

Taxon: Gardenia volkensii	Family: Rubiaceae
Common Name(s): bushveld gardenia Transvaal gardenia	Synonym(s): Gardenia spatulifolia Stapf & Hutch.

Assessor: No Assessor	Status: Assessor Approved	End Date: 31 Dec 2020
WRA Score: -4.0	Designation: L	Rating: Low Risk

Keywords: Tropical, Shrub/Tree, Ornamental, Fragrant Flowers, Animal-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)		
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	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		
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	y=1, n=-1	n
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		
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle		

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		
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	>3
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	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	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
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
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	No evidence
102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	NA
103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2020). 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. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 31 Dec 2020]	"Native: AFRICA Northeast Tropical Africa: Ethiopia; Somalia East Tropical Africa: Kenya; Tanzania; Uganda South Tropical Africa: Mozambique; Zambia; Zimbabwe Southern Africa: Botswana; South Africa"
202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 31 Dec 2020]	
203	Broad climate suitability (environmental versatility)	
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	"It occurs under a wide range of climates from semi-humid to semi-arid."
	Tropicos.org. (2020). Missouri Botanical Garden. http://www.tropicos.org/ . [Accessed 31 Dec 2020]	Possibly environmentally versatile. Collected from 10 - 1410 m elevation in Kenya & Tanzania, but only at lower tropical latitudes (between 01°53'00"S & 04°57'06"S)

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	"Widely distributed in east, central and southern Africa, from Somalia in the north to Transvaal and Namibia in the south. It occurs under a wide range of climates from semi-humid to semi-arid. In Kenya it is found from the coast to the Lake Victoria basin and also in northern Kenya in open woodland, often many concentrated in one area. The species has been widely planted as an ornamental park tree and garden plant throughout the tropics."
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	"The species has been widely planted as an ornamental park tree and garden plant throughout the tropics."

301	Naturalized beyond native range	n
	Source(s)	Notes
	Negi, P. S., & Hajra, P. K. (2007). Alien flora of Doon Valley, Northwest Himalaya. <i>Current Science</i> 92(7): 968-978	"Naturalized and widely cultivated exotics are marked by asterisks in the enumeration." "Table 1. Exotics of the Doon Valley (enumeration)" [Includes <i>Gardenia spatulifolia</i> , a synonym for <i>Gardenia volkensii</i> subsp. <i>spatulifolia</i> . Not marked with an asterisk, so presumably not naturalized or widely cultivated]
	Randall, R.P. (2012). A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Lists <i>Gardenia spatulifolia</i> (syn. = <i>Gardenia volkensii</i> subsp. <i>spatulifolia</i>) as naturalized, citing Negi, P. S., & Hajra, P. K. (2007). Alien flora of doon valley, northwest Himalaya. <i>Current science</i> , 92 (7), 968-978. However, Negi et al. (2007) do not indicate that this species is naturalized, but merely present in Doon Valley]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Cited as a weed in India, but a subsequent search of the cited website (IUCN (2017) Global Register of Introduced and Invasive Species (GRIIS) IUCN SSC Invasive Species Specialist Group. URL: http://griis.org/) indicates that it is present, but not invasive
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

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	Cited as a weed in India, but a subsequent search of the cited website (IUCN (2017) Global Register of Introduced and Invasive Species (GRIIS) IUCN SSC Invasive Species Specialist Group. URL: http://griis.org/) indicates that it is present, but not invasive

Qsn #	Question	Answer
	Randall, R.P. (2012). A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	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	Cited as a weed in India, but a subsequent search of the cited website (IUCN (2017) Global Register of Introduced and Invasive Species (GRIIS) IUCN SSC Invasive Species Specialist Group. URL: http://griis.org/) indicates that it is present, but not invasive
	Randall, R.P. (2012). A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Cited as a weed in India, but a subsequent search of the cited website (IUCN (2017) Global Register of Introduced and Invasive Species (GRIIS) IUCN SSC Invasive Species Specialist Group. URL: http://griis.org/) indicates that it is present, but not invasive
	Randall, R.P. (2012). A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	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	<i>Gardenia angusta</i> , <i>Gardenia augusta</i> . <i>Gardenia jasminoides</i> . <i>Gardenia taitensis</i> & <i>Gardenia thunbergia</i> listed as naturalized or as weeds, but evidence of impacts is insufficient or unspecified

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[No evidence] "A small branchy, deciduous tree, rarely reaching more than 8 m with relatively dense crown and a short thick and often fluted trunk. Bark is pale grey, smooth on young branches. In older parts, bark is flaking in small, fairly thick sections, resulting in a molted appearance. Leaves are glabrous, in pairs from end of 3-whorled branchlets, broadly spatulate, up to 2½-4 (-5) cm long."

402	Allelopathic	n
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	Unknown

403	Parasitic	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Schmidt, E., Lötter, M. & McClelland, W. 2002. Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg, South Africa	"Large deciduous shrub or medium-sized tree to 10 m" [Rubiaceae]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	"Leaves are browsed by game, e.g. giraffe, kudu and impala."
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"leaves browsed by game"
	Loveridge, J. P., & Moe, S. R. 2004. Termitaria as browsing hotspots for African megaherbivores in miombo woodland. <i>Journal of Tropical Ecology</i> , 20(03): 337-343	[<i>Gardenia volkensii</i> browsed in woodland plots] "Species of woody plants were recorded along with the percentage of branches browsed (cumulative browsing score) by black rhino, <i>Diceros bicornis</i> , elephant, <i>Loxodonta africana</i> and other browsers combined." ... "Table 1. Browsing (median % browse and 25%, 75% percentiles in parentheses) on some woody species found on termitaria and in woodland at Iwaba."

405	Toxic to animals	n
	Source(s)	Notes
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"leaves browsed by game"
	Curtis, B. & Mannheimer, C. (2005). Tree Atlas of Namibia. National Botanical Research Institute, Windhoek	[No evidence] "Browsed by game and livestock."
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	[No evidence] "Fruit are eaten by monkeys, baboons, elephants and large antelope. Leaves are browsed by game, e.g. giraffe, kudu and impala."
	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	n
	Source(s)	Notes
	Sunshine Seeds. (2020). <i>Gardenia volkensii</i> . http://www.sunshine-seeds.de/product_info.php?products_id=54133&language=en . [Accessed 31 Dec 2020]	"Pests: Spider mites > especially under glass"
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Pertains to <i>G. thunbergia</i> , another African species, but may be applicable to <i>G. volkensii</i>] "Pests are seldom serious but include scales, mealybugs, and sooty mold; also, caterpillars of the oleander hawk moth feed on the foliage."

Qsn #	Question	Answer
407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	[No evidence, although medicinal plants should be used with caution] "Uses and cultural aspects Used medicinally as a cure for intestinal worms. Infusions of the fruit and roots are used to induce vomiting. The ash of burnt roots is rubbed into the chest to treat pneumonia, while headaches are treated by dripping an extract into the eyes or by placing a cold compress on the forehead. For earache an extract is dripped into the ear. The wood is very hard and suitable for carving ornaments, and plants are also believed to protect against lightning or evil spirits. "
	Maroyi, A. (2020). <i>Gardenia volkensii</i> K. Schum. (Rubiaceae): Review of Medicinal uses, Phytochemistry and Biological Activities. <i>Journal of Pharmacy and Nutrition Sciences</i> , 10, 175-181	[Possibly if consumed or used in large doses] "Palmer and Pitman [3] argued that the fruits of <i>G. volkensii</i> could be poisonous and, therefore, there is need for detailed clinical and toxicological evaluations of crude extracts and compounds isolated from the species. The widespread use of <i>G. volkensii</i> as food plant and source of traditional medicines throughout its distributional range in tropical Africa suggest that the species is not taken at toxic dosages. But use of <i>G. volkensii</i> as food and for the treatment of human diseases and ailments should be treated with caution, and rigorous toxicological and clinical studies of the bark, fruits, leaves, roots and seeds, and compounds isolated from the species are necessary."
	Quattrocchi, U. (2017). <i>CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	[Used medicinally] "Roots ash rubbed into the chest to treat pneumonia; for headache, a root extract dripped into the eyes or applied on the forehead. Fruits and roots infusion emetic, vermifuge, for intestinal worms."
	Wagstaff, D.J. 2008. <i>International poisonous plants checklist: an evidence-based reference</i> . CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	Nyazika, T. P., Zisadza-Gandiwa, P., Chanyandura, A., Muboko, N., & Gandiwa, E. (2017). Influence of fire frequency on woody vegetation structure and composition in Lake Chivero Recreational Park, northern Zimbabwe. <i>Tropical Ecology</i> , 58(3), 583-589	"Table 2. Common species based on percentage occurrence in the shrub and tree layers across the three fire frequency categories in Lake Chivero Recreational Park, northern Zimbabwe. Notes: – denotes not recorded in the stratum; LFF = low fire frequency, MFF = medium fire frequency, HFF = high fire frequency" [<i>Gardenia volkensii</i> occurs in the tree layer with medium fire frequency]
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Schum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. <i>Forest & Landscape Denmark</i> , Hørsholm	[Unknown. Could possibly contribute to fuel load if growing in higher densities in fire-prone areas] "Widely distributed in east, central and southern Africa, from Somalia in the north to Transvaal and Namibia in the south. It occurs under a wide range of climates from semi-humid to semi-arid. In Kenya it is found from the coast to the Lake Victoria basin and also in northern Kenya in open woodland, often many concentrated in one area."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes

Qsn #	Question	Answer
	Grow Wild. (2020). <i>Gardenia volkensii</i> . http://growwild.co.za/trees/gardenia-volkensii . [Accessed 31 Dec 2020]	"Plant this small evergreen tree, which is waterwise in the sun or semi-shade."
	Plant This. (2020). <i>Gardenia volkensii</i> ssp. <i>spatulifolia</i> . http://www.plantthis.com.au . [Accessed 31 Dec 2020]	"Sunlight: warm low sun to dappled light"
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	"The plants are relatively slow-growing but make an attractive garden plant in sunny, well-drained spots."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	"It occurs on a wide variety of soils, ranging from sand to clay, as well as in rocky areas. The tree prefers well-drained soils and does not withstand waterlogging; often associated with termite mounds."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Schmidt, E., Lötter, M. & McClelland, W. 2002. Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg, South Africa	"Large deciduous shrub or medium-sized tree to 10 m" [Rubiaceae]

412	Forms dense thickets	
	Source(s)	Notes
	Strohbach, B. J. Vegetation of the Okavango River valley in Kavango West, Namibia. <i>Biodiversity & Ecology</i> 5: 321-339	[Formation of denser stands may be due to habitat, rather than competitive exclusion] "Again following the <i>Chrysopogon nigritianus</i> - <i>Gardenia volkensii</i> association in the catena, the <i>Terminalia sericea</i> - <i>Combretum imberbe</i> association forms a dense bushland, even thicket (Fig. 6h), on extensive sandy floodplains. These are on average 2.7 m above the river level, with a range of 1-4 m." ... "The denser stands of <i>Gardenia volkensii</i> seem to be correlated with the lower, more flood-prone areas of these floodplains, whilst in the higher parts, this species is gradually replaced by <i>Terminalia sericea</i> and <i>Acacia fleckii</i> ."
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[Many plants concentrated, but no mention of thicket formation] "In Kenya it is found from the coast to the Lake Victoria basin and also in northern Kenya in open woodland, often many concentrated in one area."
	Curtis, B. & Mannheimer, C. (2005). <i>Tree Atlas of Namibia</i> . National Botanical Research Institute, Windhoek	[No evidence] "Generally uncommon, but fairly widespread across the far northern parts of Namibia, from the Kunene River to eastern Caprivi; common in places in Kavango."

501	Aquatic	n
	Source(s)	Notes

Qsn #	Question	Answer
	Schmidt, E., Lötter, M. & McClelland, W. 2002. Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg, South Africa	[Terrestrial] "Large deciduous shrub or medium-sized tree to 10 m; in mixed deciduous woodland and thicket, often on sandy soils or rocky hills."
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[Terrestrial] "The tree prefers well-drained soils and does not withstand waterlogging; often associated with termite mounds."

502	Grass	n
	Source(s)	Notes
	Schmidt, E., Lötter, M. & McClelland, W. 2002. Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg, South Africa	"Large deciduous shrub or medium-sized tree to 10 m" [Rubiaceae]

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	"A small branchy, deciduous tree, rarely reaching more than 8 m with relatively dense crown and a short thick and often fluted trunk." [Rubiaceae]

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Schmidt, E., Lötter, M. & McClelland, W. 2002. Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg, South Africa	"Large deciduous shrub or medium-sized tree to 10 m" [Rubiaceae]

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[No evidence] "Widely distributed in east, central and southern Africa, from Somalia in the north to Transvaal and Namibia in the south."

602	Produces viable seed	y
	Source(s)	Notes
	Loveridge, J. P., & Moe, S. R. 2004. Termitaria as browsing hotspots for African megaherbivores in miombo woodland. <i>Journal of Tropical Ecology</i> , 20(03): 337-343	"Seed: The light brown, disc-shaped flat seeds are about 0.5cm long and are contained within the fruits' whitish-grey acidic pulp. The seeds are smooth and laterally flattened. The seed coat is hard. There are 35,000-50,000 seeds in a kilogramme. The number of seeds per kilogramme depends on the provenance and the climatic conditions; under suitable climatic conditions, the seed weight tends to be larger than under harsh climatic conditions."

603	Hybridizes naturally	

Qsn #	Question	Answer
	Source(s)	Notes
	Verdcourt, B. 1979. Notes on African <i>Gardenia</i> (Rubiaceae). <i>Kew Bulletin</i> , 34(2): 345-360	[No evidence] "The detailed distribution of <i>G. volkensii</i> and <i>G. ternifolia</i> shows a complex pattern and the ecological factors underlying this are not at all obvious from herbarium material alone. <i>G. volkensii</i> tends to prefer rather drier places but the distributions overlap at a number of places. <i>G. volkensii</i> extends no further north than the Omo Valley and southern Somalia but extending south across East Africa and Flora Zambesiaca area its distribution then divides, extending to Angola and South West Africa in one direction and northeastern South Africa in the other; it is, however, lacking from West and Central Africa and from most of Ethiopia. <i>G. ternifolia</i> on the other hand has a much wider distribution (see Map 1). Although morphologically appearing so similar the fact that they have maintained themselves distinct despite overlapping distributions suggests they have been quite long separated. No recognizable hybrids have been noted."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Genus Description] "Gardenia flowers have an interesting pollination mechanism; when the flower bud opens, the pollen has already been deposited from the anthers onto the sides of the spindle- or club-shaped stigma, from which the pollen is dispersed by insects; on the second or third day, the stigma lobes separate and become receptive in pollen from a different flower. The method of preventing self pollination is also characteristic of <i>Ixora</i> and some other Rubiaceae."
	East, E. M. (1940). The distribution of self-sterility in the flowering plants. <i>Proceedings of the American Philosophical Society</i> 82: 449-518	[Unknown for <i>G. volkensii</i> , but <i>G. thunbergia</i> , another African species, is self-incompatible] "The only strong self-incompatibility reactions were found in <i>Gardenia thunbergia</i> L. f. and <i>Mussaenda luteola</i> Delile, in both of which the pollen was extremely good."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	"Flowers are large, up to 10 cm long, white and fragrant, borne singly. Corolla large, 8-9 merous, showy white, turning yellow after a few days, then brown before dropping, tube up to 10cm long or more."
	Armstrong, W.P. (2020). <i>The Gardenia, The Kudu & A Long-Tongued Moth</i> . https://www2.palomar.edu . [Accessed 31 Dec 2020]	"Gardenia nectar contains fragrant essential oils which serve to attract insects for pollination. Night blooming species typically have white blossoms that attract a variety of moths."
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	"The trumpet-like flowers are white turning yellow with age, with a long tube that opens up into 6–9 lobes. The flowers open during the night and are probably moth-pollinated."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes

Qsn #	Question	Answer
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	[No evidence that this plant suckers, or that branches touching the ground will root] "Small, multi-stemmed tree with a dense, rounded crown, 3–8 m high with arching branches, sometimes touching the ground." ... "These plants are easily grown from cuttings or seed."

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	"The bushveld gardenia is a small, relatively slow-growing tree, ideal as a focus plant in summer rainfall gardens or on patios."
	Johnson, D. & Johnson, S. 2002. <i>Down to Earth: Gardening with Indigenous Trees</i> . Struik Publishers, Cape Town, South Africa	"The growth is about 30 cm per year ... At about four years, flowering begins and fruiting takes place outside the native range."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[Unlikely. Fruit remain on tree for a long time, & fruits & seeds lack means of external attachment] "The fruit is a globose indehiscent berry-capsule, about 10 cm in diameter, warty and grey with 8-10 prominent longitudinal ribs." ... "Seed: The light brown, disc-shaped flat seeds are about 0.5 cm long and are contained within the fruits' whitish-grey acidic pulp. The seeds are smooth and laterally flattened. The seed coat is hard." ... "The fruits remain on the tree for a long time after maturity."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	"The species has been widely planted as an ornamental park tree and garden plant throughout the tropics." ... "The bright and beautiful large flowers of <i>Gardenia volkensii</i> make it a highly appreciated ornamental plant."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[Unlikely as seeds remain on shrub/tree without assistance or intervention] "The fruit is a globose indehiscent berry-capsule, about 10 cm in diameter, warty and grey with 8-10 prominent longitudinal ribs." ... "Seed: The light brown, disc-shaped flat seeds are about 0.5 cm long and are contained within the fruits' whitish-grey acidic pulp. The seeds are smooth and laterally flattened. The seed coat is hard." ... "The fruits remain on the tree for a long time after maturity."

704	Propagules adapted to wind dispersal	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[No adaptations for wind dispersal] "Fruit: The fruit is a globose indehiscent berry-capsule, about 10 cm in diameter, warty and grey with 8-10 prominent longitudinal ribs." ... "Seed: The light brown, disc-shaped flat seeds are about 0.5cm long and are contained within the fruits' whitish-grey acidic pulp. The seeds are smooth and laterally flattened. The seed coat is hard."

705	Propagules water dispersed	
	Source(s)	Notes
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 30 Oct 2014]	[No evidence from distribution or ecology] " <i>Gardenia volkensii</i> prefers open woodland, bushveld and thicket and occurs from tropical Africa through Namibia, Botswana, and the northeastern parts of South Africa into KwaZulu-Natal in the southeast." ... "Fruit are eaten by monkeys, baboons, elephants and large antelope."
	Strohbach, B. J. Vegetation of the Okavango River valley in Kavango West, Namibia. <i>Biodiversity & Ecology</i> 5: 321-339	[Under these conditions, water dispersal may be possible] "Flooding occurs regularly in six out of 10 years, but only in two out of 10 years the flooding level is deeper than 2 m (Fig. 7e). This results in a limited development of the phanerophytic layer, with <i>Gardenia volkensii</i> , as a known wetland species, dominating (Fig. 6g). Most other tree species (with the exception of <i>Combretum imberbe</i>) do not seem to be able to tolerate prolonged waterlogged soil conditions (anaerobic soil conditions)."
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[Unlikely given habitat & persistence of fruits on the tree] "The tree prefers well-drained soils and does not withstand waterlogging; often associated with termite mounds." ... "The fruits remain on the tree for a long time after maturity."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	[Although fruits contain fleshy pulp, the primary dispersers are large mammals] "The flowering season ranges from July to December (winter to summer) and the fruits ripen between December and April (summer to autumn), but may remain on the tree until August. The fruit is almost round, shallowly to strongly ribbed longitudinally, greyish green to white with white, slightly raised dots (lenticels). The fruit contains numerous seeds embedded in pulp. <i>Gardenia volkensii</i> fruit and foliage Two subspecies occur in southern Africa. They are distinguished on fruit characters but this is not always possible, especially in the case of herbarium specimens. <i>Gardenia volkensii</i> subsp. <i>volkensii</i> differs from subsp. <i>spatulifolia</i> by the larger, white fruit with coarser ribs and conspicuous white dots (lenticels). <i>G. volkensii</i> subsp. <i>volkensii</i> var. <i>saundersiae</i> has a calyx with well-developed lobes (15–25 mm long) while <i>G. volkensii</i> subsp. <i>volkensii</i> var. <i>volkensii</i> has calyx lobes up to 10–15 mm long." ... "Fruit are eaten by monkeys, baboons, elephants and large antelope."

707	Propagules dispersed by other animals (externally)	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	[Presumably adapted for consumption & internal dispersal, as fruits & seeds lack means of external attachment] "Fruit are eaten by monkeys, baboons, elephants and large antelope."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Johnson, D. & Johnson, S. 2002. <i>Down to Earth: Gardening with Indigenous Trees</i> . Struik Publishers, Cape Town, South Africa	"Fruits persist on the tree for months. Antelopes and warthogs eat them after they have fallen, and disperse the seeds in their droppings."
	Steyn, H. (2010). <i>Gardenia volkensii</i> . PlantZAfrica. SANBI. http://pza.sanbi.org/gardenia-volkensii . [Accessed 31 Dec 2020]	[Presumably Yes. Could be dispersed by pigs in the Hawaiian Islands] "Fruit are eaten by monkeys, baboons, elephants and large antelope."

801	Prolific seed production (>1000/m ²)	
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[Unlikely for a tree of this size] "A small branchy, deciduous tree, rarely reaching more than 8 m with relatively dense crown and a short thick and often fluted trunk." ... "Seed: The light brown, disc-shaped flat seeds are about 0.5cm long and are contained within the fruits' whitish-grey acidic pulp. The seeds are smooth and laterally flattened. The seed coat is hard. There are 35,000-50,000 seeds in a kilogramme. The number of seeds per kilogramme depends on the provenance and the climatic conditions; under suitable climatic conditions, the seed weight tends to be larger than under harsh climatic conditions."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Kiamba, J. K., & Schmidt, L. H. (2009). <i>Gardenia volkensii</i> K. Shum ssp. <i>spathulifolia</i> (Stapf & Hutch.) Verdc. Seed Leaflet No. 145. Forest & Landscape Denmark, Hørsholm	[Probably Yes. Seeds can be "banked" on the plant, & may form a persistent seed bank as well without scarification by animal consumption] "The fruits remain on the tree for a long time after maturity." ... "Seeds can be stored in airtight containers (plastic, kilner jars, and aluminium packets) in cool dry place for 2 to 5 years. For storage lasting to over 5 years e.g. conservation, seeds can be stored at sub-zero temperature for many years with no significant loss of viability. Seeds can remain dormant for a long period."

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	Unknown. No information found on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	

Qsn #	Question	Answer
	Source(s)	Notes
	Calyx Horticultural Services. (2020). The Queensland Gardening Pages - Gardenias. http://www.calyx.com.au/gardenia.html . [Accessed 31 Dec 2020]	[Gardenia in general tolerate some pruning] "Prune after flowering. Avoid winter/spring pruning as this will result in loss of the autumn-initiated flower buds which normally bloom in late spring/early summer."
	Khavhagali, V. P. (2008). Forest colonization of savannas: patterns and process. MSc Thesis. University of Cape Town, Rondebosch, South Africa	[Gardenia volkensii only occurs in unburned plots in this study, indicating possible intolerance to fire] "In this study, I explored factors that influence forest colonization in a South African savanna. I used a 50 year fire experiment in the Kruger National Park to explore patterns of forest colonization in a mesic Terminalia sericea savanna. I studied woody seedling and sapling distribution in relation to different burning treatments, including no burning, and microsite position - in the open or under the canopy of tall trees." ... "Species responded differently to fire treatments and microsite effect. This test shows that there is high forest/thicket species composition on the no burn plot when compared to triennial, biennial and annual burns. Species such as Bridelia cathartica, Gardenia volkensii and Xeromphis obovata are forest species only occurring on the no burn plot."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m at lower tropical latitudes. demonstrating potential environmental versatility
- Thrives in tropical climates
- Tolerates many soil types
- May form dense stands in native range
- Seeds dispersed by mammals & intentionally by people
- Seeds able to be stored for extended periods; May form a persistent seed bank or remain viable in fruits that persist on the tree for an extended period

Low Risk Traits

- No reports of invasiveness or naturalization (with the possible exception of Doon Valley, India)
- Unarmed (no spines, thorns or burrs)
- Palatable to browsing animals
- Ornamental
- Not reported to spread vegetatively
- Slow-growing, & reaches maturity in 4+ years
- Relatively large, indehiscent fruit remain attached to the parent tree for an extended length of time, limiting the potential for inadvertent dispersal