Taxon: Xanthostemon chrysanthus (F. Muell.) Benth. **Family:** Myrtaceae

Common Name(s): golden penda **Synonym(s):** Metrosideros chrysantha F.Muell.
Nania chrysantha (F.Muell.) Kuntze

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 29 Apr 2019

WRA Score: 1.0 **Designation:** L **Rating:** Low Risk

Keywords: Tropical Tree, Unarmed, Non-Toxic, Ornamental, Wind-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	n
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	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
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)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	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		
604	Self-compatible or apomictic		
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	2
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	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
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)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451 -476	[No evidence of domestication] "DISTRIBUTION: Coastal Queensland, between 12 ° S and 19 ° S, mostly in riparian forest."
	Richards, A. E., Shapcott, A., Playford, J., Morrison, B., Critchley, C., & Schmidt, S. (2003). Physiological profiles of restricted endemic plants and their widespread congenors in the North Queensland wet tropics, Australia. Biological Conservation, 111(1), 41-52	[Planted, but no evidence of domestication] "X. chrysanthus is widely planted as a garden and street tree in Queensland, and elsewhere, and adapts well to environments outside its rainforest creek edge habitat."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2019). 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**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451 -476	"DISTRIBUTION: Coastal Queensland, between 12 ° S and 19 ° S, mostly in riparian forest."
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Apr 2019]	"Native Australasia AUSTRALIA: Australia [Queensland]"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Apr 2019]	

203	**Broad climate suitability (environmental versatility)**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Lake, M. (2015). Australian Rainforest Woods. CSIRO Publishing, Clayton South, Australia	"Brown penda grows from Pascoe River to the Seaview Range in north Queensland and is found mostly along the waterways in rainforest areas growing from sea level to 1000 metres."
	Dave's Garden. (2019). Xanthostemon Species, Golden Penda - Xanthostemon chrysanthus. https://davesgarden.com/guides/pf/go/68794/. [Accessed 26 Apr 2019]	"Hardiness: USDA Zone 9a: to -6.6 °C (20 °F)"
	Australian Native Plant Society. (2019). Xanthostemon chrysanthus. http://anpsa.org.au/x-chr.html. [Accessed 26 Apr 2019]	"This is a very desirable garden plant for warmer climates in a sunny position in moist, well drained soils. It responds well to pruning and may be kept to large shrub proportions if pruned annually. In sub-tropical and tropical areas it flowers reliably and often within 2-3 years from seed. However, while it will grow in temperate areas, flowering is less reliable. It has been successfully flowered at the Royal Botanic Gardens in Sydney but is not particularly vigourous there."

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	"DISTRIBUTION: Coastal Queensland, between 12 ° S and 19 ° S, mostly in riparian forest."

205	**Does the species have a history of repeated introductions outside its natural range?**	**n**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 26 Apr 2019]	"Cultivated Asia-Tropical MALESIA: Malaysia"
	Richards, A. E., Shapcott, A., Playford, J., Morrison, B., Critchley, C., & Schmidt, S. (2003). Physiological profiles of restricted endemic plants and their widespread congenors in the North Queensland wet tropics, Australia. Biological Conservation, 111(1), 41-52	"X. chrysanthus is widely planted as a garden and street tree in Queensland, and elsewhere, and adapts well to environments outside its rainforest creek edge habitat."

Qsn #	Question	Answer
301	**Naturalized beyond native range**	**n**
	Source(s)	**Notes**
	Nghiem, L. T., Tan, H. T., & Corlett, R. T. (2015). Invasive trees in Singapore: are they a threat to native forests?. Tropical Conservation Science, 8(1), 201-214	"Swietenia macrophylla, Khaya senegalensis, Tabebuia rosea, and Xanthostemon chrysanthus), each with >10,000 individuals planted [26], is invasive, although casual seedlings of A. saman, K. senegalensis, and T. rosea are fairly common [38]. This shows that propagule pressure alone is not sufficient to drive invasion."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. (2019). Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 26 Apr 2019]	No evidence in the Hawaiian Islands to date

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Mo evidence

304	Environmental weed	n
	Source(s)	**Notes**
	Nghiem, L. T., Tan, H. T., & Corlett, R. T. (2015). Invasive trees in Singapore: are they a threat to native forests?. Tropical Conservation Science, 8(1), 201-214	"Swietenia macrophylla, Khaya senegalensis, Tabebuia rosea, and Xanthostemon chrysanthus), each with >10,000 individuals planted [26], is invasive, although casual seedlings of A. saman, K. senegalensis, and T. rosea are fairly common [38]. This shows that propagule pressure alone is not sufficient to drive invasion."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

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

Qsn #	Question	Answer
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	[No evidence] "Tall tree with fairly smooth, hard, grey bark, decorticating in hard scales or strips; twigs and shoots usually sparingly pubescent or glabrous. Leaves alternate in both juvenile and adult plants; petiole short, up to 1 cm long; lamina lanceolate to oblanceolate, (7-)10-15(-20) cm long and (2-)3-4.5(-7) cm broad, acute, chartaceous to coriaceous; oil glands sometimes containing red oil. Inflorescence axillary, a monad, triad or, sometimes, a metabotryoid, borne at the apex of the seasonal growth unit. Hypanthium cup-shaped, c. 5 mm broad, extending well beyond the ovary summit. Petals 4-5, yellow, ovate to orbicular, 7-9 mm long."

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown

403	Parasitic	n
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	"Tall tree with fairly smooth, hard, grey bark, decorticating in hard scales or strips; twigs and shoots usually sparingly pubescent or glabrous." [Myrtaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown

405	Toxic to animals	n
	Source(s)	**Notes**
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Eco Organic Garden. (2019). Golden Penda. https://ecoorganicgarden.com.au/gardening-tips/how-to-grow-a-golden-penda/. [Accessed 29 Apr 2019]	"Pests and Diseases of Golden Pendas - The good news is that golden pendas suffer from minimal pests and diseases. Occasionally you might have an issue with some sap-sucking pests, like aphids which can be controlled with eco-oil or eco-neem."

Qsn #	Question	Answer
	Pegg, G. S. et al. (2014). Puccinia psidii in Queensland, Australia: disease symptoms, distribution and impact. Plant Pathology, 63(5), 1005-1021	[Austropuccinia psidii present in Hawaiian Islands. Could potentially impact Xanthostemon chrysanthus] "Table 1 Current known host list of Puccinia psidii in Queensland, Australia and susceptibility level" [Xanthostemon chrysanthus - RT, relatively tolerant, restricted leaf spot or spots only; MS, moderate susceptibility, blight symptoms on new shoots and expanding foliage]

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	QFRS North Coast Rural Operations. (2012). Planting to Reduce the Impact of Fire Damaging Your Home and Property. https://montvillerfb.com.au/homepage/planting-to-reduce-fire-impact/. [Accessed]	"There is no such thing as a fire proof plant, as all vegetation will burn in the right circumstances or if subjected to intense prolonged heat. However there are types of plants that are more resilient to a fires impact" [Suggested Vegetation includes Xanthostemon chrysanthus]
	WRA Specialist. (2019). Personal Communication	Fire ecology unknown. Recommended for fire-prone landscapes

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	**Notes**
	Gardening With Angus. (2019). Xanthostemon chrysanthus – Golden Penda. https://www.gardeningwithangus.com.au. [Accessed 29 Apr 2019]	"Light: Sunny"
	Dave's Garden. (2019). Xanthostemon Species, Golden Penda - Xanthostemon chrysanthus. https://davesgarden.com/guides/pf/go/68794/. [Accessed 29 Apr 2019]	"Sun Exposure: Full Sun"
	Ahmad Nazarudin, M. R. (2016). Xanthostemon chrysanthus (F. Muell.) Benth.: A new flowering tree for urban landscapes. International Journal of Agriculture, Forestry and Plantation, 3, 50-54	"Xanthostemon chrysanthus is a hardy species as it grows well in full sun, tolerates acidic soil and resists pollution and tropical heat (Anonymous, 2010). It grows well in subtropical gardens with fair drainage and sunny aspect (Elliot et al., 2010)."

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

Qsn #	Question	Answer
	Oakman, H.1995. Harry Oakman's what flowers when: the complete guide to flowering times in tropical and subtropical gardens. Univ. of Queensland Press, St. Lucia, Australia	"Does well in any well-drained soil; propagated from seed; origin is northern Australia."
	Gardening With Angus. (2019). Xanthostemon chrysanthus – Golden Penda. https://www.gardeningwithangus.com.au. [Accessed 29 Apr 2019]	"Ph Level: Acid, Neutral Soil Type: Loamy, Sandy loam, Clay loam"

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	"Tall tree with fairly smooth, hard, grey bark, decorticating in hard scales or strips; twigs and shoots usually sparingly pubescent or glabrous."

412	Forms dense thickets	n
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	"Coastal Queensland, between 12 ° S and 19 ° S, mostly in riparian forest." [No evidence]
	Australian Native Plant Society. (2019). Xanthostemon chrysanthus. http://anpsa.org.au/x-chr.html. [Accessed 29 Apr 2019]	"Distribution: Coastal rainforest in north Queensland from Townsville to Cape York" [No evidence]

501	Aquatic	n
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	[Terrestrial] "Tall tree with fairly smooth, hard, grey bark, decorticating in hard scales or strips; twigs and shoots usually sparingly pubescent or glabrous." ... "DISTRIBUTION: Coastal Queensland, between 12 ° S and 19 ° S, mostly in riparian forest."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Apr 2019]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Xanthostemoneae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Apr 2019]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Xanthostemoneae

Qsn #	Question	Answer
504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	"Tall tree with fairly smooth, hard, grey bark, decorticating in hard scales or strips; twigs and shoots usually sparingly pubescent or glabrous."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Australian Native Plant Society. (2019). Xanthostemon chrysanthus. http://anpsa.org.au/x-chr.html. [Accessed 29 Apr 2019]	"Conservation Status: Not considered to be at risk in the wild"

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Australian Native Plant Society. (2019). Xanthostemon chrysanthus. http://anpsa.org.au/x-chr.html. [Accessed 26 Apr 2019]	"Propagation is easy from fresh seed but germination may be slow. No special pre-treatment of seed is required."
	Ahmad Nazarudin, M. R. (2016). Xanthostemon chrysanthus (F. Muell.) Benth.: A new flowering tree for urban landscapes. International Journal of Agriculture, Forestry and Plantation, 3, 50-54	"This species can be propagated through seeds and stem cuttings. In sub-tropical and tropical regions, X. chrysanthus planted from seed flowers within 2-3 years (Anonymous, 2006). In its origin Australia, flowers appear at any time of year (Elliot et al., 2010). Recent study under local climate conditions also found that this species flowered throughout the year without distinctive flowering season (Ahmad Nazarudin et al., 2014). However, the abundance of flowers was fluctuated between months depending on the occurrence of drought period and precipitation (Ahmad Nazarudin, 2015). Previous research revealed that the major environmental factors which control the flowering transition were photoperiod, temperature and water availability (Bernier et al., 1993; Wilkie et al., 2008)."

603	**Hybridizes naturally**	
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	Unknown. No evidence

604	**Self-compatible or apomictic**	
	Source(s)	**Notes**
	Bird Ecology Study Group. (2014). Pollination of Golden Penda flowers by insects. https://besgroup.org/2014/12/16/pollination-of-golden-penda-flowers-by-insects/. [Accessed 29 Apr 2019]	"Insects visiting the flowers will end up covered with these pollen grains. They will then transfer the pollen to the stigma head when they visit another flower. In this way cross pollination occurs."

Qsn #	Question	Answer
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	"Petals 4-5, yellow, ovate to orbicular, 7-9 mm long. Sepals yellowish, triangular, 3-3.5 mm long. Stamens numerous, in one whorl, (15-)20-30 mm long. Ovary nearly superior, (2-)3(-4)-locular. Style (25-)30-40 mm long as long as or longer than the stamens, terminal or inserted in a shallow depression on the ovary summit, the base persistent; stigma small, convex."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Bird Ecology Study Group. (2014). Pollination of Golden Penda flowers by insects. https://besgroup.org/2014/12/16/pollination-of-golden-penda-flowers-by-insects/. [Accessed 29 Apr 2019]	"A total of six species of birds have been documented visiting the Golden Penda (Xanthostemon chrysanthus) for its nectar LINK. Birds obviously are an important pollinating agent of this tree. In addition to the above, various bees, wasps and ants have been seen among the flowers. This post reports the presence of the Stingless Bee (Trigona sp.) and Fruit Fly (Drosophila melanogaster) visiting the flowers – the former for the pollen and the latter for the nectar."
	Gardening With Angus. (2019). Xanthostemon chrysanthus – Golden Penda. https://www.gardeningwithangus.com.au. [Accessed 29 Apr 2019]	"Attracts Wildlife: Bees, Nectar eating birds, Butterflies, Other insects"

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Australian Native Plant Society. (2019). Xanthostemon chrysanthus. http://anpsa.org.au/x-chr.html. [Accessed 29 Apr 2019]	"Propagation is easy from fresh seed but germination may be slow. No special pre-treatment of seed is required. Cuttings are also successful using hardened, current season's growth." [No evidence of natural vegetative spread]

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	Australian Native Plant Society. (2019). Xanthostemon chrysanthus. http://anpsa.org.au/x-chr.html. [Accessed 26 Apr 2019]	"In sub-tropical and tropical areas it flowers reliably and often within 2-3 years from seed. However, while it will grow in temperate areas, flowering is less reliable. It has been successfully flowered at the Royal Botanic Gardens in Sydney but is not particularly vigourous there."

Qsn #	Question	Answer
701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**n**
	Source(s)	**Notes**
	Nghiem, T. P. L. (2010). The Ecology of Invasive Tree Species in Singapore. MSc Thesis. National University of Singapore, Singapore	"Appendix 2. Characteristics of tree species in three groups with source of data indicated in brackets (see appendix 1 for the specific reference). Column (1) species, (2) height in m, (3) seed mass in mg, (4) wood density in kg/m3, (5) leaf area in cm2, (6) native range, (7) distance to the nearest seed source in 1,000 km, (8) residence time in Singapore in year (9) flower sex, H = hermaphrodite, D = diecious, M = monoecious, (10) dispersal mode." [Xanthostemon chrysanthus dispersed by wind]

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Richards, A. E., Shapcott, A., Playford, J., Morrison, B., Critchley, C., & Schmidt, S. (2003). Physiological profiles of restricted endemic plants and their widespread congenors in the North Queensland wet tropics, Australia. Biological Conservation, 111(1), 41-52	"X. chrysanthus is widely planted as a garden and street tree in Queensland, and elsewhere, and adapts well to environments outside its rainforest creek edge habitat."

703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Nghiem, T. P. L. (2010). The Ecology of Invasive Tree Species in Singapore. MSc Thesis. National University of Singapore, Singapore	A wind-dispersed tree. Could possibly contaminate plants growing in vicinity, but generally grown as a landscaping tree, and not with commercial production. Evidence is lacking at this time

704	**Propagules adapted to wind dispersal**	**y**
	Source(s)	**Notes**
	Ahmad Nazarudin, M. R., & Tsan, F. Y. (2018). Vegetative and reproductive growth behaviour of Xanthostemon chrysanthus (F. Muell.) Benth.–an ornamental tree in Malaysia. Sains Malaysiana, 47(2), 227-233	"Upon completion of fruit ripening, the tiny seeds were explosively discharged."
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451-476	[Seeds not winged, but explosively discharged. Wind likely facilitates dispersal] "For example, the average weight of the unwinged seed of X. chrysanthus is 3.2 mg while the average weight of the (fertile) winged seed of X. eucalyptoides is only 1.3 mg." … "Fruit 9-15 mm in diameter; hypanthium usually enclosing basal 113-112 of the fruit. Seeds not winged."

705	**Propagules water dispersed**	**y**
	Source(s)	**Notes**
	Lake, M. (2015). Australian Rainforest Woods. CSIRO Publishing, Clayton South, Australia	"Brown penda grows from Pascoe River to the Seaview Range in north Queensland and is found mostly along the waterways in rainforest areas growing from sea level to 1000 metres."

Qsn #	Question	Answer
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451 -476	"DISTRIBUTION: Coastal Queensland, between 12 ° S and 19 ° S, mostly in riparian forest."
	Richards, A. E., Shapcott, A., Playford, J., Morrison, B., Critchley, C., & Schmidt, S. (2003). Physiological profiles of restricted endemic plants and their widespread congenors in the North Queensland wet tropics, Australia. Biological Conservation, 111(1), 41-52	[Distribution along creeks and riparian areas suggests seeds are probably moved by water as well as wind] "X. chrysanthus grows in a range of environments, although naturally found in riparian rainforest." ... "Table 1 ... Xanthostemon chrysanthus ... Habitat - Along creek edge"

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Nghiem, T. P. L. (2010). The Ecology of Invasive Tree Species in Singapore. MSc Thesis. National University of Singapore, Singapore	[No evidence. Wind-dispersed] "Appendix 2. Characteristics of tree species in three groups with source of data indicated in brackets (see appendix 1 for the specific reference). Column (1) species, (2) height in m, (3) seed mass in mg, (4) wood density in kg/m3, (5) leaf area in cm2, (6) native range, (7) distance to the nearest seed source in 1,000 km, (8) residence time in Singapore in year (9) flower sex, H = hermaphrodite, D = diecious, M = monoecious, (10) dispersal mode." [Xanthostemon chrysanthus dispersed by wind]

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451 -476	"Fruit 9-15 mm in diameter; hypanthium usually enclosing basal 113-112 of the fruit. Seeds not winged." [No evidence. Unlikely. No means of external attachment]
	Nghiem, T. P. L. (2010). The Ecology of Invasive Tree Species in Singapore. MSc Thesis. National University of Singapore, Singapore	[Wind-dispersed] "Appendix 2. Characteristics of tree species in three groups with source of data indicated in brackets (see appendix 1 for the specific reference). Column (1) species, (2) height in m, (3) seed mass in mg, (4) wood density in kg/m3, (5) leaf area in cm2, (6) native range, (7) distance to the nearest seed source in 1,000 km, (8) residence time in Singapore in year (9) flower sex, H = hermaphrodite, D = diecious, M = monoecious, (10) dispersal mode." [Xanthostemon chrysanthus dispersed by wind]

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Nghiem, T. P. L. (2010). The Ecology of Invasive Tree Species in Singapore. MSc Thesis. National University of Singapore, Singapore	[Wind-dispersed] "Appendix 2. Characteristics of tree species in three groups with source of data indicated in brackets (see appendix 1 for the specific reference). Column (1) species, (2) height in m, (3) seed mass in mg, (4) wood density in kg/m3, (5) leaf area in cm2, (6) native range, (7) distance to the nearest seed source in 1,000 km, (8) residence time in Singapore in year (9) flower sex, H = hermaphrodite, D = diecious, M = monoecious, (10) dispersal mode."

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wilson, P. G. (1990). A revision of the genus Xanthostemon (Myrtaceae) in Australia. Telopea, 3(4), 451 -476	[Densities unspecified] "Fruit 9-15 mm in diameter; hypanthium usually enclosing basal 113-112 of the fruit. Seeds not winged."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2019) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 29 Apr 2019]	"Storage Behaviour: Orthodox Storage Conditions: 100 % viability following drying to mc's in equilibrium with 15 % RH and freezing for 47 days at -20C at RBG Kew, WP"
	WRA Specialist. (2019). Personal Communication	Longevity of seeds in soil unknown

803	Well controlled by herbicides	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	**Notes**
	Australian Native Plant Society. (2019). Xanthostemon chrysanthus. http://anpsa.org.au/x-chr.html. [Accessed 26 Apr 2019]	"It responds well to pruning and may be kept to large shrub proportions if pruned annually."
	Gillison, A. N. (1983). Tropical savannas of Australian and the southwest Pacific. Pp. 183-243 in D.W. Goodall (ed.). Ecosystems of the World, Vol. 13. Elsevier Scientific Publishing Company, .Amsterdam	"In seasonal megatherm areas, with high fire frequency, shoots from latent epicormic buds on the upper stems of many myrtaceous species within the genera Eucalyptus, Eugenia, Melaleuca, Tristania and Xanthostemon allow recovery after fire or following defoliation from severe water stress or wind." [Generic description]

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	**Notes**
	Pegg, G. S. et al. (2014). Puccinia psidii in Queensland, Australia: disease symptoms, distribution and impact. Plant Pathology, 63(5), 1005-1021	[Austropuccinia psidii present in Hawaiian Islands. Could potentially impact Xanthostemon chrysanthus] "Table 1 Current known host list of Puccinia psidii in Queensland, Australia and susceptibility level" [Xanthostemon chrysanthus - RT, relatively tolerant, restricted leaf spot or spots only; MS, moderate susceptibility, blight symptoms on new shoots and expanding foliage]
	WRA Specialist. (2019). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Thrives in tropical climates
• Host of Austropuccinia psidii, but this fungal pathogen already has a broad host range in the Hawaiian Islands
• Tolerates many soil types
• Reproduces by seeds
• Reaches maturity in 2-3 years
• Seeds dispersed by wind, probably water (common in riparian areas) and intentionally by people
• Tolerates pruning and fire
• Gaps in biological and ecological information may reduce accuracy of risk prediction

Low Risk Traits
• No reports of invasiveness or naturalization, but no evidence of widespread introduction outside native range
• Unarmed (no spines, thorns, or burrs)
• Non-toxic
• Ornamental
• Not reported to spread vegetatively

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> No. Not known to form dense stands. A light demanding tree, & presumably shade intolerant
Outcome = Accept (Low Risk)