

**Family:** *Zingiberaceae*

**Taxon:** *Hedychium flavescens*

**Synonym:** *Hedychium emeiense* Z.Y. Zhu  
*Hedychium panzhuum* Z.Y. Zhu  
*H. coronarium* J. Konig var. *flavescens* (Roco)  
*H. flavum sensu auct., non Roxb.*

**Common Name:** yellow ginger  
 Cream ginger  
 `awapuhi meleleme

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation:	H(HPWRA)
Status:	Assessor Approved	Data Entry Person:	Chuck Chimera	WRA Score	<b>11</b>
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		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)		
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)		y
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		y=1, n=0		n
403	Parasitic		y=1, n=0		n
404	Unpalatable to grazing animals		y=1, n=-1		n
405	Toxic to animals		y=1, n=0		n
406	Host for recognized pests and pathogens		y=1, n=0		n
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	y
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	y
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	n
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	
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	
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
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	
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	
708	Propagules survive passage through the gut	y=1, n=-1	
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	
803	Well controlled by herbicides	y=-1, n=1	y
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)	y=-1, n=1	n

Designation: H(HPWRA)

WRA Score 11

**Supporting Data:**

101	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Is the species highly domesticated? No] No evidence
102	2011. WRA Specialist. Personal Communication.	NA
103	2011. WRA Specialist. Personal Communication.	NA
201	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Species suited to tropical or subtropical climate(s) 2-high] "Native to northeastern India and the Himalayas, cultivated and naturalized in tropical and subtropical countries..."
202	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Quality of climate match data? 2-high] "Native to northeastern India and the Himalayas, cultivated and naturalized in tropical and subtropical countries..."
203	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Broad climate suitability (environmental versatility)? Yes] "H. flavescens is a plant of the humid tropics, though being native to high altitudes, it can also tolerate cooler temperatures if in fully humid climates. It prefers areas with a mean annual rainfall of 1000-5000 mm, a mean annual temperature of 11-20°C, and it can also tolerate frosts, though they may kill above-ground plant parts. H. flavescens requires medium to high soil fertility, and prefers to grow in open, light filled environments which are warm and moist but will readily colonise semi and full shade under forest canopies. Altitude range in its native India is 1200-2000 m (Hooker, 1897; Mitra, 1958), 500-800 m in Sichuan, south western China, below 2000 m Sri Lanka, and below 400 m in Hawaii but up to 2300 m where annual rainfall exceeds 1500 mm."
204	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Native to northeastern India and the Himalayas, cultivated and naturalized in tropical and subtropical countries..."
205	2000. Whistler, W.A.. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	[Does the species have a history of repeated introductions outside its natural range? Yes] "...widely cultivated in the tropics and subtropics for its fragrant, pale yellow flowers."
205	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Does the species have a history of repeated introductions outside its natural range? Yes] "It is unknown when it was introduced from its native range to neighbouring areas such as to Emei Shan (Mount Omei) in Sichuan, China (Armstrong et al., 2004), southern India and Sri Lanka. Hedychium spp. were extensively cultivated in Europe in the early 1800s for their exotic forms and fragrant perfume, making the wild gingers prized ornamentals in tropical glasshouses. From the UK, the cultivation of gingers spread to parts of the British Empire, with many species transported to warmer areas of the tropics and subtropics (Orchard, 1978). Under these favourable conditions, H. flavescens (along with H. gardnerianum) escaped from cultivation to become economically important weeds. A serious weed in New Zealand and a major threat to native forests, it was introduced there around 130 years ago (Winks et al., 2007), with Owen (1986) noting 1898 as the date of first introduction, the plant having spread rapidly since the 1970s, with H. flavescens having a narrower distribution than H. gardnerianum. It was introduced to La Réunion in the 1900s (Radjassegarane, 1999; Baret et al., 2006), and to Hawaii probably about the same time before later being spread more widely around the Pacific. It is likely to be more widespread than indicated in the distribution list."
301	2004. Meyer, J-Y.. Threat of Invasive Alien Plants to Native Flora and Forest Vegetation of Eastern Polynesia. Pacific Science. 58(3): 357-375.	[Naturalized beyond native range? Yes] "Other potentially serious invasive plants in the native wet forests of eastern Polynesia are introduced ornamental plants belonging to the genera Hedychium (Zingiberaceae), especially H. flavescens on some of the highest summits of Rarotonga and in wet valleys of Rapa Iti; [Naturalized: Austral Is., Marquesas Is., Society Is.]
301	2008. Csurhes, S./Hannan-Jones, M.. Pest plant risk assessment: Kahili ginger - Hedychium gardnerianum - White ginger - Hedychium coronarium - Yellow ginger - Hedychium flavescens. Biosecurity Queensland, Brisbane, Qld	[Naturalized beyond native range? Yes] "H. coronarium is also a popular garden plant. It is naturalised in south-east Queensland and in North Queensland. While slow to spread, it has the potential to be as troublesome as H. gardnerianum...In New Zealand, the first naturalised collection of H. gardnerianum was at Auckland in 1949 (Williams et al. 2003). In Hawaii, H. gardnerianum was wild collected in 1954 (Wester 1992), H. coronarium 1888 and H. flavescens in 1913."

302	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Garden/amenity/disturbance weed? No. An environmental and forestry weed]
303	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Agricultural/forestry/horticultural weed? Possibly] "H. flavescens occurs in agricultural areas, rainforest, moist natural forests, planted forests, riparian zones, ruderal/disturbed land, urban areas and along roads. It is a serious weed in riverbanks, natural forests and forest edges, managed forestry;...H. flavescens is not a weed of crops. It is an invasive species that threatens the environment, native communities and biodiversity." [Most references mention environmental impacts, and do not describe losses to commercial forestry]
304	1985. Smith, C.W.. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	[Environmental weed? Yes] "The problems associated with this species are identical to those of H. coronarium. This species is very common in the wetter northern valleys of Kauai but is also found in many of the same habitats as the white ginger."
304	2007. Tassin, J./Triolo, J./Lavergne, C.. Ornamental plant invasions in mountain forests of Reunion (Mascarene Archipelago): a status review and management directions. African Journal of Ecology. 45(3): 444-447.	[Environmental weed? Yes] "A strong competition for light also occurs in sites invaded by Hedychium flavescens, which catches 85-95% of the incident light (Lavergne et al., 2003). In such environmental conditions, regeneration of native species decreases (Lavergne, Florens & Strasberg, 2004)."
304	2008. Csurhes, S./Hannan-Jones, M.. Pest plant risk assessment: Kahili ginger - Hedychium gardnerianum - White ginger - Hedychium coronarium - Yellow ginger - Hedychium flavescens. Biosecurity Queensland, Brisbane, Qld	[Environmental weed? Yes] "H. gardnerianum and its closely related congener, H. flavescens are both serious weeds in New Zealand where they have invaded large areas of indigenous forest in the northern part of the North Island (Williams & Timmins 1990; Byrne 1992; Porteous 1993)...In South Africa, H. gardnerianum, together with H. coccineum, H. coronarium and H. flavescens, are declared pests, due to their propensity to invade forests, plantations, riverbanks and other moist, shaded sites (Henderson 2001)."
304	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Environmental weed? Yes] "A native of the Himalayas, H. flavescens has been introduced to many locations around the world as an ornamental and subsequently escaped cultivation to become a weed of significant economic importance in countries with favourable moist and warm climates. It threatens native forests in New Zealand, in La Réunion it outcompetes native plants and forms dense stands in wet areas such as ravine sides, roadsides, native forest margins and disturbed forests, and in Hawaii it tends to be confined to forest edges but also impacts negatively on the ecosystem. Its spread and dispersal is facilitated by vegetative regeneration of its dense rhizomes, which allows it to cover large areas of land and prevent the re-growth and establishment of native species, endangering rare and specialized plant communities. It is similar in its ecology and impacts to other invasive Hedychium spp., e.g. Hedychium coronarium and Hedychium gardnerianum."
305	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Congeneric weed? Yes] "Hedychium gardnerianum...spreads rapidly and may become dominant over large areas, especially under canopy openings or in cleared areas."
401	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Produces spines, thorns or burrs? No] "Coarse perennial herbs with leafy shoots 1.5 m tall (rarely taller in Hawai'i), rhizomes ca. 3 cm in diameter, branched, internally pale and fragrant. Leaves oblong to lanceolate, 20 45 (-60) cm long, 5-10 (-12.5) cm wide, upper surface glabrous, lower surface sparsely pubescent, apex acuminate, sessile, ligules membranous, (1-) 2-4 cm long, entire, pubescent, sheaths glabrous."
402	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Allelopathic? No] "Environmental impacts are similar to that of H. gardnerianum. Its ability to form dense colonies in native forests, smothering young natives, blocking the light and preventing seedling establishment can lead to alterations of both function and structure of these native forests and in some cases total collapse. The massive branching rhizomes and horizontal underground stems produce new buds and form a dense layer up to a metre thick, which other plants cannot penetrate. It may permanently displace uncommon plants or specialised plant communities. Like H. gardnerianum, it may interfere with the successional pathways in the forests it invades by reducing densities of small seedlings and saplings in the critical regeneration phase, impacting on the future canopy composition (Williams et al., 2003). In La Réunion, strong competition for light also occurs in sites invaded by H. flavescens, which catches 85-95% of the incident light (Lavergne et al., 2003), and in such environmental conditions, regeneration of native species decreases (Lavergne et al., 2004). Wild ginger also impacts on the nutrient and hydrological regimes of an ecosystem and erosion/deposition (Williams et al., 2000)." [Competition seems to be physical, rather than allelopathic]

403	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Parasitic? No] "Coarse perennial herbs with leafy shoots 1.5 2 m tall..."[Zingiberaceae...not parasitic]
404	2011. Northland Regional Council.. Environment > Weed and pest control > Pest plants > Wild ginger. <a href="http://www.nrc.govt.nz/Environment/Weed-and-pest-control/Pest-plants/Wild-ginger/">http://www.nrc.govt.nz/Environment/Weed-and-pest-control/Pest-plants/Wild-ginger/</a>	[Unpalatable to grazing animals? No] "Distantly related to culinary ginger, wild ginger has a faint ginger smell and taste and has been used as a ginger substitute during wartime rationing. Highly palatable to livestock, both species tend to invade all areas where stock are excluded."
405	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Toxic to animals? No] No evidence
405	2011. Northland Regional Council.. Environment > Weed and pest control > Pest plants > Wild ginger. <a href="http://www.nrc.govt.nz/Environment/Weed-and-pest-control/Pest-plants/Wild-ginger/">http://www.nrc.govt.nz/Environment/Weed-and-pest-control/Pest-plants/Wild-ginger/</a>	[Toxic to animals? No] "Distantly related to culinary ginger, wild ginger has a faint ginger smell and taste and has been used as a ginger substitute during wartime rationing. Highly palatable to livestock, both species tend to invade all areas where stock are excluded." [No evidence]
406	2007. Winks, C.J./Waipara, N.W./Smith, L.A./Tsai, S./Wilkie, J.P./Peterson, P.G.. Invertebrates & Pathogens Associated with Wild Ginger, <i>Hedychium gardnerianum</i> & <i>Hedychium flavescens</i> (Zingiberaceae), New Zealand. Landcare Research Contract Report: LC0708/06	[Host for recognized pests and pathogens? No] "Wild ginger is attacked by a wide range of native and introduced invertebrates in New Zealand, but overall damage appears to be minimal and none of the herbivore niches on wild ginger are well utilized...The diversity of generalist pathogens on wild ginger in New Zealand is low, and all of these pathogens were associated with minor disease damage to both ginger hosts."
407	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	[Causes allergies or is otherwise toxic to humans? No. No evidence] "It has some minor medicinal uses in Asia; the base of the stem is chewed or made into a decoction for tonsillitis in the Philippines, and juice from the stem is applied as a remedy for swellings in the Moluccas." [Widely cultivated ornamental with no mention of toxicity or allergenic properties]
408	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Creates a fire hazard in natural ecosystems? No] "Coarse perennial herbs with leafy shoots 1.5 2 m tall (rarely taller in Hawai'i), rhizomes ca. 3 cm in diameter, branched, internally pale and fragrant. Leaves oblong to lanceolate, 20 45 (-60) cm long, 5-10 (-12.5) cm wide, upper surface glabrous, lower surface sparsely pubescent, apex acuminate, sessile, ligules membranous, (1-) 2-4 cm long, entire, pubescent, sheaths glabrous..."commonly cultivated and naturalized in moist areas"
409	2011. Weedbusters. <i>Hedychium flavescens</i> . <a href="http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39">http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39</a>	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Extremely shade-tolerant, and tolerates most soil types, good or poor drainage, and any fertility."
410	2011. Weedbusters. <i>Hedychium flavescens</i> . <a href="http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39">http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39</a>	[Tolerates a wide range of soil conditions? Yes] "Extremely shade-tolerant, and tolerates most soil types, good or poor drainage, and any fertility. "
411	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Climbing or smothering growth habit? No] "A perennial herb with tuberous rhizomes and erect, leafy pseudostems of 1-3 m height."
412	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Forms dense thickets? Yes] "...this plant forms dense thickets in forest openings and along creeks, impeding growth and regeneration of native plants."
501	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Aquatic? No] "Coarse perennial herbs with leafy shoots 1.5-2 m tall (rarely taller in Hawai'i),..." [terrestrial]
502	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Grass? No] Zingiberaceae
503	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Nitrogen fixing woody plant? No] Zingiberaceae
504	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? Yes] "A perennial herb with tuberous rhizomes and erect, leafy pseudostems..." [Functionally a geophyte]

601	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Evidence of substantial reproductive failure in native habitat? No] "Fruits are globose capsules 1-2 cm in diameter with three valves, containing numerous seeds but not seen in much of its invasive range. "
602	1998. Medeiros, A.C./Loope, L.L./Chimera, C.G.. Flowering Plants and Gymnosperms of Haleakala National Park. Technical Report 120. Pacific Cooperative Studies Unit, Honolulu, HI	[Produces viable seed? Not in Haleakala National Park as of 1998] "Planted but sparsely reproducing up to 600 ft. Not observed to produce seeds locally (R.W. Hobdy, pers. comm.). This plant does spread by vegetative regeneration of rhizomes, however, and can displace lower tier plants in wet forest communities"
602	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	[Produces viable seed? No] "Yellow ginger is not known to produce fruit in the wild, leading to speculation that is a hybrid, stabilized and reproducing vegetatively, rather than a sexually reproducing species. Plant breeders at Lyon Arboretum have been unsuccessful in attempts to cross <i>H. flavescens</i> with either <i>H. coronarium</i> or <i>H. gardnerianum</i> "
602	2008. Csurhes, S./Hannan-Jones, M.. Pest plant risk assessment: Kahili ginger - <i>Hedychium gardnerianum</i> - White ginger - <i>Hedychium coronarium</i> - Yellow ginger - <i>Hedychium flavescens</i> . Biosecurity Queensland, Brisbane, Qld	[Produces viable seed? Not in New Zealand] " <i>H. flavescens</i> does not set seeds in New Zealand (Williams et al. 2000) and probably spreads only from broken rhizomes."
602	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Produces viable seed? No, "Spread in its invasive range is mainly by vegetative growth via rhizomes; however, in Hawaii some evidence exists that <i>H. flavescens</i> may be naturalizing by seed, though no fertile fruits have yet been found."
603	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	[Hybridizes naturally? Unknown] "Yellow ginger is not known to produce fruit in the wild, leading to speculation that is a hybrid, stabilized and reproducing vegetatively, rather than a sexually reproducing species. Plant breeders at Lyon Arboretum have been unsuccessful in attempts to cross <i>H. flavescens</i> with either <i>H. coronarium</i> or <i>H. gardnerianum</i> "
603	2010. Sakhanokho, H.F./Rajasekaran, K.. Pollen biology of ornamental ginger ( <i>Hedychium</i> spp. J. Koenig). <i>Scientia Horticulturae</i> . 125: 129-135.	[Hybridizes naturally? Unknown] " <i>Hedychium</i> cv. 'Daniel Weeks', introduced in 1992 by Gainesville Tree Farm of Florida, is believed to be a hybrid of <i>Hedychium flavescens</i> and <i>Hedychium gardnerianum</i> (Branney, 2005)."
604	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	[Self-compatible or apomictic? Not in Hawaiian Islands] "Yellow ginger clones grown in Hawaii are self-sterile and do not set fruit when cross-pollinated with other yellow ginger plants; it is possible that clones from outside Hawaii would give different results."
605	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	[Requires specialist pollinators? Unknown] "Yellow ginger clones grown in Hawaii are self-sterile and do not set fruit when cross-pollinated with other yellow ginger plants; it is possible that clones from outside Hawaii would give different results."
606	2000. Whistler, W.A.. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	[Reproduction by vegetative fragmentation? Yes] "...since fruits do not form it cannot spread to other places without the rhizomes being transported."
607	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Minimum generative time (years)? Unknown] "Spread in its invasive range is mainly by vegetative growth via rhizomes; however, in Hawaii some evidence exists that <i>H. flavescens</i> may be naturalizing by seed, though no fertile fruits have yet been found." [May be able to spread vegetatively within the first year]
701	1991. Timmins, S.M./Williams, P.A.. Weed numbers in New Zealand's forest and scrub reserves. <i>New Zealand Journal of Ecology</i> . 15(2): 153-162.	[Propagules likely to be dispersed unintentionally? Yes] "The influence of presence of rubbish on numbers of weeds in reserves depends on proximity to towns and on the region (Table 6). Some weeds are moved about almost solely by dumping of garden rubbish: e.g., yellow wild ginger ( <i>Hedychium flavescens</i> ) and wandering Jew ( <i>Tradescantia fluminensis</i> ) which are seedless, and German ivy ( <i>Senecio mikanioides</i> ) which sets non-viable seed (Esler, 1988). Once dumped, these weeds spread by vegetative reproduction."
701	2011. CAB International. Invasive species compendium [online encyclopedia]. www.cabi.org, http://www.cabi.org/isc/default.aspx?site=144&page=4066	[Propagules likely to be dispersed unintentionally? Yes] "Further spread is highly probable, owing to the risks of both accidental and deliberate dumping of rhizomes locally, and deliberate long-distant introduction as an ornamental, encouraged by availability from commercial nurseries by mail-order catalogues and websites."

702	2008. Csurhes, S./Hannan-Jones, M.. Pest plant risk assessment: Kahili ginger - <i>Hedychium gardnerianum</i> - White ginger - <i>Hedychium coronarium</i> - Yellow ginger - <i>Hedychium flavescens</i> . Biosecurity Queensland, Brisbane, Qld	[Propagules dispersed intentionally by people? Yes] " <i>H. gardnerianum</i> , <i>H. flavescens</i> and <i>H. coronarium</i> are popular garden plants and are widely available in nurseries, garden centres, markets and are often swapped among gardeners (Blood 2001)."
702	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Propagules dispersed intentionally by people? Yes] "Further spread is highly probable, owing to the risks of both accidental and deliberate dumping of rhizomes locally, and deliberate long-distant introduction as an ornamental, encouraged by availability from commercial nurseries by mail-order catalogues and websites."
703	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Propagules likely to disperse as a produce contaminant? No] "Further spread is highly probable, owing to the risks of both accidental and deliberate dumping of rhizomes locally, and deliberate long-distant introduction as an ornamental, encouraged by availability from commercial nurseries by mail-order catalogues and websites." [No evidence, and lack of seed production would make contamination improbable]
704	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Propagules adapted to wind dispersal? No] "Fruits are globose capsules 1-2 cm in diameter with three valves, containing numerous seeds but not seen in much of its invasive range." [Fruits, if produced, lack adaptations for wind dispersal]
705	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Propagules water dispersed? Possibly] "Locally, <i>H. flavescens</i> spreads outwards along the ground by way of rhizomes, with new stems sprouting annually. In New Zealand, the hermaphrodite flowers are sterile (Timmins and MacKenzie, 1995) as it is in much of its invasive range, and as it does not produce seeds its spread appears to be entirely vegetative. Flooding may also aid in the spread of rhizomes."
705	2011. Weedbusters. <i>Hedychium flavescens</i> . <a href="http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39">http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39</a>	[Propagules water dispersed? Possibly] "Rhizomes spread outwards slowly, and fragments are spread by dumped vegetation, fill, soil movement, flooding, and contaminated machinery. Commonly found in gardens, tips, and on roadsides."
706	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Propagules bird dispersed? Not in Hawaii. If produced, yes] "Fruits are globose capsules 1-2 cm in diameter with three valves, containing numerous seeds but not seen in much of its invasive range." [Seeds would likely be dispersed by birds if produced outside native range]
707	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Propagules dispersed by other animals (externally)? Possibly] "Feral pigs may aid in local dispersal of rhizomes at least in Hawaii"
708	2011. WRA Specialist. Personal Communication.	[Propagules survive passage through the gut? Unknown] Seeds, if produced, would likely be adapted for passage through birds.
801	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	[Prolific seed production (>1000/m <sup>2</sup> )? No] "Yellow ginger is not known to produce fruit in the wild..."
802	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown if seeds persist in soil, but rhizomes may longer] "Fruits are globose capsules 1-2 cm in diameter with three valves, containing numerous seeds but not seen in much of its invasive range. "
802	2011. Weedbusters. <i>Hedychium flavescens</i> . <a href="http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39">http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? Possibly] "Rhizomes resprout from any fragment, and can survive years away from soil, crushing, and immersion in sea. No seed produced in New Zealand. "
803	1995. Timmins, S.M./Mackenzie, I.W.. <i>Weeds in New Zealand protected natural areas database</i> . Technical Series No. 8. Department of Conservation, Wellington, New Zealand	[Well controlled by herbicides? Yes] "Treat with herbicide. Escort 25 gm/100 l water + 0.1% Pulse; Roundup 2% +0.2% Pulse"

803	2002. Motooka, P./Ching, L./Nagai, G.. Herbicidal Weed Control Methods for Pasture and Natural Areas of Hawaii. CTAHR free publication WC-8. CTAHR, University of Hawaii, Honolulu, HI	"Metsulfuron Escort®, 60% dry flowable (DuPont) Ally®, 60% dry flowable (DuPont)...Use: Selective control of dicots in pastures and noncropland. Kahili ginger, yellow ginger and white ginger very sensitive (0.5 oz. product / acre). Application: Foliar spray 0.06-0.45 oz active/acre, with an effective surfactant, in 20-100 gal/acre. Very low doses effective. Extreme precautions should be taken to prevent drift and in cleaning equipment. Weeds can develop cross resistance between sulfonylureas (e.g., metsulfuron, sulfometuron) and imidazolinones (e.g., imazapyr) if any one or combination of these types of chemicals are used repeatedly over 4-6 years."
803	2011. Weedbusters. <i>Hedychium flavescens</i> . <a href="http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39">http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39</a>	[Well controlled by herbicides? Yes] "1. Cut down and paint stump (all year round): cut above pink 'collar' at base and apply or glyphosate (250ml/L) or metsulfuron methyl 600g/kg (1g /L). Leave stems and leaves on site to rot down. 2. Dig or pull out small plants (all year round). Do not compost, Leave on site to rot down or hang rhizomes in trees, as they survive indefinitely. Dry them out and burn them, or dispose of them at a refuse transfer station. 3. Spray dense patches away from roots of vulnerable species (all year round): metsulfuron-methyl 600g/kg (5g/10L knapsack). Add penetrant in winter. Don't replant sprayed sites for 6 months."
804	2011. Weedbusters. <i>Hedychium flavescens</i> . <a href="http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39">http://www.weedbusters.co.nz/weed_info/detail.asp?WeedID=39</a>	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes. Tolerates crushing] "Rhizomes resprout from any fragment, and can survive years away from soil, crushing, and immersion in sea."
805	1999. Anderson, R.C./Gardner, D.E.. An Evaluation of the Wilt-Causing Bacterium <i>Ralstonia solanacearum</i> as a Potential Biological Control Agent for the Alien Kahili Ginger ( <i>Hedychium gardnerianum</i> ) in Hawaiian Forests. <i>Biological Control</i> . 15: 89–96.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? No] "Kahili ginger ( <i>Hedychium gardnerianum</i> ) is an invasive weed in tropical forests in Hawaii and elsewhere. Bacterial wilt caused by the ginger strain of <i>Ralstonia solanacearum</i> systemically infects edible ginger ( <i>Zingiber officinale</i> ) and ornamental gingers ( <i>Hedychium</i> spp.), causing wilt in infected plants. The suitability of <i>R. solanacearum</i> as a biological control agent for kahili ginger was investigated by inoculating seedlings and rooted cuttings of native forest plants, ornamental ginger, and solanaceous species to confirm host specificity." [No <i>H. flavescens</i> plants wilted in trials with this pathogen]
805	2011. CAB International. Invasive species compendium [online encyclopedia]. <a href="http://www.cabi.org">www.cabi.org</a> , <a href="http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066">http://www.cabi.org/isc/default.aspx?site=144&amp;page=4066</a>	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? No] "Due to its economic importance, the wide range of pests and diseases attacking cultivated ginger have been well researched. By contrast however, not much is known about the mycobiota and entomofauna of wild ginger species. Very few fungal pathogens had been reported on <i>H. flavescens</i> in its invasive range (Farr et al., 2008) although a strain of the soil borne bacterium, <i>Ralstonia solanacearum</i> was isolated from <i>Zingiber officinale</i> (edible ginger) in Hawaii and caused no bacterial wilt in <i>H. flavescens</i> despite causing symptoms in <i>H. gardnerianum</i> and <i>H. coronarium</i> (Anderson and Gardner, 1999). The basidiomycete <i>Leptosporomyces ovoideus</i> was also recorded from <i>H. flavescens</i> in Hawaii (Farr et al., 2008). Biological control options were subsequently investigated in New Zealand (Winks et al., 2007) following on from the research carried out in Hawaii. A survey of fungi, bacteria and invertebrates associated with <i>H. flavescens</i> (and <i>H. gardnerianum</i> ) in New Zealand was carried out in 2006-07 for a national collective of regional councils and the Department of Conservation but no specialist agents were found. Furthermore, no isolates of <i>R. solanacearum</i> were found during the course of the surveys, even though it is recorded as present in New Zealand on other hosts, and it was concluded that the strain known to attack gingers was not established in New Zealand. Given the lack of specialist agents in New Zealand, recommendations were made that a classical control programme should be made, involving surveys in the native range of the wild ginger species of concern. A scoping survey to the Eastern Indian foothills of the Himalayas was carried out in 2008 by CABI scientists, sponsored by a consortium from Hawaii and New Zealand, and highlighted a large suite of damaging natural enemies associated with the <i>Hedychium</i> complex. Subsequent phases of the project have continued to consolidate and prioritise natural enemies for specificity studies, with the focus of the research being on <i>H. gardnerianum</i> , the most pernicious of the invasive complex. A shoot borer ( <i>Conogethes puctiferalis</i> ) and a leaf roller ( <i>Udaspes folus</i> ) have been recorded from <i>Hedychium</i> sp. in India and several species of pathogens have been documented from <i>Hedychium</i> species including the basidiomycete, <i>Lecanocybe lateralis</i> Desjardin & E. Horak, from senescent leaves of <i>H. flavescens</i> (Indonesia) (Soares and Barreto, 2008) and <i>Leptosporomyces ovoideus</i> from <i>H. flavescens</i> in Hawaii (Gilbertson et al., 2002)."