

<b>Taxon:</b> <i>Eugenia stipitata</i> McVaugh	<b>Family:</b> Myrtaceae
<b>Common Name(s):</b> araçá-boi araza	<b>Synonym(s):</b> <i>Eugenia stipitata</i> subsp. <i>stipitata</i>

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 11 Apr 2016
<b>WRA Score:</b> 0.0	<b>Designation:</b> L	<b>Rating:</b> Low Risk

**Keywords:** Tropical Tree, Unarmed, Shade-Tolerant, Edible Fruit, Zoochorous

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	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	y=1, n=0	n
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)	y=1, n=0	n
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m <sup>2</sup> )	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides	y=-1, n=1	y
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
	Hernando Bermejo, J.E. & Leon, J. (eds.). (1994). <i>Neglected Crops: 1492 from a Different Perspective</i> . FAO, Rome, Italy	"The species is still in the full process of domestication. The two institutions which have worked most on this fruit are INIAP's experimental station of San Roque in Iquitos, Peru, and INPA in Manaus, Brazil."
	Duarte, O., & Paull, R. (2015). <i>Exotic fruits and nuts of the New World</i> . CABI, Wallingford, UK	[One ssp. may be domesticated] "Araza ( <i>Eugenia stipitata</i> McVaugh), also known as Arazá-buey in Peru and Araca-boi in Brazil, is a relatively new fruit. It has potential as a fruit crop because it is very precocious, can produce on very poor soils, and the fruit, though acid in taste, has an appealing flavor and has a very good potential for processing. According to McVaugh (1956, 1958) there are two subspecies: one is ssp. <i>stipitata</i> , which is a larger tree (12–15 m) with large leaf blades (3.5– 9.5 by 8–18 cm), 100–150 stamens and 70–180 g fruit; the other is ssp. <i>sororia</i> , which is almost a shrub (2–4 m) with dense foliage, abundant branches, smaller leaves (2.5–4.5 by 6.5–13 cm), 75 stamens, fruit that range from 150 to 300 g, sometimes up to 800 g, and is found in lower Ucayali, Huallaga and Marañón river basins. Chávez and Clement (1984) suggest that the ssp. <i>sororia</i> is a domesticated form of ssp. <i>stipitata</i> ." ... "Araza originated and was domesticated by the native peoples in the Peruvian part of the Amazon basin close to Brazil, mainly in the lower Ucayali River basin. In the last 30–40 years some research has been done and the plant has been distributed to Amazonian and subtropical areas of Brazil, Ecuador, Colombia, Bolivia and Central America (Gentil and Clement, 1996). Outside the region it is still fairly unknown. It is commercially produced in Brazil, Colombia, Ecuador, Peru and Costa Rica. The lack of market information is probably the major reason that araza production has not expanded more rapidly."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	NA

Qsn #	Question	Answer
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, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 11 Apr 2016]	"Native: Southern America Western South America: Colombia - Putumayo; Ecuador - Napo; Peru - Loreto, - Ucayali"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 11 Apr 2016]	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Araza prefers the hot humid tropics at altitudes below 700–800 m and wild populations are found below 400 m. In its area of origin, the average temperature ranges from 25 to 28°C (Gentil and Clement, 1996). The minimum average temperature for growth is 18°C and the maximum 30°C. Below 17°C, growth stops and resumes when temperatures rise. It does not tolerate frost."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 11 Apr 2016]	"Native: Southern America Western South America: Colombia - Putumayo; Ecuador - Napo; Peru - Loreto, - Ucayali"

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	Notes
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. <a href="http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/">http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/</a> . [Accessed 11 Apr 2016]	" <i>Eugenia stipitata</i> McVaugh Locations: Waimea Arboretum & Botanical Garden"
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"In the last 30–40 years some research has been done and the plant has been distributed to Amazonian and subtropical areas of Brazil, Ecuador, Colombia, Bolivia and Central America (Gentil and Clement, 1996). Outside the region it is still fairly unknown."

Qsn #	Question	Answer
	Guézou, A., Trueman, M., Buddenhagen, C. E., Chamorro, S., Guerrero, A. M., Pozo, P., & Atkinson, R. (2010). An extensive alien plant inventory from the inhabited areas of Galapagos. PLoS One, 5(4), e10276	<i>Eugenia stipitata</i> - Cu) Cultivated (introduced for cultivation, not naturalized)

301	Naturalized beyond native range	n
	Source(s)	Notes
	Guézou, A., Trueman, M., Buddenhagen, C. E., Chamorro, S., Guerrero, A. M., Pozo, P., & Atkinson, R. (2010). An extensive alien plant inventory from the inhabited areas of Galapagos. PLoS One, 5(4), e10276	<i>Eugenia stipitata</i> - Cu) Cultivated (introduced for cultivation, not naturalized)
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
	Wagner, W.L., Herbst, D.R. & Lorence, D.H. 2016. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. <a href="http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/index.htm">http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/index.htm</a> . [Accessed 11 Apr 2016]	No evidence

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	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. 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. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

305	Congeneric weed	y
	Source(s)	Notes
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	" <i>Eugenia uniflora</i> : forms dense thickets that displace native plants and prevents their regeneration"

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	[No evidence] "Tree Araza is a small tree or large bush that can go from 3 to 5 m in height (Donadio et al., 2002). Branching starts close to the ground with smooth hairless branches. The canopy is rounded. Leaves are simple, opposite, sub-sessile, green in color, slightly pubescent or smooth, and elliptical in form, 8–12 cm long and 3–6 cm wide (Fig. 3.4). Veins are prominent only on the underside (Vargas et al., 1999)."

402	Allelopathic	
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Intercrops can also be used such as cassava, rice, cowpea, pineapple or other annuals during the first 2 years."

403	Parasitic	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Araza is a small tree or large bush that can go from 3 to 5 m in height (Donadio et al., 2002)." [Myrtaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown. No information found on palatability of foliage, only fruit

405	Toxic to animals	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"Bats are the pollen vectors and the main dispersal agents of the trees in their natural habitat. Other birds and mammals also disperse the fruit."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes

Qsn #	Question	Answer
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"According to Villachica et al. (1996) rust caused by <i>Puccinia psidii</i> can be a problem in certain areas of Brazil and Costa Rica. In Honduras, a progressive death of branches occurs and the causal agent seems to be a soil-borne fungus (Vargas et al., 1999). Fernández-Trujillo et al. (2011) mention several postharvest fungus problems including anthracnose ( <i>Cylindrocladium scoparium</i> ) that causes fruit rot and is difficult to control. <i>Curvularia</i> sp. is another necrotrophic fungus that is present mainly after harvest and is difficult to control." ... "Fruit flies, especially <i>Anastrepha obliqua</i> and <i>A. striata</i> , can be a serious problem. The Mediterranean fruit fly ( <i>Ceratitis capitata</i> ) has been detected in Costa Rica. McPhail traps should be used to capture flies and infested fruit should be picked up and buried at least 50 cm deep. A Curculionidae beetle ( <i>Atractomerus inmigrans</i> ) attacks araza seeds and can damage the pulp; the female lays eggs in green fruit and the larvae penetrate the seed, consume it and pupate there, making control difficult. <i>Plectrophoroides impressicollis</i> is a weevil that feeds on young foliage and flowers during the day and is favored by the planting of green manure crops where it hides, so these crops should be avoided if this pest is present (Couturier et al., 1997). <i>Trigona branneri</i> stingless wasps feed on the peel, pulp and sometimes the seeds, causing damage (Villachica et al., 1996). In young plants, leaf cutting ants ( <i>Atta</i> ) can be a problem."
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"Susceptibility to anthracnose is a main production drawback."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	[No evidence] "Araza pulp is very acidic and aromatic with a good content of vitamins A, B1, C, calcium, phosphorus and magnesium (Table 3.3). The peel constitutes about 8% of the fruit, the seeds about 22% and the rest is pulp (~70%). Araza's juiciness, acidity and very attractive flavor make it an excellent juice. The juice also has great potential for flavoring ice cream, sherbets and yogurt. The pulp is mainly used for making jams or jellies since it has a good content of pectic acid. Araza jams are very tasty and the addition of 90% sugar and 12% pectin of the total pulp weight is recommended. The pulp can be stored frozen, though at -12°C ascorbic acid and total carotenoids decline with storage (Andrade and Caldas, 1996). Dried pulp is also possible to prepare using artificial drying. A final potential use is the extraction of aroma from the fruit rind, since when fully ripe it has a delightful penetrating aroma. The extraction of these essential oils and other components might yield a new aroma for the perfume and cosmetic industry (Gentil and Clement, 1996)."
	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

Qsn #	Question	Answer
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	[Occurs in wet habitat that is unlikely to be fire prone] "In the wild it occurs in areas with an annual rainfall of 1,700–3,200 mm, but it can grow in the Atlantic coast of Costa Rica with almost 4,000 mm or in places with 1,500 mm rain. It tolerates moderate drought and will also grow with irrigation in areas with little rainfall or in arid zones such as the Peruvian coast."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Somarriba, E., Beer, J. & Muschler, R. (1999). Agroforestry with perennial crops: research ideas and methodologies. Pp. 157-160 in Multi - Strata Agroforestry Systems with Perennial Crops. Turrialba, Costa Rica, February 22-27, 1999.	"Research with perennial crops also included studies of <i>Eugenia stipitata</i> (Myrtaceae). a shade-tolerant, Amazonian fruit tree under the shade of either <i>C. alliodora</i> or <i>Acacia mangium</i> ."
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"The plant prefers sunny locations for best performance. Apparently there is no photoperiodic influence as it flowers and produces fruit under various day lengths."
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	[In dense forest. Possibly shade tolerant] " <i>E. stipitata</i> is a species of the dense, humid, tropical high forest."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed ]	"Soil type: Well drained rich loamy soils but will tolerate poorer clay oxisols, provided they are well drained. It tolerates acid soil stress."
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"The plant prefers well-drained loamy soils, rich in nutrients and organic matter. It tolerates well-drained poor clayey oxisols and ultisols or very poor and acid soils. It responds well to nitrogen applications under poor soil conditions. It also adapts well to soils with high aluminum saturation."

411	Climbing or smothering growth habit	n
	Source(s)	Notes



Qsn #	Question	Answer
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Araza is a small tree or large bush that can go from 3 to 5 m in height (Donadio et al., 2002). Branching starts close to the ground with smooth hairless branches. The canopy is rounded. Leaves are simple, opposite, sub-sessile, green in color, slightly pubescent or smooth, and elliptical in form, 8–12 cm long and 3–6 cm wide (Fig. 3.4). Veins are prominent only on the underside (Vargas et al., 1999)."

412	Forms dense thickets	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	" <i>E. stipitata</i> is a species of the dense, humid, tropical high forest." [In dense forest, but no descriptions of its occurrence in or formation of dense stands]
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	[No evidence] "The species appears to have its origin in the extreme west of the Amazon basin, perhaps in the Peruvian Amazon. It is only found in the western Amazon and does not appear to have been widely spread by the indians although some of the best varieties appear to have been selected by the Peruvian indians in Iquitos."

501	Aquatic	n
	Source(s)	Notes
	FAO. 1986. Food and fruit-bearing forest species 3: Examples from Latin America. FAO Forestry Paper, 44(3). Food & Agriculture Organization of the United Nations, Rome	[Terrestrial Tree] " <i>Eugenia stipitata</i> prefers well-drained, rich, loamy soils but will tolerate poorer clay oxisols, provided they are well drained, of the dense, humid, tropic high forest."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 11 Apr 2016]	"Family: Myrtaceae Subfamily: Myrtoideae Tribe: Myrteae"

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 11 Apr 2016]	"Family: Myrtaceae Subfamily: Myrtoideae Tribe: Myrteae"

Qsn #	Question	Answer
504	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Araza is a small tree or large bush that can go from 3 to 5 m in height (Donadio et al., 2002)."
601	<b>Evidence of substantial reproductive failure in native habitat</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	[No evidence] "Araza originated and was domesticated by the native peoples in the Peruvian part of the Amazon basin close to Brazil, mainly in the lower Ucayali River basin. In the last 30–40 years some research has been done and the plant has been distributed to Amazonian and subtropical areas of Brazil, Ecuador, Colombia, Bolivia and Central America (Gentil and Clement, 1996). Outside the region it is still fairly unknown."
602	<b>Produces viable seed</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Seed from highly productive plants is the most used propagation method."
603	<b>Hybridizes naturally</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. 2016. Personal Communication	Unknown
604	<b>Self-compatible or apomictic</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"E. stipitata is a hermaphrodite with the characteristics of male sterility, polyembryony and polyploidy. Pollen should be stored in dry conditions for only several days. The reproductive strategy is allogamous, with 2-5 years for each reproductive cycle."
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Self-pollination is possible, but most pollination is dependent on insects such as honey bees ( <i>Apis mellifera</i> ) and other bees ( <i>Eulaema bombiformis</i> , <i>Eulaema mocsaru</i> , <i>Melipona lateralis</i> , <i>Melipona pseudocentris</i> and <i>Megalopta</i> sp.) (Villachica et al., 1996)."

Qsn #	Question	Answer
605	Requires specialist pollinators	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Self-pollination is possible, but most pollination is dependent on insects such as honey bees ( <i>Apis mellifera</i> ) and other bees ( <i>Eulaema bombiformis</i> , <i>Eulaema mocsaru</i> , <i>Melipona lateralis</i> , <i>Melipona pseudocentris</i> and <i>Megalopta</i> sp.) (Villachica et al., 1996)."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Cleft grafting has been tried in Brazil, using seedlings as rootstocks, and flowering occurred 8–12 months after transplanting. This offers little advantage over seeds that start fruiting in 11– 12 months. Grafting has the advantages of retaining the characteristics of superior material."

607	Minimum generative time (years)	2
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"Cleft grafting has been tried in Brazil, using seedlings as rootstocks, and flowering occurred 8–12 months after transplanting. This offers little advantage over seeds that start fruiting in 11– 12 months. Grafting has the advantages of retaining the characteristics of superior material." ... "Fruit harvest can start after 18 months, and fruit yield become significant in the third year and plateau by the fifth year."
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"Well-fertilized seedlings can start to fruit after 18 months in the field."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"Fruit an oblate or spherical berry, 2-10 x 2-12 cm, weighing 50-750 g, light green at first, turning pale or orange yellow when ripe, soft, with a thin, velvety skin enclosing a juicy, thick pulp that accounts for as much as 60% of the fresh fruit. There are approximately 12 seeds in each fruit." [No evidence. Fruits & seeds lack means of external attachment]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Fruit Lover's Seed Co. 2016. Tropical Fruit Seed List. <a href="http://www.fruitlovers.com/seedlistUSA.html">http://www.fruitlovers.com/seedlistUSA.html</a> . [Accessed 11 Apr 2016]	Seeds sold online

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"Fruit an oblate or spherical berry, 2-10 x 2-12 cm, weighing 50-750 g, light green at first, turning pale or orange yellow when ripe, soft, with a thin, velvety skin enclosing a juicy, thick pulp that accounts for as much as 60% of the fresh fruit. There are approximately 12 seeds in each fruit." [No evidence, and fairly large seeds unlikely to become a contaminant of produce]

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). Exotic fruits and nuts of the New World. CABI, Wallingford, UK	"The fruit is a round or oval berry 2–12 cm wide by 2–10 cm, slightly compressed at the poles (Fig. 3.4). Fruit weight can vary from 50 to 600 g (Cavalcante, 1974). The immature fruit is a dull green and turns yellow then yellow-orange as it ripens. The peel is very thin and can be smooth or velvety to the touch. The pulp is acid, very aromatic and soft when ripe. It contains 1–20 seeds, with an average of ~10. The seeds are 1–3 cm long and slightly compressed and seed weight varies from 0.7 to 4.3 g (Villachica et al., 1996). The largest seeds are similar to cocoa beans and have a moisture content of around 50% when the fruit matures."

705	Propagules water dispersed	n
	Source(s)	Notes
	Link, A. & Stevenson, P.R. (2004). Fruit dispersal syndromes in animal disseminated plants at Tinigua National Park, Colombia. <i>Revista Chilena de Historia Natural</i> 77: 319-334	"Animal dispersed plant species in Tinigua National Park, that were included in the analyses of dispersal syndromes." [Includes <i>Eugenia stipitata</i> ]
	Hernando Bermejo, J.E. & Leon, J. (eds.). (1994). <i>Neglected Crops: 1492 from a Different Perspective</i> . FAO, Rome, Italy	"Most of the wild populations are found on old, non-floodable terraces in tropical, white, highly leached podzolic soils..."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R., & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"Bats are the pollen vectors and the main dispersal agents of the trees in their natural habitat. Other birds and mammals also disperse the fruit."

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Orwa C., Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestry Database: a tree reference and selection guide version 4.0. <a href="http://www.worldagroforestry.org">http://www.worldagroforestry.org</a> . [Accessed 11 Apr 2016]	"Fruit an oblate or spherical berry, 2-10 x 2-12 cm, weighing 50-750 g, light green at first, turning pale or orange yellow when ripe, soft, with a thin, velvety skin enclosing a juicy, thick pulp that accounts for as much as 60% of the fresh fruit. There are approximately 12 seeds in each fruit." [No evidence of external transport by animals, and no means of external attachment]

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Link, A. & Stevenson, P.R. (2004). Fruit dispersal syndromes in animal disseminated plants at Tinigua National Park, Colombia. <i>Revista Chilena de Historia Natural</i> 77: 319-334	"Animal dispersed plant species in Tinigua National Park, that were included in the analyses of dispersal syndromes." [Includes <i>Eugenia stipitata</i> ]
	Doughty, C. E., Wolf, A., Morueta-Holme, N., Jørgensen, P. M., Sandel, B., Violle, C., Boyle, B., Kraft, N. J. B., Peet, R. K., Enquist, B. J., Svenning, J.-C., Blake, S. and Galetti, M. (2016), Megafauna extinction, tree species range reduction, and carbon storage in Amazonian forests. <i>Ecography</i> , 39: 194–203	"SI Table 3 – Full species list used to calculate table 1 and figure 1 for animal dispersed species, megafauna dispersed species, and wind or water dispersed species." [Megafauna dispersed species includes <i>Eugenia stipitata</i> . Presumably ingested & could be dispersed by feral pigs in the Hawaiian Islands]

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Hernando Bermejo, J.E. & Leon, J. (eds.). (1994). <i>Neglected Crops: 1492 from a Different Perspective</i> . FAO, Rome, Italy	"The fruit is a subspherical berry, reaching 12 cm in diameter and weighing 750 g when ripe; the flesh is yellow and thin; the skin is shiny, velvety and yellow, with few seeds which are oblong and measure up to 2.5 cm."
	Duarte, O., & Paull, R. (2015). <i>Exotic fruits and nuts of the New World</i> . CABI, Wallingford, UK	"Up to 1,770 flowers per plant have been reported of which only 2.3% set fruit in Peru (Villachica et al., 1996), while another study indicated 25% (Gentil and Clement, 1996)." [Unlikely. Low fruit set, & fruit & seeds relatively large]

Qsn #	Question	Answer
802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes
	Lima, M.de J.V.Jr., Hong, T. D., Arruda, Y. M. B. C., Mendes, A. M. S., & Ellis, R. H. (2014). Classification of seed storage behaviour of 67 Amazonian tree species. <i>Seed Science and Technology</i> , 42(3), 363-392	"Table 3. Summary of seed drying and storage data with probable seed storage behaviour of 67 tree species from Amazonia: O (orthodox), I (intermediate), R (recalcitrant) (mc = moisture content)." [ <i>Eugenia stipitata</i> - Seed storage behavior = R (recalcitrant)]
	Duarte, O., & Paull, R. (2015). <i>Exotic fruits and nuts of the New World</i> . CABI, Wallingford, UK	"The seeds are recalcitrant and drying seeds for 5 days in the shade reduces germination from 100% to 70% (Gentil and Clement, 1996). Seeds should be extracted from mature sound fruit, cleaned and washed to remove the pulp remaining around them and then immediately planted." ... "Superficially dried seeds can be stored up to 2 months in a moist medium or in a closed plastic bag above 15°C (Villachica et al., 1996). Germination can take from 1.5 to 4 months and be completed after 9 months."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Langeland, K.A.& Stocker, R.K. 2001. Control of Non-native Plants in Natural Areas of Florida. SP 242. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL	"For seedlings and small plants up to 1/2 inch diameter, use a basal bark treatment with 10% Garlon 4. This species takes a long time to die, and may require a subsequent herbicide application. For larger stems, use a cut-stump treatment with either 50% Garlon 3A or 10% Garlon 4" [information is for control of the invasive <i>Eugenia uniflora</i> , and should therefore work on <i>E. stipitata</i> ]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). <i>Exotic fruits and nuts of the New World</i> . CABI, Wallingford, UK	"The trees should be pruned in the nursery to leave a single stem. After transplanting, formation pruning should promote the formation of three or four main branches. Normal pruning involves the elimination of damaged or diseased material as well as branches growing in the wrong direction or in a wrong position."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Duarte, O., & Paull, R. (2015). <i>Exotic fruits and nuts of the New World</i> . CABI, Wallingford, UK	"According to Villachica et al. (1996) rust caused by <i>Puccinia psidii</i> can be a problem in certain areas of Brazil and Costa Rica." [ <i>P. psidii</i> widespread in Hawaii, but impacts on <i>E. stipitata</i> unknown]

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Thrives in tropical climates
- Other *Eugenia* species are invasive
- Shade tolerant
- Reproduces by seeds
- Self-compatible, but primarily outcrossing
- Reaches maturity in 18 months
- Seeds dispersed by bats, birds & intentionally by people

## Low Risk Traits

- No reports of invasiveness or naturalization, but limited evidence of widespread introduction outside native range
- Unarmed (no spines, thorns or burrs)
- Non-toxic
- Edible fruit
- Not reported to spread vegetatively
- Seeds recalcitrant & unlikely to form a persistent seed bank