

<b>Taxon:</b> <i>Alpinia galanga</i> (L.) Willd.	<b>Family:</b> Zingiberaceae
<b>Common Name(s):</b> false galangal greater galanga languas Siamese-ginger Thai ginger	<b>Synonym(s):</b> Languas galanga (L.) Stuntz Maranta galanga L.

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 16 Jun 2016
<b>WRA Score:</b> 5.0	<b>Designation:</b> L	<b>Rating:</b> Low Risk

**Keywords:** Rhizomatous, Naturalized, Edible, Self-Compatible, Pollinator-Limited

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)	Low
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	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	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
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		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
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	y
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
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		
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m <sup>2</sup> )	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

**Supporting Data:**

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 14 Jun 2016]	[No evidence of domestication, but a long history of cultivation] "Original and geographic distribution The exact origin of galanga is unknown; the oldest reports about its use and existence come from southern China and Java. At present it is cultivated in all South-East Asian countries and in India, Bangladesh, China and Surinam."
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
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
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [India, Indonesia, Malaysia, Myan-mar, Thailand, Vietnam]."
202	Quality of climate match data	Low
	Source(s)	Notes
	Staples, G. & Kristiansen, M.S. 1999. Ethnic culinary herbs: a guide to identification and cultivation in Hawaii. University of Hawaii Press, Honolulu, HI	"The precise natural distribution for galanga is unknown as it has been cultivated since ancient times. It is now widely distributed in India, Myanmar, Southeast Asia, Malaysia, and Indonesia."
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Forests, scrub, grasslands; 100–1300 m."
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	"In the tropics, galanga occurs up to 1200 m altitude." [Elevation range exceeds 1000 m, demonstrating environmental versatility]

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Staples, G. & Kristiansen, M.S. 1999. Ethnic culinary herbs: a guide to identification and cultivation in Hawaii. University of Hawaii Press, Honolulu, HI	"The precise natural distribution for galanga is unknown as it has been cultivated since ancient times. It is now widely distributed in India, Myanmar, Southeast Asia, Malaysia, and Indonesia."
205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"now widely cultivated in Southeast Asia as a spice and medicinal." ... "introduced to Hawaii by Southeast Asian immigrants and can frequently be seen in community garden plots."
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	"The exact origin of galanga is unknown; the oldest reports about its use and existence come from southern China and Java. At present it is cultivated in all South-East Asian countries and in India, Bangladesh, China and Surinam."
301	Naturalized beyond native range	y
	Source(s)	Notes
	Wu, S. H., Hsieh, C. F., & Rejmánek, M. (2004). Catalogue of the naturalized flora of Taiwan. <i>Taiwania</i> , 49(1), 16-31	"Table 1. List of naturalized species." [Includes <i>Alpinia galangal</i> . First record from 1896]
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

Qsn #	Question	Answer
	Source(s)	Notes
	CABI, 2016. <i>Alpinia zerumbet</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	" <i>A. zerumbet</i> is listed as an “environmental weed” and “cultivation escape” in the Global Compendium of Weeds (Randall, 2012). The species forms dense thickets and can reproduce through rhizome fragmentation or by seed, producing as many as 1000 seeds per square foot (PIER, 2013). <i>A. zerumbet</i> is listed as a ‘potential transformer’ in South Africa, invading watercourses, forest margins, roadsides, and urban open space (Henderson, 2001). In Hawaii, it is generally an occasional escape from cultivation (Wagner et al., 1999) but invasive on Moloka’i and Maui Islands (Oppenheimer, 2008). <i>A. zerumbet</i> is listed as native to northeastern India, Burma (Myanmar), Indo-China, China and Japan, and has been actively cultivated as an ornamental across Southeast Asia and many tropical and subtropical countries (Ibrahim, 2001). It is considered a noxious weed in Cuba (Oviedo Prieto et al., 2012), and invasive in many Pacific countries including Fiji, French Polynesia, Palau, and New Caledonia (PIER, 2013). The Global Invasive Species Programme lists <i>A. zerumbet</i> as an invasive weed in South Africa (Macdonald et al., 2003)."
	Foxcroft, L. C., Richardson, D. M., & Wilson, J. R. 2008. Ornamental plants as invasive aliens: problems and solutions in Kruger National Park, South Africa. <i>Environmental Management</i> , 4 (1): 32-51	"Considerable effort was also invested in educating residents as to the damage caused by invasive alien species. This included some species present in these villages and not yet invasive in South Africa but invasive elsewhere in the world. Despite this, problems were still experienced when scheduling removal of established alien plants from gardens; especially well established or large plants that formed prominent features in gardens (e.g. <i>Alpinia zerumbet</i> [shell ginger],..."
	Randall, R.P. 2012. <i>A Global Compendium of Weeds</i> . 2nd Edition. Department of Agriculture and Food, Western Australia	A number of species are listed as naturalized, and a few are included in references of weeds

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Staples, G. & Kristiansen, M.S. 1999. <i>Ethnic culinary herbs: a guide to identification and cultivation in Hawaii</i> . University of Hawaii Press, Honolulu, HI	[No evidence] " <i>Deciduous</i> perennial herb 4-7 feet tall, proliferating from underground rhizomes. Stems with leaves in two ranks; blades oblong to lanceolate, 1~24 inches x 2-6 inches, minutely hairy on the underside or glabrous."

402	Allelopathic	
	Source(s)	Notes
	Xuan, T. D., & Teschke, R. (2015). Dihydro-5, 6-dehydrokavain (DDK) from <i>Alpinia zerumbet</i> : Its Isolation, Synthesis, and Characterization. <i>Molecules</i> , 20(9), 16306-16319	[Possibly] " <i>Kavalactones</i> have been identified in other <i>Alpinia</i> species such as <i>Alpinia kumatake</i> [37], <i>Alpinia galanga</i> [38,39], and <i>Alpinia oxyphyllae</i> [38–41]. However, DDK and DK coexist only in <i>Alpinia zerumbet</i> [18,19] and <i>Alpinia kumatake</i> [37], and not in <i>Alpinia galanga</i> and <i>Alpinia oxyphyllae</i> [39,40];" ... "It can be proposed that DDK and DK may play an important role in allelopathy of <i>alpinia</i> to suppress growth of other plants in its vicinity and expands its population in the plant ecosystem."

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Rhizomes tuberous. Pseudostems ca. 2 m. Ligule suborbicular, ca. 5 mm; petiole ca. 6 mm; leaf blade oblong or lanceolate, 25–35 × 6–10 cm, glabrous or abaxially pubescent, base attenuate, apex acute or acuminate." [Zingiberaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	[Palatable to humans. Unknown if consumed by browsing/grazing animals] "Uses Galanga is principally used as a spice. It has a strong pungent taste like a mixture of pepper ( <i>Piper nigrum</i> L.) and ginger ( <i>Zingiber officinale</i> Roscoe). Its rhizomes are very commonly used and said to be indispensable in everyday cooking throughout South Asia and South-East Asia. The flowers and young shoots are used as a vegetable or as a spice."

405	Toxic to animals	n
	Source(s)	Notes
	Qureshi, S., Shah, A. H., & Ageel, A. M. (1992). Toxicity studies on <i>Alpinia galanga</i> and <i>Curcuma longa</i> . <i>Planta Medica</i> , 58(2), 124-127	[No evidence of acute toxicity] "Acute (24 h) and chronic (90 days) oral toxicity studies on the ethanolic extracts of the rhizomes of <i>Alpinia galanga</i> and <i>Curcuma longa</i> were carried out in mice. Acute dosages were 0.5, 1.0, and 3 g/kg body weight while the chronic dosage was 100 mg/kg/day as the extract. All external morphological, hematological, and spermatogenic changes, in addition to body weight and vital organ weights were recorded. During this investigation no significant mortality as compared to the controls was observed. The weight gain in the <i>A. galanga</i> treated animals was significant as in the control group while the <i>C. longa</i> -treated animals gained no significant weight after chronic treatment. <i>C. longa</i> treatment induced significant changes in heart and lungs weights upon chronic treatment. Hematological studies revealed a significant rise in the RBC level of <i>A. galanga</i> -treated animals and a significant fall in the WBC and RBC levels of the <i>C. longa</i> treated animals as compared to the controls. The gain in weights of sexual organs and increased sperm motility and sperm counts were observed in both groups of extract-treated male mice, however, these changes were highly significant in the <i>A. galanga</i> -treated group. Both extracts failed to show any spermatotoxic effects. "
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

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

Qsn #	Question	Answer
	Staples, G. & Kristiansen, M.S. 1999. Ethnic culinary herbs: a guide to identification and cultivation in Hawaii. University of Hawaii Press, Honolulu, HI	"PESTS: None have been noticed."
	Missouri Botanical Garden. 2016. <i>Alpinia galanga</i> . <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=287591&amp;isprofile=0&amp;">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=287591&amp;isprofile=0&amp;</a> . [Accessed 14 Jun 2016]	"Problems No serious insect or disease problems. Fungal leaf spot and root rot. Spider mites may appear in dry weather."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"(Used in Ayurveda, Unani and Sidha. Rhizome antidiabetic, expectorant, antibacterial, digestive, hot, carminative, stimulant, fungicide, antioxidant, antiulcer, aphrodisiac, used for skin diseases, scabies, indigestion, colic, dysentery, enlarged spleen, ear pain, respiratory diseases, stomachache, for treatment of systemic infections and cholera; juice given in heart diseases; powder or decoction given in rheumatism, fever, bronchitis, catarrh; macerated rhizomes taken for leprosy, included in a preparation known as awas empas. Seed powder in gastrointestinal problems, diarrhea, vomiting. Veterinary medicine.)"
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	[No evidence] "Uses Galanga is principally used as a spice. It has a strong pungent taste like a mixture of pepper ( <i>Piper nigrum</i> L.) and ginger ( <i>Zingiber officinale</i> Roscoe). Its rhizomes are very commonly used and said to be indispensable in everyday cooking throughout South Asia and South-East Asia. The flowers and young shoots are used as a vegetable or as a spice. The rhizomes have a wide range of applications in traditional medicine, e.g. in skin diseases, indigestion, colic, dysentery, enlarged spleen, respiratory diseases, cancers of mouth and stomach, for treatment of systemic infections and cholera, as an expectorant, and after childbirth. The rhizomes have also been used as an aphrodisiac, for other stimulating properties and as a veterinary medicine. The rhizomes, the rhizome oleoresin ('root extract'), and the essential oil isolated from the rhizomes ('root oil') are used to flavour liqueurs, ice-cream, pastry, etc. An essential oil can also be isolated from the leaves, but it is not used. In the United States the regulatory status 'generally recognized as safe' has been accorded to galanga root (GRAS 2498), galanga root oleoresin (GRAS 2499) and galanga root oil (GRAS 2500). The fruits of galanga are used locally as a substitute for true cardamom ( <i>Elettaria cardamomum</i> (L.) Maton)."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	[No evidence. An herb of relatively wet habitats] "A robust, tillering, perennial herb, up to 3.5 m tall" ... "Galanga requires sunny or moderately shady locations. Soils should be fertile, moist but not swampy."

Qsn #	Question	Answer
409	<b>Is a shade tolerant plant at some stage of its life cycle</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. 2016. Edible Medicinal And Non-Medicinal Plants. Volume 12, Modified Stems, Roots, Bulbs. Springer, Dordrecht	"A shade-loving tropical plant. Its natural habitat is in forests, scrub or grasslands, from 100 to 1300 m altitude."
	Staples, G. & Kristiansen, M.S. 1999. Ethnic culinary herbs: a guide to identification and cultivation in Hawaii. University of Hawaii Press, Honolulu, HI	"Partial sunlight is suitable and protection from winds is essential."
	Globinmed. 2016. <i>Alpinia galanga</i> . <a href="http://www.globinmed.com/index.php?option=com_content&amp;view=article&amp;id=83489:lengkuas&amp;catid=799:l">http://www.globinmed.com/index.php?option=com_content&amp;view=article&amp;id=83489:lengkuas&amp;catid=799:l</a> . [Accessed 15 Jun 2016]	"The plants perform better in open areas with full sunlight."

410	<b>Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G. & Kristiansen, M.S. 1999. Ethnic culinary herbs: a guide to identification and cultivation in Hawaii. University of Hawaii Press, Honolulu, HI	"Plant in an organically rich, well-drained soil."
	Lim, T.K. 2016. Edible Medicinal And Non-Medicinal Plants. Volume 12, Modified Stems, Roots, Bulbs. Springer, Dordrecht	"prefers a rich, well-drained soil high in organic matter"
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	"Soils should be fertile, moist but not swampy. Sandy clayey soils rich in organic matter and with a good drainage are preferred."
	Globinmed. 2016. <i>Alpinia galanga</i> . <a href="http://www.globinmed.com/index.php?option=com_content&amp;view=article&amp;id=83489:lengkuas&amp;catid=799:l">http://www.globinmed.com/index.php?option=com_content&amp;view=article&amp;id=83489:lengkuas&amp;catid=799:l</a> . [Accessed 15 Jun 2016]	"The plant is very hard and is adaptable to various soil types from the lowland to the upland areas with temperatures ranging from 25-35°C."

411	<b>Climbing or smothering growth habit</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Rhizomes tuberous. Pseudostems ca. 2 m. Ligule suborbicular, ca. 5 mm; petiole ca. 6 mm; leaf blade oblong or lanceolate, 25–35 × 6–10 cm, glabrous or abaxially pubescent, base attenuate, apex acute or acuminate."

412	<b>Forms dense thickets</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G. & Kristiansen, M.S. 1999. Ethnic culinary herbs: a guide to identification and cultivation in Hawaii. University of Hawaii Press, Honolulu, HI	"Wild or semi-wild types occur in old clearings, thickets and forests." [Unknown if naturally occurring dense stands or thickets form]

501	<b>Aquatic</b>	<b>n</b>
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Terrestrial herb] "Forests, scrub, grasslands; 100–1300 m."

502	Grass	n
	<b>Source(s)</b>	<b>Notes</b>
	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 14 Jun 2016]	Family: Zingiberaceae Subfamily: Alpinioideae Tribe: Alpinieae

503	Nitrogen fixing woody plant	n
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Rhizomes tuberous. Pseudostems ca. 2 m. Ligule suborbicular, ca. 5 mm; petiole ca. 6 mm; leaf blade oblong or lanceolate, 25–35 × 6–10 cm, glabrous or abaxially pubescent, base attenuate, apex acute or acuminate." [Zingiberaceae]

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	<b>Source(s)</b>	<b>Notes</b>
	Lim, T.K. 2016. Edible Medicinal And Non-Medicinal Plants. Volume 12, Modified Stems, Roots, Bulbs. Springer, Dordrecht	"Alpinia galanga is a vigorous, tillering perennial herb with tuberous underground, much-branched rhizome..."
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly, 25(2): 56-74	"This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes" [Alpinia galangal is rhizomatous, and can likely can spread vegetatively]

601	Evidence of substantial reproductive failure in native habitat	n
	<b>Source(s)</b>	<b>Notes</b>
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. Alpinia galanga (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	[No evidence. Widespread] "The exact origin of galanga is unknown; the oldest reports about its use and existence come from southern China and Java. At present it is cultivated in all South-East Asian countries and in India, Bangladesh, China and Surinam."

602	Produces viable seed	y
	<b>Source(s)</b>	<b>Notes</b>
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Capsule brown or red when dry, oblong, slightly contracted at middle, 1–1.5 cm × ca. 7 mm, thin, glabrous. Seeds 3–6."

Qsn #	Question	Answer
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 14 Jun 2016]	"Flowering occurs after exceptionally dry weather. In India, plants start flowering in the latter half of the hot season (April-May) and seeds ripen in November. However, seeds rarely reach maturity."

603	Hybridizes naturally	
	Source(s)	Notes
	Liu, S. C., & Wang, J. C. (2009). New natural hybrid, <i>Alpinia</i> × <i>ilanensis</i> (Zingiberaceae) in Taiwan. <i>Taiwania</i> , 54 (2), 134-139	[Unknown. Hybridization documented in genus] "The genus <i>Alpinia</i> in Taiwan was very impressed by its frequent hybridization. Four out of 6 indigenous species in Taiwan proper have been reported to be involved in a reticulate hybridization. This paper describes and illustrates a new natural hybrid <i>A.</i> × <i>ilanensis</i> , putatively derived from <i>A. japonica</i> and <i>A. pricei</i> , which is supported by morphological and ecogeographical evidences. Based on sparse distribution mode and serious fertility reduction in these hybrid individuals, we suppose that the hybridization events between <i>A. japonica</i> and <i>A. pricei</i> have been independently occurred multiple times in field. This newly discovered hybrid reveals that all 6 independent species in this island possess the ability to cross each other."

604	Self-compatible or apomictic	Y
	Source(s)	Notes
	Yu-Wen, C. U. I., & Qing-Jun, L. I. (2015). Autonomous Self-pollination under Dominant Flexistylous Outcrossing Mechanism in <i>Alpinia galanga</i> (Zingiberaceae). <i>Plant Diversity</i> , 37(06) 793-800	"Here, we studied the breeding system of <i>Alpinia galanga</i> , the results show that (1) <i>Alpinia galanga</i> is self-compatible in which inbreeding depression occurs to some degree; (2) The anaflexistylous (ANA) morph of <i>Alpinia galanga</i> allocates more resource into outcrossing than the CATA morph; (3) The P/O ratio of the ANA morph is significantly lower than that of the CATA morph, as <i>Alpinia galanga</i> has constant six ovules in each ovary, the significant difference in P/O value reflects the contrast in pollen production." ... "In summary, autonomous self-pollination exists in <i>Alpinia galanga</i> , and while flexistylous functions to avoid unnecessary self-pollination and sexual interference, it also provides advantages for delayed autonomous self-pollination as a necessary reproductive assurance and preventing conflict among these three major features by controlling the time of autonomous self-pollination. This peculiar mechanism in <i>Alpinia galanga</i> thoroughly demonstrates its adaptation to unfavorable surrounding during the evolutionary process."

Qsn #	Question	Answer
	Li, Q. J., Kress, W. J., Xu, Z. F., Xia, Y. M., Zhang, L., Deng, X. B., & Gao, J. Y. (2002). Mating system and stigmatic behaviour during flowering of <i>Alpinia kwangsiensis</i> (Zingiberaceae). <i>Plant Systematics and Evolution</i> , 232(1-2), 123-132	[Apparently self-compatible, but with mechanisms to prevent selfing] "Fruit set was higher in controlled pollinations than in flowers visited by natural pollinators (Table 1), suggesting that pollination in <i>Alpinia kwangsiensis</i> is pollinator-limited (Holsinger 2000). In the controlled pollination treatments, fruit set in bagged plants was moderate, with fruit set in cataflexistyle plants higher than in anaflexistyle individuals. No fruit was set in inflorescences that had been bagged when the stigmas were at their receptive positions. Similar results were obtained in controlled experiments with a second flexistyle species <i>Alpinia galanga</i> (Li et al., unpublished data). Our results suggest that at least two species of the genus <i>Alpinia</i> that we have studied, and maybe others, are self-compatible and insect-pollinated (e.g. <i>Xylocopa magnifica</i> and <i>X. tenuiscapa</i> ), and that selfing appears to be prevented by flexistily."

605	Requires specialist pollinators	y
	Source(s)	Notes
	Kress, W. J., Liu, A. Z., Newman, M., & Li, Q. J. (2005). The molecular phylogeny of <i>Alpinia</i> (Zingiberaceae): a complex and polyphyletic genus of ginger. <i>American Journal of Botany</i> , 92(1), 167-178	"Although most alpinias are pollinated by large bees, some species attract birds and even bats as pollinators (Zhang et al., 2003; Kress and Specht, in press)."
	Li, Q. J., Kress, W. J., Xu, Z. F., Xia, Y. M., Zhang, L., Deng, X. B., & Gao, J. Y. (2002). Mating system and stigmatic behaviour during flowering of <i>Alpinia kwangsiensis</i> (Zingiberaceae). <i>Plant Systematics and Evolution</i> , 232(1-2), 123-132	[ <i>Alpinia galanga</i> has a similar mating system & is probably also pollinator limited] "The large flowers of <i>Alpinia kwangsiensis</i> attract many kinds of insects searching for nectar. However, successful pollination is only affected by large, solitary bees that contact both the anthers and stigmas. These bees, such as the carpenter bee <i>Xylocopa magnifica</i> (Figs. 3, 6) and <i>X. tenuiscapa</i> , apparently forage over long distances and visit the same plants repeatedly along a feeding route (i.e. trapline). Small bees, such as <i>Nomia yunnanensis</i> , and various types of flies frequently visit flowers, but are not successful pollinators due to their small body size." ... "Fruit set was higher in controlled pollinations than in flowers visited by natural pollinators (Table 1), suggesting that pollination in <i>Alpinia kwangsiensis</i> is pollinator-limited (Holsinger 2000)."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Staples, G. & Kristiansen, M.S. 1999. <i>Ethnic culinary herbs: a guide to identification and cultivation in Hawaii</i> . University of Hawaii Press, Honolulu, HI	"PROPAGATION METHODS: Seed: Not usually done. Cuttings: Not usually done. Division: When the plants are dormant, the rhizomes can be divided and replanted. Once established, the rhizomes proliferate readily."
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 14 Jun 2016]	"Shoots from pieces of galanga rhizome emerge about 1 week after planting. About 4 weeks after planting 2-3 leaves have developed. Rhizomes develop quickly and reach their best harvest quality about 3 months after planting. If left longer in the field, they become too fibrous and the large clumps of plants that are formed hamper harvesting."

Qsn #	Question	Answer
607	Minimum generative time (years)	1
	Source(s)	Notes
	Globinmed. 2016. <i>Alpinia galanga</i> . <a href="http://www.globinmed.com/index.php?option=com_content&amp;view=article&amp;id=83489:lengkuas&amp;catid=799:l">http://www.globinmed.com/index.php?option=com_content&amp;view=article&amp;id=83489:lengkuas&amp;catid=799:l</a> . [Accessed 15 Jun 2016]	"'Lengkuas' can be propagated using its rhizomes. To ensure that it will germinates, the matured rhizomes having 2 to 3 growing points and some roots are used." ... "Depending on the soil fertility, 'lengkuas' reach its maturity at about 10-12 months after planting. At this growth stage, the plant starts to produce flowers."
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	"Fruit a globose to ellipsoidal capsule, 1-1.5 cm in diameter, orange-red to wine red." [No evidence. Typically propagated with rhizomes]
702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"now widely cultivated in Southeast Asia as a spice and medicinal." ... "introduced to Hawaii by Southeast Asian immigrants and can frequently be seen in community garden plots."
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed ]	[No evidence. Unlikely given limited production of seeds, & propagation typically with rhizomes] "Flowering occurs after exceptionally dry weather. In India, plants start flowering in the latter half of the hot season (April-May) and seeds ripen in November. However, seeds rarely reach maturity."
704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 15 Jun 2016]	[No evidence] "Fruit a globose to ellipsoidal capsule, 1-1.5 cm in diameter, orange-red to wine red." ... "Flowering occurs after exceptionally dry weather. In India, plants start flowering in the latter half of the hot season (April-May) and seeds ripen in November. However, seeds rarely reach maturity."

Qsn #	Question	Answer
705	Propagules water dispersed	n
	Source(s)	Notes
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Distribution and fruit type suggest water would not be an important dispersal vector] "Capsule brown or red when dry, oblong, slightly contracted at middle, 1–1.5 cm × ca. 7 mm, thin, glabrous. Seeds 3–6." ... "Forests, scrub, grasslands; 100–1300 m."

706	Propagules bird dispersed	
	Source(s)	Notes
	Dennis, A.J., Schupp, E.W., Green, R.A. & Westcott, D.A. (eds.). (2007). Seed dispersal: theory and its application in a changing world. CABI, Wallingford, UK	"Appendix I. List of plant genera with mean seed dimensions, including length (L), width (W) and roundness (R) and number of species known to be consumed and dispersed by frugivores in four rain forests on different continents (N)." [Alpinia has been identified as a genus with a number of species adapted for frugivory]
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Seeds, when produced, would presumably be bird-dispersed] "Capsule brown or red when dry, oblong, slightly contracted at middle, 1–1.5 cm × ca. 7 mm, thin, glabrous. Seeds 3–6."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Typically propagated with rhizomes. Rhizomes & seeds lack means of external attachment] "Rhizomes tuberous. Pseudostems ca. 2 m." ... "Capsule brown or red when dry, oblong, slightly contracted at middle, 1–1.5 cm × ca. 7 mm, thin, glabrous. Seeds 3–6."

708	Propagules survive passage through the gut	
	Source(s)	Notes
	Wu, Z. Y. & Raven, P. H. (eds.). 2000. Flora of China. Vol. 24 (Flagellariaceae through Marantaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Seeds, when produced, would presumably be bird-dispersed & would also presumably survive gut passage] "Capsule brown or red when dry, oblong, slightly contracted at middle, 1–1.5 cm × ca. 7 mm, thin, glabrous. Seeds 3–6."

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 14 Jun 2016]	"In India, plants start flowering in the latter half of the hot season (April-May) and seeds ripen in November. However, seeds rarely reach maturity." [Probably No]

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

Qsn #	Question	Answer
	Scheffer, J.J.C. & Jansen, P.C.M., 1999. <i>Alpinia galanga</i> (L.) Willd [Internet] Record from Proseabase. de Guzman, C.C. and Siemonsma, J.S. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. <a href="http://www.proseanet.org">http://www.proseanet.org</a> . [Accessed 16 Jun 2016]	"In India, plants start flowering in the latter half of the hot season (April-May) and seeds ripen in November. However, seeds rarely reach maturity." [Seed longevity unknown]

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Food Plant Solutions. (2015). Potentially Important Food Plants of Indonesia. FPS, Devonport, Tasmania	"Cultivation: It is grown by dividing the rootstock. A piece about 5-10 cm long with at least 2 undamaged buds is used. Rhizomes are planted just below the surface and 60 cm apart." [Would likely be able to resprout from rhizomes if aboveground vegetation was cut]

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Staples, G. & Kristiansen, M.S. 1999. Ethnic culinary herbs: a guide to identification and cultivation in Hawaii. University of Hawaii Press, Honolulu, HI	"PESTS: None have been noticed."

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalized in Taiwan
- Other *Alpinia* species have become invasive weeds
- Reproduces by seeds (rarely) & rhizomes
- Self-compatible, but primarily outcrossing
- Reaches maturity rapidly (10-12 months) from rhizomes
- Seeds, if produced, likely dispersed by birds & intentionally by people
- May be able to resprout from cutting of rhizomes

## Low Risk Traits

- No reports of invasiveness or negative impacts
- Unarmed (no spines, thorns or burrs)
- Edible & medicinal uses
- Pollinator limited (requires specialized bee pollination)
- Limited production of seed in cultivation minimizes risk of accidental or long-distance dispersal

## Second Screening Results for Herbs &amp; Low Stature Plants

(A) Reported as a weed of cultivated lands? No  
Outcome = Accept (Low Risk)