

<b>Taxon:</b> <i>Strobilanthes hamiltoniana</i> (Steud.) Bosser & Heine	<b>Family:</b> Acanthaceae
<b>Common Name(s):</b> Chinese rain bell temple bells	<b>Synonym(s):</b> Goldfussia colorata Nees Ruellia hamiltoniana Steud.

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 11 Nov 2019
<b>WRA Score:</b> 11.0	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** Tropical Herb, Naturalized, Ornamental, Possibly Sterile, Spreads Vegetatively

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	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)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
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	y

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
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		
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators		
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)		
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
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		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m <sup>2</sup> )	y=1, n=-1	n
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
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence of domestication] "Strobilanthes hamiltoniana is an ornamental plant. It is widely cultivated in tropical countries and in conservatories in temperate climates. The species is sometimes naturalized, occasionally becoming an invasive weed as on the island of Réunion. Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

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
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 5 Nov 2019]	"Native Asia-Temperate CHINA: China [Xizang Zizhiqu] Asia-Tropical INDIAN SUBCONTINENT: Bhutan, India (n.e.), Nepal (e.) INDO-CHINA: Myanmar"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 6 Nov 2019]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes

Qsn #	Question	Answer
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Forests on mountain slopes; 800–2000 m." ... "Strobilanthes hamiltoniana is an ornamental plant. It is widely cultivated in tropical countries and in conservatories in temperate climates." [Elevation range exceeds 1000 m, demonstrating environmental versatility]
	Wood, J., & Scotland, R. (2003). <i>Strobilanthes</i> : Panicked Species from East Asia. Kew Bulletin, 58(3), 679-702	"Locally frequent in moist places in hill forest from 200 - 1400 m along the Himalayas from Central Nepal to the Brahmaputra bend; also in the hills on the Indo-Burmese border and, very locally, in Upper Burma. Also widely cultivated in warm countries." [Elevation range exceeds 1000 m, demonstrating environmental versatility]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Parsons, R. & Parker, J. 2015. BIISC Early Detection Botanist. Pers. Comm. 21 October	"During recent surveys in lower Puna, we encountered this plant naturalized on the sides of the road twice and once cultivated near a house." [Originally identified as <i>Peristrophe speciosa</i> . Reidentified as <i>Strobilanthes hamiltoniana</i> in October 2019]
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 6 Nov 2019]	"Native Asia-Temperate CHINA: China [Xizang Zizhiqu] Asia-Tropical INDIAN SUBCONTINENT: Bhutan, India (n.e.), Nepal (e.) INDO-CHINA: Myanmar Cultivated (cult. throughout tropics) Naturalized Africa WESTERN INDIAN OCEAN: Mauritius, Reunion Asia-Tropical INDIAN SUBCONTINENT: Sri Lanka Southern America CARIBBEAN: Jamaica"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Bennett, J., & Scotland, R. (2003). A Revision of <i>Strobilanthes</i> (Acanthaceae) in Java. Kew Bulletin, 58(1), 1-82	"Native to the Himalaya, <i>S. hamiltoniana</i> is naturalised in the tropics."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	" <i>Strobilanthes hamiltoniana</i> is an ornamental plant. It is widely cultivated in tropical countries and in conservatories in temperate climates. The species is sometimes naturalized, occasionally becoming an invasive weed as on the island of Réunion."

301	Naturalized beyond native range	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Parsons, R. & Parker, J. 2015. BIISC Early Detection Botanist. Pers. Comm. 21 October	"During recent surveys in lower Puna, we encountered this plant naturalized on the sides of the road twice and once cultivated near a house." [Originally identified as <i>Peristrophe speciosa</i> . Reidentified as <i>Strobilanthes hamiltoniana</i> in October 2019]
	Bennett, J., & Scotland, R. (2003). A Revision of <i>Strobilanthes</i> (Acanthaceae) in Java. <i>Kew Bulletin</i> , 58(1), 1-82	"Native to the Himalaya, <i>S. hamiltoniana</i> is naturalised in the tropics. It is readily identified by the much branched, diffuse inflorescences bearing purple flowers, and the secondary veins which protrude from the leaf surface."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 6 Nov 2019]	"Naturalized Africa WESTERN INDIAN OCEAN: Mauritius, Reunion Asia-Tropical INDIAN SUBCONTINENT: Sri Lanka Southern America CARIBBEAN: Jamaica"
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	" <i>Strobilanthes hamiltoniana</i> is an ornamental plant. It is widely cultivated in tropical countries and in conservatories in temperate climates. The species is sometimes naturalized, occasionally becoming an invasive weed as on the island of Réunion."

302	Garden/amenity/disturbance weed	n
	<b>Source(s)</b>	<b>Notes</b>
	Meyer, J. Y., & Lavergne, C. 2004. Beautés fatales: Acanthaceae species as invasive alien plants on tropical Indo-Pacific Islands. <i>Diversity and Distributions</i> , 10(5-6): 333-347	[Environmental weed] "The case of <i>Strobilanthes hamiltoniana</i> is noteworthy. While only considered as a naturalized plant in the Mascarenes until very recently (Bossler & Heine, 2000), it is now one of the most invasive plants in native rain forests of La Réunion."

303	Agricultural/forestry/horticultural weed	n
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	y
	<b>Source(s)</b>	<b>Notes</b>
	Kiehn, M. (2011). Invasive alien species and islands. Pp. 365-384 in Bramwell, D. and J. Caujapé-Castells (eds.). <i>The Biology of Island Floras</i> . Cambridge University Press, Cambridge	"Introduced to the Mascarenes as an ornamental, it was first collected as a naturalised plant on La Reunion and Mauritius in 1956 but, for a long time, was not considered to be invasive. In 2004, however, a survey showed that the species had already covered c.1000 hectares of wet mountain areas on La Reunion at between 900 m and 1500 m elevation."

Qsn #	Question	Answer
	Meyer, J. Y., & Laverigne, C. 2004. Beautés fatales: Acanthaceae species as invasive alien plants on tropical Indo-Pacific Islands. Diversity and Distributions, 10(5-6): 333-347	" <i>Strobilanthes hamiltonianus</i> , not to be confused with <i>S. coloratus</i> according to Bosser & Heine (1988), is an erect shrubby herb with leaves reddish-purple beneath. The species was first collected on La Réunion as a naturalized plant by G. Rouillard in 1956 (Herbarium specimen [MAU]). It is now widely naturalized on La Réunion and Mauritius in native and secondary wet vegetation between 900 m and 1500 m elevation, covering approximately 1000 ha." ... "The case of <i>Strobilanthes hamiltonianus</i> is noteworthy. While only considered as a naturalized plant in the Mascarenes until very recently (Bosses & Heine, 2000), it is now one of the most invasive plants in native rain forests of La Réunion. The lifehistory traits of <i>Strobilanthes</i> species in its native range may explain its great invasiveness potential. This species plays a special role in the ecology of the montane rain forests in Sri Lanka, as their cycles of flowering, fruiting and dieback dominate life on the forest floor: 'the dense undergrowth of <i>Strobilanthes</i> spp. which reaches 3 m in height, play an important role in the dynamics of these forests [ ... ]. Once <i>Strobilanthes</i> stands have grown, they form impenetrable forest [ ... ]. <i>Strobilanthes</i> is not only a competitor with tree saplings but also with herbs on the forest floor or with ferns' (Werner, 1995: 228)."

305	Congeneric weed	y
	Source(s)	Notes
	Biosecurity Queensland. (2016). Persian shield. <i>Strobilanthes dyerianus</i> . State of Queensland, Department of Agriculture and Fisheries. <a href="https://www.daf.qld.gov.au">https://www.daf.qld.gov.au</a> . [Accessed 7 Nov 2019]	"Native to Burma, Persian shield was introduced to Queensland as a garden plant. It invades the understorey of rainforest margins and creek lines." ... "Hand pull seedlings and small plants, ensuring that all stem fragments and roots are removed. Plant pieces should either be bagged and taken to the dump or hung up off the ground to prevent reshooting."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Bennett, J., & Scotland, R. (2003). A Revision of <i>Strobilanthes</i> (Acanthaceae) in Java. Kew Bulletin, 58(1), 1-82	[No evidence] "Shrub to 1.5 m. Stems glabrous; nodes with a horizontal purple ridge, prominent on older stems. Leaves isophyllous to weakly anisophyllous, the smaller at least two-thirds the length of the larger; lower leaves petiolate, upper leaves subsessile, petioles 0 - 25 (- 87) mm, glabrous; lamina 5 1 - 150 (- 190) x 16 - 53 (- 90) mm, narrowly ovate to lanceolate or narrowly elliptic to elliptic, glabrous, sessile glands sometimes present below, margin sharply serrate, with a tuft of short hairs in the sinus of each tooth, eciliate or rarely ciliate, apex acuminate, base symmetrical or rarely weakly asymmetrical, larger leaves decurrent, smaller leaves decurrent or cordate; 3 - 6 (- 7) lateral veins either side of midrib, veins prominent above."

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Ali, K. W., Shinwari, M. I., & Khan, S. (2019). Screening of 196 medicinal plant species leaf litter for allelopathic potential. Pak. J. Bot, 51(6), 2169-2177	"Table 1. Allelopathic effect of 196 tested medicinal plants" [Unknown for <i>Strobilanthes hamiltoniana</i> . This study explored the allelopathic effect of medicinal plants on the germination and seedling growth of lettuce using sandwich method. Leaf leachates from a congener, <i>Strobilanthes glutinosus</i> , did not exhibit strong inhibitory effect on the radicles of lettuce seeds]

403	Parasitic	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs 0.5–1.5 m tall, much branched, anisophyllous. Stems 4-angled, sulcate, glabrous." [Acanthaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Gad, S. D., & Shyama, S. K. (2011). Diet composition and quality in Indian bison ( <i>Bos gaurus</i> ) based on fecal analysis. Zoological Science, 28(4), 264-268	[Possibly. Related species are palatable] "Three species of <i>Strobilathes</i> were available in the study area which comprised of more than 60% of ground vegetation in winter and summer. <i>Strobilanthes</i> species were the most preferred among the ground vegetation."
	Venkatesh, A., Sridharan, N., Packiavathi, A. J., & Selvan, M. (2017). Abundance of Large Carnivore and its Prey Species after Removal of Cattle Grazing in Mundanthurai Plateau of Kalakad-Mundanthurai Tiger Reserve, Tamil Nadu, India. J Biodivers Endanger Species, 5(178): doi: 10.4172/2332-2543.1000178	[Unknown for <i>Strobilanthes hamiltoniana</i> . <i>Strobilanthes</i> sp reported to be palatable to guar, a wild bison in India] "The Mundanthurai forest area has become so thick, wooded and presence of <i>Strobilanthes</i> sp also may support the guar presence. <i>Strobilanthes</i> sp is observed to be preferred food plants of gaur and this indicates the qualitative improvement of habitat. However, the extent of gaur presence insists the establishment of tiger in Mundanthurai plateau in near future."

405	Toxic to animals	n
	Source(s)	Notes
	NIH U.S. National Library of Medicine. (2019). TOXNET Toxicology Data Network. <a href="https://toxnet.nlm.nih.gov/">https://toxnet.nlm.nih.gov/</a> . [Accessed ]	No evidence
	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

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown

407	Causes allergies or is otherwise toxic to humans	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	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
	NIH U.S. National Library of Medicine. (2019). TOXNET Toxicology Data Network. <a href="https://toxnet.nlm.nih.gov/">https://toxnet.nlm.nih.gov/</a> . [Accessed 11 Nov 2019]	No evidence

408	Creates a fire hazard in natural ecosystems	
	<b>Source(s)</b>	<b>Notes</b>
	Bennett, J., & Scotland, R. (2003). A Revision of <i>Strobilanthes</i> (Acanthaceae) in Java. <i>Kew Bulletin</i> , 58(1), 1-82	"Naturalised in dry and shaded forests, 75 - 2130 m." [Unknown. No evidence, but may increase fuel load in dry, fire prone areas]

409	Is a shade tolerant plant at some stage of its life cycle	y
	<b>Source(s)</b>	<b>Notes</b>
	Tropical Breeze. (2019). <i>Strobilanthes hamiltoniana</i> . <a href="http://www.tropicalfoliagegarden.com/fg_plants16.html">http://www.tropicalfoliagegarden.com/fg_plants16.html</a> . [Accessed 11 Nov 2019]	"Morning sun or a lightly shaded position is ideal."
	Bennett, J., & Scotland, R. (2003). A Revision of <i>Strobilanthes</i> (Acanthaceae) in Java. <i>Kew Bulletin</i> , 58(1), 1-82	"Naturalised in dry and shaded forests, 75 - 2130 m."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	<b>Source(s)</b>	<b>Notes</b>
	Hubbuck, C. (2019). Gardening in the Coastal Southeast - The Genus <i>Strobilanthes</i> Family Acanthaceae. <a href="http://southeastgarden.com/strobilanthes.html">http://southeastgarden.com/strobilanthes.html</a> . [Accessed 11 Nov 2019]	"It grows well in a partly shaded, moist, reasonably well-drained site."

411	Climbing or smothering growth habit	n
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs 0.5–1.5 m tall, much branched, anisophyllous. Stems 4-angled, sulcate, glabrous."

412	Forms dense thickets	y
	<b>Source(s)</b>	<b>Notes</b>



Qsn #	Question	Answer
	Meyer, J. Y., & Lavergne, C. 2004. Beautés fatales: Acanthaceae species as invasive alien plants on tropical Indo-Pacific Islands. <i>Diversity and Distributions</i> , 10(5-6): 333-347	"The case of <i>Strobilanthes hamiltonianus</i> is noteworthy. While only considered as a naturalized plant in the Mascarenes until very recently (Bossler & Heine, 2000), it is now one of the most invasive plants in native rain forests of La Réunion. The lifehistory traits of <i>Strobilanthes</i> species in its native range may explain its great invasiveness potential. This species plays a special role in the ecology of the montane rain forests in Sri Lanka, as their cycles of flowering, fruiting and dieback dominate life on the forest floor: 'the dense undergrowth of <i>Strobilanthes</i> spp. which reaches 3 m in height, play an important role in the dynamics of these forests [ ... ]. Once <i>Strobilanthes</i> stands have grown, they form impenetrable forest [ ... ]. <i>Strobilanthes</i> is not only a competitor with tree saplings but also with herbs on the forest floor or with ferns' (Werner, 1995: 228)."

501	Aquatic	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Terrestrial] "Shrubs 0.5–1.5 m tall, much branched, anisophyllous." ... "Forests on mountain slopes; 800–2000 m."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). <i>Germplasm Resources Information Network (GRIN-Taxonomy)</i> . National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 6 Nov 2019]	Family: Acanthaceae Subfamily: Acanthoideae Tribe: Ruellieae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). <i>Germplasm Resources Information Network (GRIN-Taxonomy)</i> . National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 6 Nov 2019]	Family: Acanthaceae Subfamily: Acanthoideae Tribe: Ruellieae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs 0.5–1.5 m tall, much branched, anisophyllous."

601	Evidence of substantial reproductive failure in native habitat	n

Qsn #	Question	Answer
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 6 Nov 2019]	"Native Asia-Temperate CHINA: China [Xizang Zizhiqu] Asia-Tropical INDIAN SUBCONTINENT: Bhutan, India (n.e.), Nepal (e.) INDO-CHINA: Myanmar Cultivated (cult. throughout tropics) Naturalized Africa WESTERN INDIAN OCEAN: Mauritius, Reunion Asia-Tropical INDIAN SUBCONTINENT: Sri Lanka Southern America CARIBBEAN: Jamaica"
	Bennett, J., & Scotland, R. (2003). A Revision of <i>Strobilanthes</i> (Acanthaceae) in Java. <i>Kew Bulletin</i> , 58(1), 1-82	[No evidence] "DISTRIBUTION. East Himalaya from East Nepal to northern Thailand (Chiang Mai) and south west China (Yunnan), naturalised in Indonesia (Qava), Malaysia (Sabah) and Sri Lanka." ... "Native to the Himalaya, <i>S. hamiltoniana</i> is naturalised in the tropics."

602	Produces viable seed	
	Source(s)	Notes
	Kiehn, M. (2011). Invasive alien species and islands. Pp. 365-384 in Bramwell, D. and J. Caujapé-Castells (eds.). <i>The Biology of Island Floras</i> . Cambridge University Press, Cambridge	"Initially, <i>Strobilanthes hamiltoniana</i> on La Reunion and Mauritius spread only by vegetative propagation. But in 2002 and 2003, the first plants with fruits were found, indicating a potential for sexual reproduction and for dispersal through seeds (Meyer & Lavergne, 2004)."
	Wood, J., & Scotland, R. (2003). <i>Strobilanthes</i> : Panicked Species from East Asia. <i>Kew Bulletin</i> , 58(3), 679-702	"The whole inflorescence is normally glabrous but in older plants becomes glandular-pilose on the inflorescence branches." ... "It is only seen on older, fruiting plants and never on cultivated plants, which seem to be always sterile and without capsules. Cultivated plants seem also to have been selected for their deep pink corolla, whereas in wild plants the corolla is very pale lilac or white."
	Meyer, J. Y., & Lavergne, C. 2004. Beautés fatales: Acanthaceae species as invasive alien plants on tropical Indo-Pacific Islands. <i>Diversity and Distributions</i> , 10(5-6): 333-347	"We recently found in 2002 and 2003 mature capsules of <i>Strobilanthes hamiltonianus</i> at about 1000 m elevation (C. Fontaine, pers. comm. 2002). This is the first record of fruiting plants on La Réunion."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Cultivated plants reported to be sterile] "Capsule green then dark purple, fusiform, 1–1.5 cm, glabrous or with gland-tipped trichomes, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, with long trichomes; areola small." ... "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."
	WRA Specialist. (2019). Personal Communication	Cultivated plants are reported to be sterile, but seeds have been reported from La Reunion plants previously believed to be sterile. Unknown if plants reported from Hawaii are capable of producing seeds.

Qsn #	Question	Answer
603	Hybridizes naturally	
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Unlikely if plants are sterile] "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."
	Bennett, J., & Scotland, R. (2003). A Revision of <i>Strobilanthes</i> (Acanthaceae) in Java. Kew Bulletin, 58(1), 1-82	Unknown. No hybrids reported between any of the 25 species recognized in this publication

604	Self-compatible or apomictic	
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Unknown. Cultivated plants are reportedly sterile] "Corolla white, lilac, or (in cultivated forms) deep pink with a white tube, 3.5–4 cm, subventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1.3 cm then slightly ventricose and gradually widened to 1.4–1.8 cm at mouth; lobes ovate, 4–5 × ca. 6 mm, apex rounded to retuse. Stamens 4, included; filaments glabrous; shorter filament pair ca. 1 mm, equal; longer filament pair 7–9 mm, unequal, erect; anther thecae white, spherical, ca. 1.2 mm in diam., partially recurved; pollen type 3. Ovary ca. 2.5 mm, glabrous; style ca. 3.8 cm, sparsely pubescent" ... "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."
	Sharma, M. V., Kuriakose, G., & Shivanna, K. R. (2008). Reproductive strategies of <i>Strobilanthes kunthianus</i> , an endemic, semelparous species in southern Western Ghats, India. Botanical Journal of the Linnean Society, 157(1), 155-163	[Unknown. Self-compatibility documented in genus] "As the species is self-compatible, the prevailing high degree of geitonogamous pollinations does not interfere with fruit set."

Qsn #	Question	Answer
605	<b>Requires specialist pollinators</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Corolla white, lilac, or (in cultivated forms) deep pink with a white tube, 3.5–4 cm, subventricose, outside glabrous, inside glabrous except for trichomes retaining style; tube basally cylindrical and ca. 2 mm wide for ca. 1.3 cm then slightly ventricose and gradually widened to 1.4–1.8 cm at mouth; lobes ovate, 4–5 × ca. 6 mm, apex rounded to retuse."
	Sharma, M. V., Kuriakose, G., & Shivanna, K. R. (2008). Reproductive strategies of <i>Strobilanthes kunthianus</i> , an endemic, semelparous species in southern Western Ghats, India. <i>Botanical Journal of the Linnean Society</i> , 157(1), 155-163	[Congener, with bluish purple flowers, is bee-pollinated] "The reproductive strategies of <i>S. kunthianus</i> were investigated by studying the floral traits, pollination biology, and breeding system that are critical for reproductive success. The species exhibits a series of floral traits: (1) gregarious flowering attracts a large number of <i>Apis cerana indica</i> , the major pollinator; (2) the stigma is sensitive to touch by the pollinator; in fresh flowers, the receptive surface faces the entry path of the incoming bee, facilitating pollen deposition; as an immediate response, the stigma curves backwards moving the receptive surface away from the path of the exiting bee, thus preventing autogamy and interference in pollen transfer;"

606	<b>Reproduction by vegetative fragmentation</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

607	<b>Minimum generative time (years)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Possibly irrelevant. Cultivated plants may be sterile but can spread vegetatively] "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

701	<b>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Unknown, but could possibly be dispersed by green waste] "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

702	<b>Propagules dispersed intentionally by people</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Dassanayake, M.D. & Clayton, W.D. (eds.). (1998). A Revised handbook to the Flora of Ceylon, Volume 12. A.A. Balkema, Rotterdam, Netherlands	"Ecol. Apparently naturalised in moist lowland forest. Uses. Cultivated as a garden plant."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	" <i>Strobilanthes hamiltoniana</i> is an ornamental plant. It is widely cultivated in tropical countries and in conservatories in temperate climates. The species is sometimes naturalized, occasionally becoming an invasive weed as on the island of Réunion."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence. Unlikely is plants are sterile] "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Wood, J. R. (2014). 786. <i>Strobilanthes attenuata</i> : Acanthaceae. Curtis's Botanical Magazine, 31(2), 154-167	[Many species possess sticky hairs that enable external transport] "However another characteristic does help seed dispersal. As the inflorescence matures and the seed capsules develop, the glandular hairs on the inflorescence elongate and become markedly sticky (Fig. 1) so portions of the inflorescence and the capsules themselves adhere to clothing or passing animals so facilitating seed dispersal. This feature is not unique to <i>Strobilanthes attenuata</i> but is common in other species of <i>Strobilanthes</i> including <i>Strobilanthes nutans</i> (Nees) T. Anderson described elsewhere in this number and indeed in Acanthaceae in general."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence. Cultivated plants may be sterile, and seeds, although small, lack any obvious mechanisms to facilitate wind dispersal] "Capsule green then dark purple, fusiform, 1–1.5 cm, glabrous or with gland-tipped trichomes, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, with long trichomes; areola small." ... "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

705	Propagules water dispersed	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Unknown. Cultivated plants may be sterile. It may be possible that seeds, if produced, or vegetative fragments, could be moved by water] "Capsule green then dark purple, fusiform, 1–1.5 cm, glabrous or with gland-tipped trichomes, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, with long trichomes; areola small." ... "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

706	Propagules bird dispersed	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "Capsule green then dark purple, fusiform, 1–1.5 cm, glabrous or with gland-tipped trichomes, 4-seeded. Seeds ovate in outline, ca. 3 × 2 mm, with long trichomes; areola small."

707	Propagules dispersed by other animals (externally)	y
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."
	Wood, J. R. (2014). 786. <i>Strobilanthes attenuata</i> : Acanthaceae. Curtis's Botanical Magazine, 31(2), 154-167	[Members of genus stick to clothing or animals, if capsules and seeds are produced] "However another characteristic does help seed dispersal. As the inflorescence matures and the seed capsules develop, the glandular hairs on the inflorescence elongate and become markedly sticky (Fig. 1) so portions of the inflorescence and the capsules themselves adhere to clothing or passing animals so facilitating seed dispersal. This feature is not unique to <i>Strobilanthes attenuata</i> but is common in other species of <i>Strobilanthes</i> including <i>Strobilanthes nutans</i> (Nees) T. Anderson described elsewhere in this number and indeed in Acanthaceae in general."

708	Propagules survive passage through the gut	n
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Externally dispersed by vegetative fragments] "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

801	Prolific seed production (>1000/m2)	n
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"The species is sometimes naturalized, occasionally becoming an invasive weed as on the island of Réunion. Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."
	Wood, J., & Scotland, R. (2003). <i>Strobilanthes</i> : Panicked Species from East Asia. Kew Bulletin, 58(3), 679-702	"The whole inflorescence is normally glabrous but in older plants becomes glandular-pilose on the inflorescence branches." ... "It is only seen on older, fruiting plants and never on cultivated plants, which seem to be always sterile and without capsules. Cultivated plants seem also to have been selected for their deep pink corolla, whereas in wild plants the corolla is very pale lilac or white."

802	Evidence that a persistent propagule bank is formed (>1 yr)	

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y., P. H. Raven & D. Y. Hong, (eds). 2011. Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Possibly no if plants are sterile] "Cultivated plants and plants of cultivated origin seem always to be glabrous, pink-flowered, and sterile with dispersal being by cuttings or shoots broken off by grazing animals."

803	Well controlled by herbicides	
	<b>Source(s)</b>	<b>Notes</b>
	Biosecurity Queensland. (2016). Persian shield. <i>Strobilanthes dyerianus</i> . State of Queensland, Department of Agriculture and Fisheries. <a href="https://www.daf.qld.gov.au">https://www.daf.qld.gov.au</a> . [Accessed 11 Nov 2019]	[Methods to control a related species may be effective] "There is no herbicide currently registered for control of persian shield in Queensland; however, an off-label use permit allows the use of various herbicides for the control of environmental weeds in non-agricultural areas, bushland and forests." [The following herbicides and rates have been suggested for control of a related species. Glyphosate (360 g/L) 1 L per 100 L water; Fluroxypyr (200 g/L) 500 ml to 1 L per 100 L water; Triclopyr (300 g/L) + picloram (100 g/L) 350 ml to 500 ml per 100 L water plus wetting agent or spray oil]
	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
	<b>Source(s)</b>	<b>Notes</b>
	Tropical Breeze. (2019). <i>Strobilanthes hamiltoniana</i> . <a href="http://www.tropicalfoliagegarden.com/fg_plants16.html">http://www.tropicalfoliagegarden.com/fg_plants16.html</a> . [Accessed 11 Nov 2019]	" <i>Strobilanthes hamiltoniana</i> needs to be cut back in early spring and it is easy to grow from cuttings."
	Garden Drum. (2016). Year-round flowers for shady, subtropical gardens. <a href="https://gardendrum.com/2016/06/18/year-round-flowers-for-shady-subtropical-gardens/">https://gardendrum.com/2016/06/18/year-round-flowers-for-shady-subtropical-gardens/</a> . [Accessed 11 Nov 2019]	[Tolerates repeated cutting] "Chinese rain bells ( <i>Strobilanthes hamiltoniana</i> , formerly <i>Strobilanthes flaccidifolius</i> ), or sometimes known as Darwin rain bells or just rain bells. I know of people who grow this happily in full sun, mine however is growing in dappled light for summer and dense shade for winter, and thriving. It is approximately 1.5 m tall and in late autumn bursts into masses of pink bell shaped flowers. Just when you think it has finished flowering and go to cut it back, another flush of flowers often arrives. It can get a bit leggy so a good annual haircut not only helps to thicken it up but also provides great cutting material."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2019). Personal Communication	Unknown



**Summary of Risk Traits:**

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalized on Hawaii island (Hawaiian Islands), and in several other tropical locations
- An environmental weed in La Reunion
- Other *Strobilanthes* species are invasive
- Shade tolerant
- Forms dense stands that can exclude other vegetation
- Reproduces vegetatively by cuttings and fragments
- May reproduce by seed in some locations, although cultivated plants are reported to be sterile
- Vegetative fragments dispersed by animals and people
- Tolerates and will grow back after repeated cutting

Low Risk Traits

- Unarmed (no spines, thorns, or burrs)
- Non-toxic
- Cultivated plants reported to be sterile
- Lack of seed production limits dispersal ability