

Family: *Orchidaceae*

Taxon: *Vanilla planifolia*

Synonym: *Myrobroma fragrans* Salisb
Vanilla fragrans auct.

Common Name: Bourbon vanilla
vanilla
vinilla

Questionnaire :	current 20090513	Assessor:	Patti Clifford	Designation:
Status:	Assessor Approved	Data Entry Person:	Patti Clifford	WRA Score 9
101	Is the species highly domesticated?		y=-3, n=0	n
102	Has the species become naturalized where grown?		y=1, n=-1	
103	Does the species have weedy races?		y=1, n=-1	
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"		(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data		(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)		y=1, n=0	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	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)	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		y=1, n=0	
403	Parasitic		y=1, n=0	n
404	Unpalatable to grazing animals		y=1, n=-1	
405	Toxic to animals		y=1, n=0	n
406	Host for recognized pests and pathogens		y=1, n=0	
407	Causes allergies or is otherwise toxic to humans		y=1, n=0	
408	Creates a fire hazard in natural ecosystems		y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle		y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		y=1, n=0	n

411	Climbing or smothering growth habit	y=1, n=0	y
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	y
606	Reproduction by vegetative fragmentation	y=1, n=-1	
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	
803	Well controlled by herbicides	y=-1, n=1	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation:

WRA Score **9**

Supporting Data:

101	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. <i>Genetic Resources Crop Evolution</i> . 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Is the species highly domesticated? No] "The pre-Columbian history of vanilla in Mexico is poorly documented. Stehle´ (1952) refers to archive documents dating from 1427, which mention the gathering of vanilla pods by Aztecs. Vanilla belongs to a group of native plants in the Maya Lowlands that could have been subjected to human selection before 3400 B.C. However, its domestication origin is still unresolved. The first vanilla plantations were only established from 1767 by the Totonac Indians (in the Veracruz region), particularly in the Papantla and Misantla areas, marking the start of vanilla cultivation. Soto Arenas considers that Totonac Indians did not use manual pollination to produce vanilla pods. Indeed, no evidence of manual pollination has been reported before the 19th century. From 1841, the technique of manual pollination discovered in Europe was transferred to Mexico and Totonac Indians became the world most important producers (Bruman 1948), until the supremacy of Madagascar in 1924."
101	2011. WRA Specialist. Personal Communication.	[Is the species highly domesticated? No] No evidence of domestication that reduces weediness traits. <i>Vanilla planifolia</i> has a specialist pollinator.
102	2011. WRA Specialist. Personal Communication.	[Has the species become naturalized where grown?] NA
103	2011. WRA Specialist. Personal Communication.	[Does the species have weedy races?] NA
201	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"? High] Native range: Mexico; Costa Rica; Guatemala; Honduras; Panama; Antigua and Barbuda; Dominica; Grenada; Guadeloupe; Martinique; Puerto Rico; Virgin Islands (U.S.); Guyana; Suriname; Venezuela; Ecuador; Peru.
202	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Quality of climate match data? High] Native range: Mexico; Costa Rica; Guatemala; Honduras; Panama; Antigua and Barbuda; Dominica; Grenada; Guadeloupe; Martinique; Puerto Rico; Virgin Islands (U.S.); Guyana; Suriname; Venezuela; Ecuador; Peru.
203	2007. Raj, N.M./Peter, K.V./Nybe, E.V.. Spices: volume 5 horticultural science series. New India Publishing, http://books.google.com/books?id=HHs6ANrJ-MEC&dq=vanilla+planifolia&source=gbs_navlinks_s	[Broad climate suitability (environmental versatility)? No] Vanilla requires warm and moist temperatures of the humid tropics. It thrives in latitudes between 10 degrees North and 20 degrees South. It comes up well up to 1500 m above MSL.
203	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Broad climate suitability (environmental versatility)? No] "Warm tropical climates are ideal, with annual rainfall of 1,500-2,500 mm per year. Elevation range sea level to about 1,500 m.
203	2011. Dave's Garden. PlantFiles: vanilla orchid (<i>Vanilla planifolia</i>). Dave's Garden, http://davesgarden.com/guides/pf/go/1214/	[Broad climate suitability (environmental versatility)? No] Hardiness: USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)
204	2007. Ackerman, J.D.. Invasive orchids: weeds we hate to love?. <i>Lankesteriana</i> . 7(1-2): 19-21.	[Native or naturalized in regions with tropical or subtropical climates? Yes] Naturalized in: Puerto Rico, West Indies, Central & South America.
204	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Native or naturalized in regions with tropical or subtropical climates? Yes] Native range: Mexico; Costa Rica; Guatemala; Honduras; Panama; Antigua and Barbuda; Dominica; Grenada; Guadeloupe; Martinique; Puerto Rico; Virgin Islands (U.S.); Guyana; Suriname; Venezuela; Ecuador; Peru.

205	2008. Bory, S./Lubinsky, P./Risterucci, A./Noyer, J./Grisoni, M./Duval, M./Besse, P.. Patterns of introduction and diversification of <i>Vanilla planifolia</i> (Orchidaceae) in Reunion Island (Indian Ocean). <i>American Journal of Botany</i> . 95: 805-815. http://www.amj	[Does the species have a history of repeated introductions outside its natural range? Yes] "As early as the mid-18th century, cuttings of <i>V. planifolia</i> began to be introduced into Europe, not from Mexico into Spain, where vanilla bean imports were centered (Kour i , 2004), but from the West Indies into England. When or how <i>V. planifolia</i> made its way to the West Indies is unknown and/or unrecorded, but most probably was an introduction postdating Spanish arrival in the New World. The lectotype of <i>V. planifolia</i> was based on a plant introduced by the Marquis de Blanford from the West Indies and cultivated in the greenhouse of the R. Hon. C. Greville in Paddington in the early 1800s. This same individual was propagated shortly thereafter throughout botanical institutions in continental Europe, and a widely subscribed viewpoint is that the entire stock of cultivated vanilla in the Indian Ocean and Indonesia derives from this single genetic individual (clone), the Blanford/Greville type, introduced into these regions essentially contemporaneously during the 1820s and 1830s by French and Dutch colonists, respectively. In Reunion Island, five primary successive vanilla introductions are cited in the literature."
205	2010. Sasikumar, B.. <i>Vanilla</i> breeding - a review. <i>Agricultural Reviews</i> . 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Does the species have a history of repeated introductions outside its natural range? Yes] " <i>Vanilla</i> (<i>Vanilla planifolia</i> Andrews) with the sobriquet 'Prince of Spices' is the only orchid spice. It is a perennial succulent vine trailed on trees or other standards . <i>Vanilla</i> accounts for about 0.75 percent world import of spices in volume and in terms of value its share is six to seven percent of nearly 1500 million US\$ of global spice trade (<i>Vanilla</i> Status Paper, Spices Board, Kochi, India, 2003). The major vanilla producing countries are India, Indonesia, Madagascar, Mexico, Reunion Islands and the Comoros besides the other countries such as China, Guadeloupe, French Polynesia, Fiji, Malawi, Tonga, Uganda, Zimbabwe."
301	1984. Stoddart, D.R.. <i>Biogeography and ecology of the Seychelles Islands</i> . Springer, http://books.google.com/books?hl=en&lr=&id=hAu6qogRHloC&oi=fnd&pg=PA193&dq=vanilla+planifolia+%2B+%22coppice%22&ots=6lvBv7l9cV&sig=lzN5w3RcT6O2w8tUWTIT_jmz9M#v=snippet&q	[Naturalized beyond native range? Yes] In the 19th century, <i>Vanilla planifolia</i> became an important crop in the Seychelles. Disease at the turn of the century led to a decline in the crop, but not before <i>V. planifolia</i> had become naturalized.
301	2007. Ackerman, J.D.. <i>Invasive orchids: weeds we hate to love?</i> . <i>Lankesteriana</i> . 7(1-2): 19-21.	[Naturalized beyond native range? Yes] Naturalized in: Puerto Rico, West Indies, Central & South America.
302	2007. Randall, R.. <i>Global Compendium of Weeds - Vanilla planifolia</i> [online database]. http://www.hear.org/gcw/species/vanilla_planifolia/	[Garden/amenity/disturbance weed? No] No evidence.
303	2007. Randall, R.. <i>Global Compendium of Weeds - Vanilla planifolia</i> [online database]. http://www.hear.org/gcw/species/vanilla_planifolia/	[Agricultural/forestry/horticultural weed? No] No evidence.
304	2007. Randall, R.. <i>Global Compendium of Weeds - Vanilla planifolia</i> [online database]. http://www.hear.org/gcw/species/vanilla_planifolia/	[Environmental weed? No] No evidence.
305	2007. Randall, R.P.. <i>Global Compendium of Weeds - Index</i> [Online Database]. http://www.hear.org/gcw/	[Congeneric weed? No] No evidence of species in the <i>Vanilla</i> genus having negative impacts to the environment or agriculture.
401	2003. Ackerman, J.D.. <i>Flora of North America</i> volume 26 - <i>Vanilla planifolia</i> . www.efloras.org ; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Produces spines, thorns or burrs? No] " Roots usually 1 per node, aerial portions 2–3 mm diam. Stems occasionally branched, leafy, thick, 5–10 mm diam., smooth. Leaves persistent; blade flat, oblong-elliptic to ovate, longer than internodes, 15–25 × 5–8 cm, fleshy-leathery, apex acute to acuminate. Inflorescences axillary, 15-flowered racemes, short-pedunculate, to 5 cm excluding peduncle; "
402	2011. WRA Specialist. Personal Communication.	[Allelopathic?] Unknown.

403	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.eFloras.org ; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Parasitic? No] Orchidaceae (not parasitic genus)
404	2011. WRA Specialist. Personal Communication.	[Unpalatable to grazing animals?] Unknown.
405	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Toxic to animals? No] No evidence.
405	2011. National Center for Biotechnology Information. PubMed. U.S. National Library of Medicine, Bethesda, Maryland http://www.ncbi.nlm.nih.gov/	[Toxic to animals? No] No evidence.
406	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Host for recognized pests and pathogens?] "Occurrence of pests depends on the region. Pests include slugs and snails, which are common in many forests and ecosystems with support trees. These pests feed on the tender shoots, floral buds, young beans, and roots of vanilla vines. They have been reported from Africa, the South Pacific, India, and are likely to occur everywhere in moist environments. Insects such as the Lamellicron beetle (<i>Hoplia retusa</i>) and the ashy-gray weevil (<i>Cratopus retuse</i>) produce holes in flowers, preventing bean formation. The sucking bug (<i>Halyomorpha</i> sp.) infests young shoots and floral buds and kills them (Anandaraj et al. 2005). Scales and thrips can also cause damage. However, most insects can be controlled with appropriate insecticides, with availability varying by country." "Six viruses have been reported for vanilla, although not all are severe. Both <i>Cymbidium</i> mosaic virus (CyMV) and <i>Odontoglossum</i> ring spot virus (ORSV) are common on ornamental orchids in many parts of the world." Cucumber mosaic virus, <i>Vanilla</i> mosaic virus. Fungal diseases include: <i>Fusarium</i> spp., <i>Colletrichum</i> spp., <i>Sclerotium</i> sp., <i>Phytophthora</i> spp.
407	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Causes allergies or is otherwise toxic to humans?] Wagstaff mentions several studies where there is contact dermatitis.
407	2011. Dave's Garden. PlantFiles: vanilla orchid (<i>Vanilla planifolia</i>). Dave's Garden, http://davesgarden.com/guides/pf/go/1214/	[Causes allergies or is otherwise toxic to humans?] Handling plant may cause skin irritation or allergic reaction.
407	2011. National Center for Biotechnology Information. PubMed. U.S. National Library of Medicine, Bethesda, Maryland http://www.ncbi.nlm.nih.gov/	[Causes allergies or is otherwise toxic to humans?] No evidence of toxicity in PubMed.
407	2011. WRA Specialist. Personal Communication.	[Causes allergies or is otherwise toxic to humans?] Major spice crop with limited documentation of allergies.
408	2010. Sasikumar, B.. <i>Vanilla</i> breeding - a review. <i>Agricultural Reviews</i> . 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Creates a fire hazard in natural ecosystems? No] Succulent vine.
409	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Is a shade tolerant plant at some stage of its life cycle? Yes] A shady growing environment is required.
409	2011. Dave's Garden. PlantFiles: vanilla orchid (<i>Vanilla planifolia</i>). Dave's Garden, http://davesgarden.com/guides/pf/go/1214/	[Is a shade tolerant plant at some stage of its life cycle? Yes] Full shade.

410	1998. Dian, L./La, C./Shumei, T./Jixing, L.. Study on soil conditions for high-yielding vanilla (<i>Vanilla planifolia</i>). Chinese Journal of Tropical Crops. 1: . http://en.cnki.com.cn/Article_en/CJFDTOTAL-RDZX199801004.htm	[Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island? No] "Soil physicochemical property was studied by way of investigation and analysis of soil conditions of vanilla (<i>Vanilla planifolia</i>) plantations managed different1y in Hainanas well as of pot experiments involving soil acidity, moisture content and mu1ch. The results found the main soil conditions for consistently high yielding vanilla as follows. Vanilla was highly sensitive to soil acidity. Vanilla grew well between 6. 0 to 7.0,theoptimum being 6. 5;pH below 5. 5 of over 7. 0 restrained vanilla from growth, low hiving much greater inhibition than high pH. Vanilla responded well in growth and nutrient uptake on the acid soil applied with lime."
410	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island? No] "In the forest or field, vanilla grows in well drained, loose organic matter. Vanilla plants do not tolerate standing, stagnant, or waterlogged or compacted soils."
410	2011. Dave's Garden. PlantFiles: vanilla orchid (<i>Vanilla planifolia</i>). Dave's Garden, http://davesgarden.com/guides/pf/go/1214/	[Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island? No] Soil pH requirements: 6.6 to 7.5 (neutral)
411	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.eFloras.org; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Climbing or smothering growth habit? Yes] Vine.
412	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.eFloras.org; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Forms dense thickets? No] Vine.
501	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.eFloras.org; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Aquatic? No] Terrestrial; vine.
502	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.eFloras.org; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Grass? No] Orchidaceae.
503	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.eFloras.org; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Nitrogen fixing woody plant? No] Orchidaceae; vine
504	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.eFloras.org; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers) No] No underground storage organs.
601	1985. Ames, O./Correll, D.S.. Orchids of Guatemala and Belize. Courier Dover Publications, http://books.google.com/books?id=zZUCHb9-5UsC&pg=PA57&dq=vanilla+planifolia+%2B+%22soil%22&hl=en&ei=HSInTs_qFo-isQO1xqmGCQ&sa=X&oi=book_result&ct=result&resnum=2&v	Evidence of substantial reproductive failure in native habitat? No] "Rooted in soil and climbing on trees in swamps, wet thickets, savannahs and mixed forests, up to 600 meters alt. Rather common in the lowlands from southern Florida and Mexico through Central America to northern South America and the West Indies."

602	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. <i>Genetic Resources Crop Evolution</i> . 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Produces viable seeds? Yes] "Seeds produced by vanilla rarely germinate. They have an undifferentiated embryo, little reserve matter, very hard and waxy teguments containing germination inhibitors."
602	2010. Sasikumar, B.. Vanilla breeding - a review. <i>Agricultural Reviews</i> . 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Produces viable seeds? Yes] "Vanilla, though sets seed, is conventionally propagated using cuttings."
602	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Produces viable seeds? Yes] Fresh vanilla fruits have viable seed.
603	2010. Sasikumar, B.. Vanilla breeding - a review. <i>Agricultural Reviews</i> . 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Hybridizes naturally?] "Lubinsky also hypothesized the spontaneous occurrence of hybrids between the sympatric species such as <i>V. planifolia</i> , <i>V. pompona</i> etc. Nelsen and Seigismund(1999)too suggested the possibility of natural hybridization of <i>Vanilla</i> spp. of the Caribbean Islands. Interspecific hybrid between <i>V. planifolia</i> x <i>V. aphylla</i> is reported from India too."
604	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. <i>Genetic Resources Crop Evolution</i> . 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Self-compatible or apomictic]? Yes] "Vanilla <i>planifolia</i> possesses a mixed reproductive system in which the real proportion of self-compatible and self-incompatible individuals is still unknown."
604	2010. Sasikumar, B.. Vanilla breeding - a review. <i>Agricultural Reviews</i> . 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Self-compatible or apomictic]? Yes] "even though the floral biology basically favours allogamy, Soto Arenas (1999) could find very low cross pollination rate and very low observed heterozygosity in <i>V. planifolia</i> , making him to conclude that the dominant breeding behaviour is autogamy. However, based on the works reported, it appears that <i>Vanilla planifolia</i> can be better included under the group 'often cross pollinated species' of plants."
605	2003. Ackerman, J.D.. Flora of North America volume 26 - <i>Vanilla planifolia</i> . www.efloras.org ; Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242102047	[Requires specialist pollinators? Yes] "Pollinators are euglossine bees which do not occur in Florida. Natural pollination has been recorded in Florida, although very rarely."
605	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. <i>Genetic Resources Crop Evolution</i> . 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Requires specialist pollinators?] "Moreover, in Reunion Island, rare natural pollination events are reported on high flowers, such flowers being often visited by the bird <i>Zosterops</i> (<i>Zosteropidae</i>) or by ants (<i>P. Fontaine, Jardin des Parfums et des Epices, pers. com.</i>). Interestingly, <i>Zosterops</i> was recently shown to be involved in the pollination of an <i>Angraecoid</i> Orchid in Reunion Island (Micheneau et al. 2006). In Madagascar, Delassus (1960) also describes seeds germinating in the wild, but seedlings rarely reach adult age. Although it is clear, according to these arguments, that sexual recombination is expected to be a rare phenomenon in the areas of introduction, it is important to keep in mind that a single sexual reproduction event is able to generate numerous genotypes that can be vegetatively propagated rapidly."
605	2008. Bory, S./Lubinsky, P./Risterucci, A./Noyer, J./Grisoni, M./Duval, M./Besse, P.. Patterns of introduction and diversification of <i>Vanilla planifolia</i> (<i>Orchidaceae</i>) in Reunion Island (Indian Ocean). <i>American Journal of Botany</i> . 95: 805-815. http://www.amj	[Requires specialist pollinators? Yes] The only true sources of natural vanilla are the cured fruits of two obligatorily hand-pollinated and clonally propagated orchids: ' Bourbon/ Mexican vanilla ' [<i>Vanilla planifolia</i> G. Jackson, syn. <i>V. fragrans</i> (Salisb.) Ames] and ' Tahitian vanilla ' (<i>V. tahitensis</i> J. W. Moore).
605	2010. Sasikumar, B.. Vanilla breeding - a review. <i>Agricultural Reviews</i> . 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Requires specialist pollinators? Yes] "Bees of the genus <i>Melipona</i> , humming birds, <i>Euglossa viridisima</i> , <i>Eulaema</i> spp. etc. are considered to be pollinators of vanilla."

605	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Requires specialist pollinators? Yes] A <i>Melipona</i> bee is the only insect known to pollinate vanilla flowers in Mexico. In Hawai'i and other areas of the Pacific where <i>Melipona</i> are absent, a few beans sometimes form on vines high in trees, suggesting that other insects or organisms pollinate vanilla flowers, but at a very low rate.
606	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. Genetic Resources Crop Evolution. 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Reproduction by vegetative fragmentation?] "Vegetative propagation ultimately remains the predominant reproduction mode in <i>Vanilla</i> . It naturally occurs from stem cuttings. In natural conditions, one individual of <i>V. planifolia</i> can cover very large areas, up to 0.2 ha, although not very densely."
606	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Reproduction by vegetative fragmentation?] <i>Vanilla</i> is usually propagated from stem cuttings. The size of the cuttings is dependent upon the amount of plant material that is available. Each node will make a new plant but generally at least two or four nodes are used per cutting. The cuttings are planted in containers kept in a moist, shady environment. New shoots grow from the nodes in 2–3 months. Establishment is faster for longer cuttings. If 2–3 m vine sections are used, plants will flower in less than 2 years.
607	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. Genetic Resources Crop Evolution. 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Minimum generative time (years)? 2+] "Sexual reproduction is rarely observed in natural conditions. Natural reproduction of <i>V. planifolia</i> in Puerto Rico was observed for less than 1% of the flowers. Similar rates (between 1 and 3%) were reported in Central America. And even lower rates were reported in Mexico (1 fruit for 100–1,000 flowers)."
607	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Minimum generative time (years)? 2+] Flowers form on mature vines after at least 2 years of growth. " <i>Vanilla</i> is usually propagated from stem cuttings. The size of the cuttings is dependent upon the amount of plant material that is available. Each node will make a new plant but generally at least two or four nodes are used per cutting. The cuttings are planted in containers kept in a moist, shady environment. New shoots grow from the nodes in 2–3 months. Establishment is faster for longer cuttings. If 2–3 m vine sections are used, plants will flower in less than 2 years."
701	2011. WRA Specialist. Personal Communication.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)?] Unknown [possibly in agricultural situations, new plants are produced from nodes]
702	2007. Raj, N.M./Peter, K.V./Nybe, E.V.. Spices: volume 5 horticultural science series. New India Publishing, http://books.google.com/books?id=HHs6ANrJ-MEC&dq=vanilla+planifolia&source=gbs_navlinks_s	[Propagules dispersed intentionally by people? Yes] " <i>Vanilla</i> is one of the most expensive spices traded in the global market. It accounts for 0.75% of the total world trade on spices. Major vanilla growing countries are: Madagascar, Indonesia, India, Mexico, Comoros and Reunion:
702	2010. Sasikumar, B.. <i>Vanilla</i> breeding - a review. Agricultural Reviews. 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Propagules dispersed intentionally by people? Yes] " <i>Vanilla</i> (<i>Vanilla planifolia</i> Andrews) with the sobriquet 'Prince of Spices' is the only orchid spice. It is a perennial succulent vine trailed on trees or other standards. <i>Vanilla</i> accounts for about 0.75 percent world import of spices in volume and in terms of value its share is six to seven percent of nearly 1500 million US\$ of global spice trade (<i>Vanilla</i> Status Paper, Spices Board, Kochi, India, 2003). The major vanilla producing countries are India, Indonesia, Madagascar, Mexico, Reunion Islands and the Comoros besides the other countries such as China, Guadeloupe, French Polynesia, Fiji, Malawi, Tonga, Uganda, Zimbawe."
702	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Propagules dispersed intentionally by people? Yes] "Tom Kadooka, a pioneer in commercial vanilla cultivation in Hawai'i, shows his propagation benches in Kainaliu, Hawai'i."
703	2011. WRA Specialist. Personal Communication.	[Propagules likely to disperse as a produce contaminant? No] No evidence.
704	2010. Sasikumar, B.. <i>Vanilla</i> breeding - a review. Agricultural Reviews. 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Propagules adapted to wind dispersal? Yes] " <i>Vanilla</i> pods contain many minute black, globose seeds. Seeds of vanilla could be dispersed by air or water or even by bats. It is even proposed that <i>V. planifolia</i> seeds could be dispersed by birds as the passing of the seeds through the intestinal gut helps quick germination."

705	2010. Sasikumar, B.. Vanilla breeding - a review. Agricultural Reviews. 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Propagules water dispersed? Yes] "Vanilla pods contain many minute black, globose seeds. Seeds of vanilla could be dispersed by air or water or even by bats It is even proposed that <i>V. planifolia</i> seeds could be dispersed by birds as the passing of the seeds through the intestinal gut helps quick germination."
706	2010. Sasikumar, B.. Vanilla breeding - a review. Agricultural Reviews. 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Propagules bird dispersed?] "Vanilla pods contain many minute black, globose seeds. Seeds of vanilla could be dispersed by air or water or even by bats It is even proposed that <i>V. planifolia</i> seeds could be dispersed by birds as the passing of the seeds through the intestinal gut helps quick germination."
707	2010. Sasikumar, B.. Vanilla breeding - a review. Agricultural Reviews. 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Propagules dispersed by other animals (externally)? No] "Vanilla pods contain many minute black, globose seeds. Seeds of vanilla could be dispersed by air or water or even by bats It is even proposed that <i>V. planifolia</i> seeds could be dispersed by birds as the passing of the seeds through the intestinal gut helps quick germination."
708	2010. Sasikumar, B.. Vanilla breeding - a review. Agricultural Reviews. 31: 139-144. http://220.227.138.214:8080/dspace/bitstream/123456789/645/1/Vanilla+Breeding.pdf	[Propagules survive passage through the gut?] "Vanilla pods contain many minute black, globose seeds. Seeds of vanilla could be dispersed by air or water or even by bats It is even proposed that <i>V. planifolia</i> seeds could be dispersed by birds as the passing of the seeds through the intestinal gut helps quick germination."
801	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. Genetic Resources Crop Evolution. 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Prolific seed production (>1000/m2)? Yes] "Seeds produced by vanilla rarely germinate. They have an undifferentiated embryo, little reserve matter, very hard and waxy teguments containing germination inhibitors."
801	2011 (revised). Uchida, J.Y.. Farm and forestry production marketing profile for vanilla (<i>Vanilla planifolia</i>) in: specialty crops for Pacific Island Agroforestry. Permanent Agriculture Resources, Holualoa http://www.agroforestry.net/scps/Vanilla_specialty	[Prolific seed production (>1000/m2)? Yes] "The fruit is a long capsule, which is known as a "bean" and when mature contains thousands of tiny black, round seeds."
802	2008. Bory, S./Grisoni, M./Duval, M./Besse, P.. Biodiversity and preservation of vanilla: present state of knowledge. Genetic Resources Crop Evolution. 55: 551-571. http://www.springerlink.com/content/p1k3k0288m4v0513/fulltext.pdf	[Evidence that a persistent propagule bank is formed (>1 yr)?] "Seeds produced by vanilla rarely germinate. They have an undifferentiated embryo, little reserve matter, very hard and waxy teguments containing germination inhibitors."
802	2011. WRA Specialist. Personal Communication.	[Evidence that a persistent propagule bank is formed (>1 yr)?] Unknown.
803	2011. WRA Specialist. Personal Communication.	[Well controlled by herbicides?] Unknown.
804	2011. WRA Specialist. Personal Communication.	[Tolerates, or benefits from, mutilation, cultivation, or fire?] Unknown. [possibly, does create new plants from each node]
805	2011. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)?] Unknown.