

Family: *Malvaceae*

Taxon: *Durio zibethinus*

Synonym: NA

Common Name: Durian
Stinkfrucht
Durião
durión

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation: L
Status:	Assessor Approved	Data Entry Person:	Chuck Chimera	WRA Score -2
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	?
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	n
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	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
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		y=1, n=0	y

411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	y
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	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	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	
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: L

WRA Score -2

Supporting Data:

101	2009. Bumrungsri, S./Sripaoraya, E./Chongsiri, T./Sridith, K./Racey, P.A.. The Pollination Ecology of Durian (<i>Durio zibethinus</i> , Bombacaceae) in Southern Thailand. <i>Journal of Tropical Ecology</i> . 25(1): 85-92.	[Is the species highly domesticated? No] "Durian (<i>Durio zibethinus</i> L.) is one of the most popular and economically important fruit crops in South East Asia." ... "Durio zibethinus was introduced to Thailand more than 300 y ago (Brown 1997, Subhadrabandhu & Ketsa 2001) and it is hardly surprising therefore that at least 200 cultivars, resulting from human selection, have been reported in Thailand (Hiranpradit et al. 1992). Some of these (e.g. 'Mon Thong', 'Chanee', 'Kan Yaw', 'Kradum Thong') are more popular than others and are grown commercially in large plantations." ... "Semi-wild durian trees are robust, and resist drought and fungal infection much better than commercial varieties." [Certain cultivars may be highly domesticated, but this assessment refers to the "wild" type]
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	2005. Staples, G.W./Herbst, D.R.. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Species suited to tropical or subtropical climate(s) 2-High] "Durian is perhaps native to Sumatra and Borneo, but it is so widely naturalized and cultivated in Asia for its edible fruit that its origins are uncertain. Today durian is grown in Sri Lanka, southern India, Myanmar, Thailand, Indochina, Malaysia, Indonesia, New Guinea, and the Philippines, but has not become popular outside Asia."
202	2005. Staples, G.W./Herbst, D.R.. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Quality of climate match data 2-High] "Durian is perhaps native to Sumatra and Borneo, but it is so widely naturalized and cultivated in Asia for its edible fruit that its origins are uncertain. Today durian is grown in Sri Lanka, southern India, Myanmar, Thailand, Indochina, Malaysia, Indonesia, New Guinea, and the Philippines, but has not become popular outside Asia."
203	1987. Morton, J.F.. <i>Fruits of warm climates</i> . J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/index.html	[Broad climate suitability (environmental versatility)? No] "The durian is ultra-tropical and cannot be grown above an altitude of 2,000 ft (600 m) in Ceylon; 2,300 ft (700 m) in the Philippines, 2,600 ft (800 m) in Malaysia. The tree needs abundant rainfall. In India, it flourishes on the banks of streams, where the roots can reach water."
203	2005. CAB International. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? No] "- Altitude range: 0 - 900 m - Mean annual rainfall: 2000 - 4000 mm - Rainfall regime: bimodal; uniform - Dry season duration: 0 - 5 months - Mean annual temperature: 25 - 27°C - Mean maximum temperature of hottest month: 26 - 34°C - Mean minimum temperature of coldest month: 21 - 30°C - Absolute minimum temperature: > 15°C"
203	2008. Janick, J./Paull, R.E.. <i>The encyclopedia of fruit & nuts</i> . Cabi Publishing, Wallingford, UK	[Broad climate suitability (environmental versatility)? No] "The ideal temperature range for durian growth is 27-30°C, with a relative humidity of 75-80%. Growth is limited below a mean monthly temperature of 22°C, though flowering and fruiting appear to be more prolific. Temperatures below 10°C cause premature leaf abscission, while temperatures of 46°C can be tolerated."
203	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. <i>Agroforestry Database: a tree reference and selection guide version 4.0</i> . World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Broad climate suitability (environmental versatility)? No] "Durian is strictly tropical; it grows successfully near the equator, and up to 18 deg from the equator in Thailand and Australia. At these extreme latitudes, extension growth comes to a halt during coolest months. It needs well-distributed rainfall, but a relatively dry spell stimulates and synchronizes flowering."
204	2005. Staples, G.W./Herbst, D.R.. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Durian is perhaps native to Sumatra and Borneo, but it is so widely naturalized and cultivated in Asia for its edible fruit that its origins are uncertain. Today durian is grown in Sri Lanka, southern India, Myanmar, Thailand, Indochina, Malaysia, Indonesia, New Guinea, and the Philippines, but has not become popular outside Asia."
204	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. <i>Agroforestry Database: a tree reference and selection guide version 4.0</i> . World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Native or naturalized in regions with tropical or subtropical climates? No] "Native: Indonesia, Malaysia. Exotic: Australia, Cambodia, Dominica, India, Myanmar, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Zanzibar"

205	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Uncertain (?)] "Durian is perhaps native to Sumatra and Borneo, but it is so widely naturalized and cultivated in Asia for its edible fruit that its origins are uncertain. Today durian is grown in Sri Lanka, southern India, Myanmar, Thailand, Indochina, Malaysia, Indonesia, New Guinea, and the Philippines, but has not become popular outside Asia."
301	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Naturalized beyond native range? Probably Yes] "Durian is perhaps native to Sumatra and Borneo, but it is so widely naturalized and cultivated in Asia for its edible fruit that its origins are uncertain." [Likely naturalized, although area of origin uncertain]
301	2007. McCormack, G.. Cook Islands Biodiversity Database, Version 2007.2.. Cook Islands Natural Heritage Trust, Rarotonga http://cookislands.bishopmuseum.org	[Naturalized beyond native range? Not in Cook Islands] "COOK ISLANDS STATUS: Introduced - Recent, Not naturalised; Land, lowlands"
301	2007. Randall, R.P.. Global Compendium of Weeds - <i>Durio zibethinus</i> [Online Database]. http://www.hear.org/gcw/species/durio_zibethinus/	[Naturalized beyond native range? Yes] "Flora List for Pohnpei from Christopher Dahl (File creation date 15 Nov 1997) College of Micronesia-FSM Botany 250 (naturalised) "
301	2009. Chong, K.Y./Tan, H.T.W./Corlett, R.T.. A Checklist of the Total Vascular Plant Flora of Singapore: Native, Naturalized and Cultivated Species. Raffles Museum of Biodiversity Research, National University of Singapore, Singapore	[Naturalized beyond native range? Possibly] " <i>Durio zibethinus</i> L.; Malvaceae; casual"
302	2007. Randall, R.P.. Global Compendium of Weeds - <i>Durio zibethinus</i> [Online Database]. http://www.hear.org/gcw/species/durio_zibethinus/	[Garden/amenity/disturbance weed? No] No evidence
303	2007. Randall, R.P.. Global Compendium of Weeds - <i>Durio zibethinus</i> [Online Database]. http://www.hear.org/gcw/species/durio_zibethinus/	[Agricultural/forestry/horticultural weed? No] No evidence
304	2007. Randall, R.P.. Global Compendium of Weeds - <i>Durio zibethinus</i> [Online Database]. http://www.hear.org/gcw/species/durio_zibethinus/	[Environmental weed? No] No evidence
305	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. http://www.hear.org/gcw/	[Congeneric weed? No] NO evidence
401	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Produces spines, thorns or burrs? No] " <i>Durio zibethinus</i> is a medium to large buttressed tree, up to 45 m tall in dense lowland forests and 10-15 m in orchards and backyards; bark dark red brown, peeling off irregularly." ... "Fruit varies greatly in size; 15-25 cm in diameter, green to yellowish brown, with spines that are variable in length and shape." [Fruits are spiny, however]
402	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Allelopathic? No] "Intercropping with cocoa could improve productivity through several aspects of the cropping system, such as provision of shade." [No evidence, and unlikely as durian is cultivated with other trees]
403	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Parasitic? No] " <i>Durio zibethinus</i> is a medium to large buttressed tree, up to 45 m tall in dense lowland forests and 10-15 m in orchards and backyards;"
404	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Unpalatable to grazing animals? Unknown] "Animals involved in the propagation of <i>D. zibethinus</i> include civet cat, elephant, tiger, deer, rhinoceros and monkeys. They are attracted by the durian scent and may ingest the seeds while feeding on the arils, thereby dispersing them." [Fruit are palatable, but no information found on leaf palatability]
405	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Toxic to animals? No] "Animals involved in the propagation of <i>D. zibethinus</i> include civet cat, elephant, tiger, deer, rhinoceros and monkeys. They are attracted by the durian scent and may ingest the seeds while feeding on the arils, thereby dispersing them." [No evidence]

406	1987. Morton, J.F.. Fruits of warm climates. J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/index.html	[Host for recognized pests and pathogens? Potentially] "Minor pests in the Philippines are the white mealybug (<i>Pseudococcus lilacinus</i>) and the giant mealybug (<i>Drosicha townsendi</i>) which infest young and developing fruits. Very few diseases have been reported. In West Malaysia, patch canker caused by <i>Phytophthora palmivora</i> was first noted in 1934. It is becoming increasingly common on roots and stems of durian seedlings. Infection in the field begins at the collar with oozing of brownish-red gum and extends up the trunk and down to the roots. Sometimes a tree is completely girdled at the base and dies. Testing of 13 clones showed that all but 2 were susceptible. The 2 resistant clones succumbed after the stems were wounded and inoculated. It is evident that pruning injuries have provided access for the organism. The disease is encouraged by close-planting which shades the soil and promotes dampness. Weeds, grass and mulch around the collar are also contributing factors. Budded trees are particularly susceptible because of their habit of putting forth low branches and the occurrence of cracks where these join the main stem. When these low branches are pruned, the wound must be immediately treated with a fungicide."
406	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Host for recognized pests and pathogens? Potentially] "Pests and diseases: Pests include scale insects, leaf eating caterpillars and beetles, and trunk and branch borers. Two nematode pests, <i>Helicotylenchus</i> spp. and <i>Radopholus</i> spp., have also been reported. In poorly drained soils, root rot or patch canker, caused by <i>Phytophthora palmivora</i> and <i>Pythium complectens</i> , can quickly kill trees shortly after the 1st symptoms appear. Associated with <i>Pythium</i> are secondary fungi such as <i>Diplodia</i> spp. And <i>Fusarium</i> spp. <i>Corticium salmonicolor</i> causes pink disease; <i>Phyllosticta durionis</i> , and <i>Homostegia durionis</i> cause black and brown leaf spots. Leaves also suffer severe damage due to <i>Colletotrichum zibethinus</i> and <i>C. durionis</i> . Die-back of buddings is associated with <i>Diplodia</i> spp. and <i>Phomopsis</i> spp. Cultural practices, rather than deployment of resistant varieties, have historically tackled these disease problems. The younger trees, which are somewhat resistant, have often been used as rootstock to in-arch older, diseased trees."
407	2002. Olivieri, J./Quilquini-Chambard, A.-M./Hauser, C.. Allergy to durian. <i>Allergy</i> . 57: 263.	[Causes allergies or is otherwise toxic to humans? Unlikely, but possible in susceptible individuals] "Tropical fruits are part of the natural diet in countries in which these fruits are indigenous, and are now more frequently consumed in industrialized countries. We report a case of food anaphylaxis in a 47- year-old female of Thai origin." ... "The last episode appeared 30 min after ingestion of durian, a tropical fruit." ... "To our knowledge this is the first description of an allergic food anaphylaxis related to this tropical fruit."
407	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Causes allergies or is otherwise toxic to humans? No] "D. zibethinus is well known for its fruit, which is much relished in South-East Asia. The fruits are globose, ovoid or ellipsoid approximately 25 x 20 cm, and covered with sharp spines (Verheij and Coronel, 1991). The highly flavoured, often considered pungent arils around the seeds are eaten fresh or used for flavouring ice creams and cakes, or fermented. The boiled and roasted seeds are also eaten." [No evidence, despite human utilization]
408	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Creates a fire hazard in natural ecosystems? No] No evidence
408	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Creates a fire hazard in natural ecosystems? No] No evidence
409	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Young trees benefit from 30-50% shade until they are 1 m high, at which time they should be gradually introduced to full sun."
410	2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK	[Tolerates a wide range of soil conditions? Yes] "Deep, well-drained sandy clay or clay loam soils are best suited for this species (Subhadrabandhu and Ketsa, 2001). Poor drainage in heavy soils can induce <i>Phytophthora</i> root rot."
411	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Climbing or smothering growth habit? No] "D. zibethinus is a large tree up to 40 m in height, with dark red-brown bark and dark red heart wood (Verheij and Coronel, 1991)."

412	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Forms dense thickets? No] "Durian is strictly tropical; it grows successfully near the equator, and up to 18 deg from the equator in Thailand and Australia. At these extreme latitudes, extension growth comes to a halt during coolest months. It needs well-distributed rainfall, but a relatively dry spell stimulates and synchronizes flowering." [No evidence]
501	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Aquatic? No] "Durio zibethinus is a medium to large buttressed tree, up to 45 m tall in dense lowland forests and 10-15 m in orchards and backyards;"
502	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Grass? No] "Malvaceae subfamily: Helicteroideae tribe: Durioneae. Also placed in: Bombacaceae Durionaceae "
503	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Nitrogen fixing woody plant? No] "Malvaceae subfamily: Helicteroideae tribe: Durioneae. Also placed in: Bombacaceae Durionaceae "
504	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database:a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Durio zibethinus is a medium to large buttressed tree, up to 45 m tall in dense lowland forests and 10-15 m in orchards and backyards; bark dark red brown, peeling off irregularly."
601	2004. Paz-Alberto, A.M./Tamayo-Galves, C.. Handbook on Trees. Rex Book Store, Inc., Quezon City, Philippines	[Evidence of substantial reproductive failure in native habitat? No] "Wild trees are depleted due to logging and kaingin-making and other human activities. Commercial varieties under cultivation." [Reproductive failure due to over-harvesting and habitat destruction]
602	2009. Bumrungsri, S./Sripaoraya, E./Chongsiri, T./Sridith, K./Racey, P.A.. The Pollination Ecology of Durian (<i>Durio zibethinus</i> , Bombacaceae) in Southern Thailand. <i>Journal of Tropical Ecology</i> . 25(1): 85-92.	[Produces viable seed? Yes] "...seed-planted semi-wild durian has been grown traditionally for household consumption in southern Thailand, Malaysia and Indonesia."
603	1999. Somsri, S./Kengkad, P./Detpitayanant, V.. Interspecific hybridization of durian. <i>Thai Agricultural Research Journal</i> . 17(3): 294-302.	[Hybridizes naturally? Potentially] "Investigation of interspecific hybridization of Durian was conducted at Chanthaburi Horticultural Research Center during February 1988-February 1992. Hybridization between the cultivars and the other species of Durian were done with 805 flowers from 25 crosses during 1988-1991. Mostly, all crosses had low percentage of fruit setting except some crosses such as the Durio zibethinus via Chanee crossed with Durio mansoni via charian and the Durio mansoni via charian crossed with Durio zibethinus via Monthong, Kradumthong, Kanyao and Kob Pikulthong which some pollinated fruits could develop until harvesting. For 1992, 963 flowers from 20 crosses were crossed and found that the hybrid fruits from the Durio mansoni via charian crossed with Durio zibethinus via Chanee, Kanyao, Monthong, Kradumthong, and Kob Pikulthong and the Durio kutejensis crossed with Durio zibethinus via Kanyao could develop until harvesting. These F1 hybrid seeds were planted to produce F1 hybrid plants."

603	2002. Somsri, S./Khaegkad, P.. Comparisons of Durian Fruit Quality Between F1 Hybrid Plants and Their Parents. <i>Acta Horticulturae</i> (ISHS). 575: 313-322.	[Hybridizes naturally? Unknown] "A Durian Breeding program was conducted in Thailand at the Chanthaburi Horticultural Research Center, by making 55 crosses, between 1986-1990. 7,634 F1 durian hybrid seedlings were produced. 2,743 F1 hybrids were planted in the field and 330 F1 hybrids have been grafted on bearing trees, to hasten flowering. Currently, some of them started bearing and were evaluated for fruit quality. Fruit quality measurements of 774 F1 fruits and their parents were carried out, using twenty-two different characteristics to compare these F1 hybrids with their parents. It was found that there were substantial differences. Five characteristics viz. fruit weight, flesh thickness, percentage of flesh per fruit, eating quality (taste, aroma and texture) and percentage of aborted seeds are considered to be important to durian fruit quality and instrumental in the selection of F1 hybrids. Eating quality was poorly correlated with fruit weight and flesh thickness. Flesh thickness and percentage of flesh per fruit were positively correlated with fruit weight. Percentage of aborted seeds was rather poorly correlated with fruit weight. Eighteen of forty one promising F1 plants have been selected as superior F1 plants, on the basis that they produced good taste, had a fruit weight 2.4-4.5 kg, a flesh thickness of more than 0.70 cm, percentage of flesh per fruit more than 20 and percentage of aborted seeds more than 15. Another seven F1 plants were also selected as they showed good eating quality but a percentage of aborted seed of less than 15 or a percentage of flesh per fruit of less than 20. These F1 superior plants would be considered worthy of propagation by vegetative means and by selfing, to produce F2 plants for further selection." [Refers to hybrid cultivars. Unknown if natural hybridization occurs]
604	2000. Yumoto, T.. Bird-Pollination of Three Durio Species (Bombacaceae) in a Tropical Rainforest in Sarawak, Malaysia. <i>American Journal of Botany</i> . 87(8): 1181-1188.	[Self-compatible or apomictic? NO] "Pollen limitation or resource limitation All Durio species in this study were self incompatible. The cultivated durian, <i>D. zibethinus</i> , is usually self-incompatible (Yaacob and Subhad-rabandhu, 1995), and wild durian, <i>D. griffithii</i> in Peninsular Malaysia is also reported as self incompatible (Ha et al., 1988)."
604	2009. Bumrungsri, S./Sripaoraya, E./Chongsiri, T./Sridith, K./Racey, P.A.. The Pollination Ecology of Durian (<i>Durio zibethinus</i> , Bombacaceae) in Southern Thailand. <i>Journal of Tropical Ecology</i> . 25(1): 85-92.	[Self-compatible or apomictic? No] "Very low pollination success in facilitated autogamy suggests that most durian trees are highly self incompatible."
605	2009. Bumrungsri, S./Sripaoraya, E./Chongsiri, T./Sridith, K./Racey, P.A.. The Pollination Ecology of Durian (<i>Durio zibethinus</i> , Bombacaceae) in Southern Thailand. <i>Journal of Tropical Ecology</i> . 25(1): 85-92.	[Requires specialist pollinators? Yes] "Fruit bats, especially <i>Eonycteris spelaea</i> , are the major pollinators of this durian although the giant honey bee (<i>Apis dorsata</i>) was the most frequent visitor to the flowers. Bats visited durian flowers at the rate of 26.1 (SD=20.7) visits per inflorescence per night. Since this semi-wild durian depends on fruit bats as its pollinator, protecting fruit bat populations and their roosts is vital for the production of the durian fruit crop."
606	1987. Morton, J.F.. Fruits of warm climates. J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/index.html	[Reproduction by vegetative fragmentation? No] "They have been successfully shipped to tropical America packed in a barely moist mixture of coconut husk fiber and charcoal. Ideally, they should be planted fresh, flat side down, and they will then germinate in 3 to 8 days. Seeds washed, dried for 1 or 2 days and planted have shown 77-80% germination. It is reported that, in some countries, seedling durian trees have borne fruit at 5 years of age. In India, generally, they come into bearing 9 to 12 years after planting, but in South India they will not produce fruit until they are 13 to 21 years old. In Malaya, seedlings will bloom in 7 years; grafted trees in 4 years or earlier. Neither air-layers nor cuttings will root satisfactorily. Inarching can be accomplished with 50% success but is not a popular method because the grafts must be left on the trees for many months. Selected cultivars are propagated by patch-budding (a modified Forkert method) onto rootstocks 2 months old and pencil-thick, and the union should be permanent within 25 to 30 days. The plants can be set out in the field within 14 to 16 months. Grafted trees never grow as tall as seedlings; they are usually between 26 to 32 ft (8-10 m) tall; rarely 40 ft (12 m)."
607	2009. Bumrungsri, S./Sripaoraya, E./Chongsiri, T./Sridith, K./Racey, P.A.. The Pollination Ecology of Durian (<i>Durio zibethinus</i> , Bombacaceae) in Southern Thailand. <i>Journal of Tropical Ecology</i> . 25(1): 85-92.	[Minimum generative time (years)? 8+] "Generally, trees begin to flower when they are about 8 y old."
607	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. <i>Agroforestry Database: a tree reference and selection guide version 4.0</i> . World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Minimum generative time (years)? 7+] "Durian fruits in 7-8 years under orchard conditions."

701	2008. Nakashima, Y./Lagan, P./Kitayama, K.. A Study of Fruit–Frugivore Interactions in Two Species of Durian (<i>Durio</i> , Bombacaceae) in Sabah, Malaysia. <i>Biotropica</i> . 40(2): 255–258.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "In contrast, <i>D. zibethinus</i> has an ellipsoid green husk, 13.2 ± 3.1 cm long and 10.0 ± 3.3 cm wide (N = 20), which opens after the fruits have fallen. The seeds, 3.9 ± 0.3 cm long and 2.6 ± 0.2 cm wide (N = 30), are surrounded by a white aril that is sweet tasting with a strong odor. The number of seeds per fruit is 5.5 ± 3.2 (N = 20)." [Fruits and seeds too large for inadvertent dispersal]
702	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules dispersed intentionally by people? Yes] "it is grown to a limited extent in Hawaii."
703	2008. Nakashima, Y./Lagan, P./Kitayama, K.. A Study of Fruit–Frugivore Interactions in Two Species of Durian (<i>Durio</i> , Bombacaceae) in Sabah, Malaysia. <i>Biotropica</i> . 40(2): 255–258.	[Propagules likely to disperse as a produce contaminant? No] "In contrast, <i>D. zibethinus</i> has an ellipsoid green husk, 13.2 ± 3.1 cm long and 10.0 ± 3.3 cm wide (N = 20), which opens after the fruits have fallen. The seeds, 3.9 ± 0.3 cm long and 2.6 ± 0.2 cm wide (N = 30), are surrounded by a white aril that is sweet tasting with a strong odor. The number of seeds per fruit is 5.5 ± 3.2 (N = 20)." [Fruits and seeds too large for inadvertent dispersal]
704	2008. Nakashima, Y./Lagan, P./Kitayama, K.. A Study of Fruit–Frugivore Interactions in Two Species of Durian (<i>Durio</i> , Bombacaceae) in Sabah, Malaysia. <i>Biotropica</i> . 40(2): 255–258.	[Propagules adapted to wind dispersal? No] "We determined the fruit predators and seed dispersers of two species of durian (<i>Durio</i> , Bombacaceae), <i>D. graveolens</i> and <i>D. zibethinus</i> , which have contrasting aril color and timing of dehiscence by observing fruiting trees in Deramakot forest reserve. In our observations in the wild, both species were extensively predated by orangutans before fruits matured. <i>Durio graveolens</i> was dispersed by black hornbills and <i>D. zibethinus</i> was dispersed by long-tailed macaques."
705	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules water dispersed? No] "Animals involved in the propagation of <i>D. zibethinus</i> include civet cat, elephant, tiger, deer, rhinoceros and monkeys. They are attracted by the durian scent and may ingest the seeds while feeding on the arils, thereby dispersing them."
706	2008. Nakashima, Y./Lagan, P./Kitayama, K.. A Study of Fruit–Frugivore Interactions in Two Species of Durian (<i>Durio</i> , Bombacaceae) in Sabah, Malaysia. <i>Biotropica</i> . 40(2): 255–258.	[Propagules bird dispersed? No] " <i>Durio zibethinus</i> was thought to be dispersed by elephants (Rutten 1939), bears (Ridley 1894), and even tigers (Ridley 1894), while the <i>Durio</i> species with small red arils were considered to be dispersed by hornbills (Ridley 1894). Nyffeler and Baum (2001) suggested two major dispersal syndromes within the genus <i>Durio</i> involving either birds (fruits opening on the trees; aril red/yellow and odorless) or terrestrial mammals (fruits opening only after falling to the ground; aril pale colored and pungent)." [Mammal dispersed after fruit fall to ground]
707	2008. Nakashima, Y./Lagan, P./Kitayama, K.. A Study of Fruit–Frugivore Interactions in Two Species of Durian (<i>Durio</i> , Bombacaceae) in Sabah, Malaysia. <i>Biotropica</i> . 40(2): 255–258.	[Propagules dispersed by other animals (externally)? Yes, but not for long distances, and seeds more often depredated] "Long-tailed macaques visited when the fruits were already dehisced on the ground. They cleaned arils in front of the mouth and then dropped the seeds. They sometimes carried the fruits > 10 m by hand. We found seed and husk discarded 23 m from the mother tree (transporting the fruit for the first 18 m). Thus, these macaques do transport seeds beyond the crown of a mother tree although this behavior may be rare. The <i>D. zibethinus</i> seeds were mainly predated by orangutans and dispersed by long-tailed macaques." ... "Our results suggest that both <i>Durio</i> species studied face difficulties with seed dispersal due to high predation pressure, especially by orangutans, and limited occurrence of alternative dispersal agents. The low density of wild <i>Durio</i> may be in part caused by high predation pressure. Our study did not reveal the main seed dispersers of <i>D. zibethinus</i> , but it is clear that the two <i>Durio</i> species are dispersed by different animals: <i>D. graveolens</i> by hornbills and <i>D. zibethinus</i> by macaques and large terrestrial mammals."
708	2008. Nakashima, Y./Lagan, P./Kitayama, K.. A Study of Fruit–Frugivore Interactions in Two Species of Durian (<i>Durio</i> , Bombacaceae) in Sabah, Malaysia. <i>Biotropica</i> . 40(2): 255–258.	[Propagules survive passage through the gut? No] "one individual at Sandakan Crocodile Farm in Sabah swallowed and excreted the intact <i>D. zibethinus</i> seeds. These results suggest that seed handling strategies differ among and/or within individuals. In the wild, the Asian elephant <i>E. maximus borneensis</i> can probably also disperse seeds of <i>D. zibethinus</i> . A captive elephant (which was originally wild), was observed to trample the <i>D. zibethinus</i> fruit and roll it on the ground to cover the thorns with leaves; the fruit was then swallowed whole and the husk and intact seeds passed through the digestive system (H. Matsubayashi, pers. comm.)." [Seeds more often depredated]
708	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Propagules survive passage through the gut? Yes] "Animals involved in the propagation of <i>D. zibethinus</i> include civet cat, elephant, tiger, deer, rhinoceros and monkeys. They are attracted by the durian scent and may ingest the seeds while feeding on the arils, thereby dispersing them."

708	2011. Campos-Arceiz, A./Traeholt, C./Jaffar, R./Santamaria, L./Corlett, R.T.. Asian Tapirs Are No Elephants When It Comes To Seed Dispersal. <i>Biotropica</i> . doi: 10.1111/j.1744-7429.2011.00784.x: .	[Propagules survive passage through the gut? Possibly not with tapirs] "The species with large seeds (durian, chempedak, tamarind) showed high germination probabilities (58–89%) for noningested controls but failed to germinate when defecated by tapirs."
801	2008. Nakashima, Y./Lagan, P./Kitayama, K.. A Study of Fruit–Frugivore Interactions in Two Species of Durian (<i>Durio</i> , <i>Bombacaceae</i>) in Sabah, Malaysia. <i>Biotropica</i> . 40(2): 255–258.	[Prolific seed production (>1000/m ²)? No] " <i>D. zibethinus</i> has an ellipsoid green husk, 13.2 ± 3.1 cm long and 10.0 ± 3.3 cm wide (N = 20), which opens after the fruits have fallen. The seeds, 3.9 ± 0.3 cm long and 2.6 ± 0.2 cm wide (N = 30), are surrounded by a white aril that is sweet tasting with a strong odor. The number of seeds per fruit is 5.5 ± 3.2 (N = 20)." [No evidence, and unlikely given large fruit with relatively few seeds]
802	1981. Henty, E.E. (ed.). <i>Handbooks of the Flora of Papua New Guinea. Volume II</i> . Melbourne University Press, Carlton South, Australia	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "The seeds lose viability very quickly"
802	1987. Morton, J.F.. <i>Fruits of warm climates</i> . J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/index.html	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "Durian seeds lose viability quickly, especially if exposed even briefly to sunlight. Even in cool storage they can be kept only 7 days. Viability can be maintained for as long as 32 days if the seeds are surface-sterilized and placed in air-tight containers and held at 68° F (20° C)."
803	2012. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown] No information found on chemical control of or herbicide efficacy for this species.
804	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. <i>Agroforestry Database: a tree reference and selection guide version 4.0</i> . World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Tolerates, or benefits from, mutilation, cultivation, or fire? Unknown] "During the 1st years after planting, the trees are shaped by removing orthoropic limbs, including watershoots, and by thinning out plagiotropic laterals. Trees bear fruit best on limbs that are more or less horizontal; upright limbs contribute more to tree size and height. Pruning dominant upright laterals to maintain 1 central leader is essential." [No evidence on whether durian tolerates heavy pruning]
805	2012. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]