."
603	2004. Zee, F./Yen, C.-R./Nishina, M.. Pitaya (Dragon Fruit, Strawberry Pear). Fruits and Nuts. F&N-9. College of Tropical Agriculture and Human Resources (CTAHR), Honolulu, HI	[Hybridizes naturally? Unknown if natural hybridization occurs] "Many selections are being evaluated from the red-fleshed fruit types belonging to two closely related species, <i>Hylocereus polyrhizus</i> and <i>H. costaricensis</i> , and their hybrids with <i>H. undatus</i> ."
604	2003. Merten, S.. A review of <i>Hylocereus</i> production in the United States. Journal of the Professional Association for Cactus Development. 5: 98-105.	[Self-compatible or apomictic? Potentially Yes] "Many of the varieties from Asia (predominantly <i>H. undatus</i> ) are self compatible, and some of these are autogamous and will set fruit without the involvement of a pollen vector."
604	2013. CABI. <i>Hylocereus undatus</i> In: Invasive Species Compendium. CAB International, Wallingford, UK <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	[Self-compatible or apomictic? Potentially] "Flowers are 25-30 cm long, 15-17 cm wide, nocturnal, scented and hermaphroditic; however, some cultivars are self compatible."

605	2004. Zee, F./Yen, C.-R./Nishina, M.. Pitaya (Dragon Fruit, Strawberry Pear). Fruits and Nuts. F&N-9. College of Tropical Agriculture and Human Resources (CTAHR), Honolulu, HI	[Requires specialist pollinators? Yes] "Pitaya is pollinated by moths in the evening, and hand pollination can enhance fruit set and size. The blooming of pitaya flowers is affected by temperature and light intensity. The flowers may open as early as 4:00 p.m. on a warm, cloudy day, while cool temperatures during off-seasons could slow flower wilting so it concludes as late as 10:00 a.m."
605	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Requires specialist pollinators? Yes] "Fruit is rarely produced here because there is only one clone present (or only a few) and no pollinator for the flowers, but the plants spread rampantly by vegetative means." ... "Fruit may form if the flowers are hand-pollinated, but wild plants rarely if ever bear fruit."
605	2010. Pushpakumara, D.K.N.G.. Underutilized Fruit Trees in Sri Lanka. World Agroforestry Center, Peradeniya, Sri Lanka	[Requires specialist pollinators? Yes] "Pollination is essential in fruit production of the Dragon fruit. As the flowers open in the night, bats and hawk moths in the natural range pollinate the flowers. In many countries where the 'crop is grown as a new crop, pollination is poor due to the lack of natural pollinators. Hence, hand pollination has been suggested to increase fruit set. Under Sri Lankan conditions, Honey bee ( <i>Apis cerana</i> ), little honey bee ( <i>Apis florea</i> ) and Rock bee ( <i>Apis dorsata</i> ) effectively pollinate the Dragon fruit during the early hours of morning (Pushpakumara et al., 2005)."
605	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Requires specialist pollinators? Yes] "Flowers nocturnal, fragrant, 25–30 cm long, 15–25 cm by 15–34 cm; sepaloid perianth parts greenish white, linear to linear-lanceolate, 10–15 cm long, 1–1.5 cm wide, inner perianth parts white, oblanceolate, 10–15 cm long, ca 2.5 cm wide (Plates 2–3); stamens numerous with long cream-colored staminal filaments; style cream-colored, 17.5–20 cm long; stigma lobes up to 24, cream-colored."
606	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Reproduction by vegetative fragmentation? Yes] "In Hawai'i widely cultivated on all of the main islands, rarely setting fruit, but spreading, often extensively, vegetatively"
607	2013. Shoot Gardening. <i>Hylocereus undatus</i> (Dragon fruit). <a href="http://www.shootgardening.co.uk/plant/hylocereus-undatus">http://www.shootgardening.co.uk/plant/hylocereus-undatus</a> [Accessed 29 Nov 2013]	[Minimum generative time (years)? 5+] "5-10 years to maturity" [Although can spread vegetatively at an earlier age]
701	2003. Erskine, A.. Vegetation Management Plan East Ballina Crown Reserve. Wetland Care Australia, Ballina NSW	[Propagules likely to be dispersed unintentionally? Possibly] "Very difficult to control. All parts must be physically removed and taken to a landfill." [Improper disposal of vegetative material could result in inadvertent dispersal]
701	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Possibly] " ...plants spread rampantly by vegetative means." ... "Many plants growing on roadsides and hillsides are exceedingly yellow and unsightly, seeming due to a lack of adequate nitrogen." [Although fruit production is rare in wild plants, vegetative fragments could possibly be spread accidentally when occurring along roads]
702	2008. Janick, J./Paull, R.E.. The Encyclopedia of Fruit & Nuts. Cabi Publishing, Wallingford, UK	[Propagules dispersed intentionally by people? Yes] "...the second most important commercial cactus species with respect to fruit..."
702	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Propagules dispersed intentionally by people? Yes] "Pitahaya is also planted as an ornamental and occasionally planted as flowering hedge plant."
703	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules likely to disperse as a produce contaminant? No] "Fruit may form if the flowers are hand-pollinated, but wild plants rarely if ever bear fruit." [Plants cultivated for fruit would be harvested and are unlikely to become a produce contaminant]
704	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Propagules adapted to wind dispersal? No] "Fruit large, red, non-spiny berry, subglobose, ellipsoid, oblong-oval, 5–12.5 cm long by 4–9 cm across, coated with the bright-red, fleshy, ovate bases of scales red and greenish at the tips"
705	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules water dispersed? No. Unlikely] "...grown on all the inhabited islands and has become naturalized on the dry leeward sides of at least Oahu and Kauai." [Although vegetative fragments might break off and be transported by water, this cactus occurs in drier areas and rarely produces fruit in the wild]
706	2003. Ford, J.. Duck Creek Vegetation Restoration Plan. EnviTE NSW, Lismore, NSW	[Propagules bird dispersed? Yes, when fruit are produced] "Fruit species such as Dragon Fruit ( <i>Hylocereus undatus</i> ) have been planted in an orchard situation in close proximity to the main rainforest section. Some of these species are known to be dispersed by birds and flying foxes and so will need to be closely monitored to avoid these species entering natural areas."
706	2008. Janick, J./Paull, R.E.. The Encyclopedia of Fruit & Nuts. Cabi Publishing, Wallingford, UK	[Propagules bird dispersed? Yes] "...its wide natural distribution resulted from seed dispersal by birds..."

707	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules dispersed by other animals (externally)? Fruit, if produced, lack means of external attachment] "Fruit is rarely produced here because there is only one clone present (or only a few) and no pollinator for the flowers, but the plants spread rampantly by vegetative means."
708	2008. Janick, J./Paull, R.E.. The Encyclopedia of Fruit & Nuts. Cabi Publishing, Wallingford, UK	[Propagules survive passage through the gut? Yes, if fruit are produced] "...its wide natural distribution resulted from seed dispersal by birds..."
801	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Prolific seed production (>1000/m2)? Not in Hawaiian Islands] "Fruit may form if the flowers are hand-pollinated, but wild plants rarely if ever bear fruit."
801	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Prolific seed production (>1000/m2)? Possibly Yes] "Within is white or deep red, juicy, sweet pulp containing innumerable tiny black, partly hollow seeds"
802	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown, but unlikely given limited fruit production] "Fruit is rarely produced here because there is only one clone present (or only a few) and no pollinator for the flowers, but the plants spread rampantly by vegetative means."
802	2008. Royal Botanic Gardens Kew. Seed Information Database (SID). Version 7.1. <a href="http://data.kew.org/sid/">http://data.kew.org/sid/</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown] "Storage Behaviour: Orthodox"
803	2001. Langeland, K.A./Stocker, R.K.. Control of Non-native Plants in Natural Areas of Florida. SP 242. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL <a href="http://mrec.ifas.ufl.edu/ldspmg/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.p">http://mrec.ifas.ufl.edu/ldspmg/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.p</a>	[Well controlled by herbicides? Yes] "Hand pull and remove from site if possible; if removal is not feasible, lay the plants out on a plastic tarp and spray them with 10% Garlon 4; 15% Roundup has been successful but it takes much longer for the plants to die."
804	2003. Erskine, A.. Vegetation Management Plan East Ballina Crown Reserve. Wetland Care Australia, Ballina NSW	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "It is semi-epiphytic and xerophytic and can survive in the canopy after the main root had been severed." ... "Very difficult to control. All parts must be physically removed and taken to a landfill."
805	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? No evidence] "In Hawai'i widely cultivated on all of the main islands, rarely setting fruit, but spreading, often extensively, vegetatively"

## **Summary of Risk Traits**

### **High Risk / Undesirable Traits**

- Grows in tropical climates
- Environmentally adaptable
- Naturalized
- Environmental weed in Australia & Florida
- Areoles with 1-4 conical spines
- Shade-tolerant
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Climbing & smothering growth habit
- Some varieties may be self-compatible
- Spreads vegetatively
- Fruits, when produced, may be consumed, and seeds dispersed by birds
- Tolerates cuttings, and fragments may reroot

### **Low Risk / Desirable Traits**

- Non-toxic
- Edible fruit
- Requires specialized pollinators (bats & hawk moths)
- Landscaping and ornamental value
- Reaches maturity after several years
- Limited fruit and seed production in the wild