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Diversity of the Genus *Hedychium* J.Koenig (Zingiberaceae) in Northeast In- dia- III: Arunachal Pradesh

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Introduction

Hedychium (ginger lilies; ~90 species) is distributed in all the seven biodiversity hotspots in the Indo-Malayan Realm (IMR) – (1) Western Ghats and Sri Lanka, (2) Himalaya, (3) Mountains of Southwest China, (4) Indo-Burma, (5) Sundaland, (6) Wallacea, and (7) Philippines (Myers et al. 2000, Cox 2001, Sodhi et al. 2004, de Bruyn et al. 2014, Bibi and Métais 2016, Ashokan 2020). It is naturally distributed in the Indian subcontinent (India, Sri Lanka, Bhutan, Nepal, Bangladesh), Southwest and Southcentral China, and Southeast Asia (Myanmar, Thailand, Laos, Vietnam, Cambodia, Malaysia, Indonesia, and Philippines; Ashokan et al. 2019).

Within the Indian subcontinent, *Hedychium* J. Koenig is the most diverse genus in the family Zingiberaceae (Sanoj 2011). Higher species diversity of *Hedychium* is recorded in the northeastern states of Meghalaya, followed by Arunachal Pradesh, Manipur and Nagaland. Northeast India consists of eight states, out of which Arunachal Pradesh (previously known as NEFA or North-East Frontier Agency) represents the easternmost part of the Himalayan biodiversity hotspot (Mani 1974, Srivastava 1984, Paul et al. 2005). Arunachal Pradesh is bordered by Indian states of Assam and Nagaland, and shares international borders with China and Myanmar. It is second-highest (22 species) in *Hedychium* diversity in India, next to Meghalaya (28 species; see Table 1). Two *Hedychium*

species (*H. radiatum* A.S.Rao & Hajra, and *H. ziroense* V.Gowda & Ashokan) are known to be narrow endemics to Arunachal Pradesh and *H. ziroense* is so far known only from its type locality (Rao and Hajra 1974, Sanoj 2011, Ashokan and Gowda 2019).

The current article is the third edition in our series on *Hedychium* diversity of Northeast India, and here we list all the species documented to date from the state of Arunachal Pradesh. In the first part, we included some of the *Hedychium* species from the state of Meghalaya (v. 23, p. 1-11, 2017). In the second part we discussed the *Hedychium* species from the states of Manipur and Nagaland (v. 24, p. 1-8, 2018). We are not listing those species that are also found in Arunachal Pradesh and are already discussed in the first two parts.



Hedychium aurantiacum

Descriptions of some of the *Hedychium* native to Arunachal Pradesh

1. *Hedychium aurantiacum* Roscoe

It was described by William Roscoe in 1825. It is characterized by its moderately dense cylindrical inflorescence, brown bracts and bright orange flowers. It is morphologically very similar to *H. coccineum* Buch.-Ham. ex Sm., but differs by the colour of inflorescence bracts and other floral parts such as labellum, lateral staminodes and stamen.

Distribution: India (Arunachal Pradesh), Bhutan, Nepal

Etymology: The specific epithet refers to the orange-coloured flowers.

Common name: ?; Flowering & Fruiting: July-October.

*Hedychium densiflorum*

2. *Hedychium densiflorum* Wall.

It was described by Nathaniel Wallich in 1853. It can be easily distinguished by the short, dense inflorescence, entire or shallowly-clefted labellum, and absence of labellum claw. It is morphologically very similar to *H. sino-aureum* Stapf and the latter is often treated as a synonym of *H. densiflorum*.

Distribution: India (Arunachal Pradesh, Nagaland, Sikkim), Nepal, Bhutan, China

Etymology: The specific name is derived from the dense inflorescence.

Common name(s): Dense ginger lily; Flowering: July-August; Fruiting: August-September.

*Hedychium hookeri*

3. *Hedychium hookeri* C.B.Clarke ex Baker

It was described by John Gilbert Baker in 1892 from a specimen collected from present day Arunachal Pradesh. It has morphological similarities to *H. longipedunculatum* Sastry & Verma, *H. nutantiflorum* H. Dong &

G.J.Xu, and *H. putaoense* Y.H.Tan & H.B.Ding. It can be distinguished by its short, dense spike, long peduncle and purplish black aril (also observed in *H. longipedunculatum*).

Distribution: India (Arunachal Pradesh, Nagaland)

Etymology: The specific name honours Mr. Joseph Dalton Hooker (1817-1911), a British botanist and the founder of Phytogeography.

Common name(s): ?; Flowering: May- July; Fruiting: June-August.

*Hedychium longipedunculatum*

4. *Hedychium longipedunculatum* Sastry & Verma.

It was described by Addala Rama Krishna Sastry and Dinesh Mohan Verma from Arunachal Pradesh in 1968. It was later found to be native to Nagaland as well. It has morphological similarities to *H. hookeri*, *H. nutantiflorum* and *H. putaoense*. It can be easily distinguished by long peduncle, short spike, pink corolla lobes and the distinct venation

pattern on labellum and lateral staminodes, and purplish black aril (also observed in *H. hookeri*).

Etymology: The specific name refers to the long peduncle.

Common name(s): ?; Flowering: May- July; Fruiting: June-August.

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The purpose of HSI is to increase the enjoyment and understanding of *Heliconia* (Heliconiaceae) and related plants (in the families Cannaceae, Costaceae, Lowiaceae, Marantaceae, Musaceae, Strelitziaceae, and Zingiberaceae) of the order Zingiberales through education, research and communication. Interest in Zingiberales and information on the cultivation and botany of these plants is rapidly increasing. HSI will centralize this information and distribute it to members.

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Website: www.heliconia.org

Table 1. List of *Hedychium* species recorded from the Himalayan region.

Nepal	Bhutan	Sikkim (India)	Arunachal Pradesh (India)
<i>H. aurantiacum</i> Roscoe	<i>H. aurantiacum</i> Roscoe	<i>H. aurantiacum</i> Roscoe	<i>H. aurantiacum</i> Roscoe
<i>H. coccineum</i> Buch.-Ham. ex Sm.	<i>H. coccineum</i> Buch.-Ham. ex Sm.	<i>H. chrysoleucum</i> Hook.	<i>H. chrysoleucum</i> Hook.
<i>H. coronarium</i> J.Koenig	<i>H. coronarium</i> J.Koenig	<i>H. coccineum</i> Buch.-Ham. ex Sm	<i>H. coccineum</i> Buch.-Ham. ex Sm.
<i>H. densiflorum</i> Wall.	<i>H. densiflorum</i> Wall.	<i>H. coronarium</i> J.Koenig	<i>H. coronarium</i> J.Koenig
<i>H. elatum</i> R.Br.	<i>H. elatum</i> R.Br.	<i>H. densiflorum</i> Wall.	<i>H. densiflorum</i> Wall.
<i>H. ellipticum</i> Buch.-Ham. ex Sm.	<i>H. ellipticum</i> Buch.-Ham. ex Sm.	<i>H. ellipticum</i> Buch.-Ham. ex Sm.	<i>H. gardnerianum</i> Sheph. ex Ker Gawl.
<i>H. flavescens</i> Carey ex Roscoe	<i>H. gardnerianum</i> Sheph. ex Ker Gawl.	<i>H. gardnerianum</i> Sheph. ex Ker Gawl.	
<i>H. gardnerianum</i> Sheph. ex Ker Gawl.	<i>H. gracile</i> Roxb.	<i>H. gracile</i> Roxb.	<i>H. gracile</i> Roxb.
<i>H. gracile</i> Roxb.	<i>H. greenii</i> W.W.Sm.	<i>H. speciosum</i> Wall.	<i>H. greenii</i> W.W.Sm.
<i>H. speciosum</i> Wall.	<i>H. griersonianum</i> R.M.Sm.	<i>H. spicatum</i> Buch.-Ham. ex Sm.	<i>H. hookeri</i> C.B.Clarke ex Baker
<i>H. spicatum</i> Buch.-Ham. ex Sm.	<i>H. speciosum</i> Wall.	<i>H. stenopetalum</i> G.Lodd.	<i>H. longipedunculatum</i> Sastry & Verma
<i>H. thyrsoforme</i> Buch.-Ham. ex Sm.	<i>H. spicatum</i> Buch.-Ham. ex Sm.	<i>H. thyrsoforme</i> Buch.-Ham. ex Sm.	<i>H. radiatum</i> A.S.Rao & Hajra
<i>H. villosum</i> Wall.	<i>H. stenopetalum</i> G.Lodd.		<i>H. raoii</i> G.D.Pal & G.S.Giri
	<i>H. thyrsoforme</i> Buch.-Ham. ex Sm.		<i>H. robustum</i> A.S.Rao & Hajra
			<i>H. speciosum</i> Wall.
			<i>H. spicatum</i> Buch.-Ham. ex Sm.
			<i>H. stenopetalum</i> G.Lodd.
			<i>H. tenuiflorum</i> Wall. ex Voigt
			<i>H. thyrsoforme</i> Buch.-Ham. ex Sm.
			<i>H. villosum</i> Wall.
			<i>H. wardii</i> C.E.C.Fisch.
			<i>H. ziroense</i> V.Gowda & Ashokan



See more *Hedychium* images on pages 13 and 14.



5. *Hedychium radiatum* A.S. Rao & Hajra.

It was described by Aragula Sathyana-rayana Rao and Prabhat Kumar Hajra in 1974, from Arunachal Pradesh, India. It is characterized by its wider than long inflorescence, bilobed labellum and long stamen. Morphologically, it is very similar to *H. ellipticum* Buch.-Ham. ex Sm., but differs by its pine-cone like arrangement of inflorescence bracts and the shape of central labellum.

Hedychium radiatum

similar to *H. ellipticum* Buch.-Ham. ex Sm., but differs by its pine-cone like arrangement of inflorescence bracts and the shape of central labellum.

Distribution: India (Arunachal Pradesh)

Etymology: The specific epithet denotes the radiating outward nature of the flowers.

Common name(s): ?; Flowering: August-September; Fruiting: ?



6. *Hedychium raoii* G.D. Pal & G.S. Giri.

It was described by Gaur Das Pal and Girija Sankar Giri in 1998, from Arunachal Pradesh, India. It can be distinguished by the folded inflorescence bracts, linear lateral staminodes, emarginate labellum and short stamen.

Hedychium raoii

In the previous taxonomic revision of Indian *Hedychium* (Sanoj 2011), *H. raoii* was treated as a synonym of *H. spicatum* Buch.-Ham. ex Sm. But based on our field collections and herbarium studies we found that *H. raoii* differs from *H. spicatum* in its lamina texture, cincinnus capacity (number of flowers borne on a bract), inflorescence bracts, and orientation of floral parts such as, central labellum, lateral staminodes, and stamen.

Distribution: India (Arunachal Pradesh, Nagaland)

Etymology: The specific epithet honours Dr. Aragula Sathyana-rayana Rao (former Joint Director of Botanical Survey of India) for his valuable contributions to the Flora of Northeast India.

Common name(s): ?; Flowering & Fruiting: August-October.



7. *Hedychium robustum* A.S. Rao & Hajra.

It was described by Aragula Sathyana-rayana Rao and Prabhat Kumar Hajra in 1974, from Arunachal Pradesh, India. It is characterized by its tall plant habit, folded bracts, multi-flowered cincinnati, entire (not lobed) labellum and short stamen.

Hedychium robustum

Distribution: India (Arunachal Pradesh), Bhutan

Etymology: The specific epithet refers to the robust plant habit.

Common name(s): ?; Flowering & Fruiting: August-October.



8. *Hedychium speciosum* Wall.

It was described by Nathaniel Wallich in 1820 from a specimen collected in India. It can be easily distinguished by its leathery lamina, glaucous indumentum all over the plant, cylindrical inflorescence,

Hedychium speciosum

yellow flowers with orange stamens and emarginate labellum. It is morphologically very similar to *H. gardnerianum* Sheph. ex Ker Gawl., but can be distinguished by its petiolate leaves and emarginate labellum.

Distribution: India, Nepal, Bhutan, China

Etymology: The specific epithet refers to its showy inflorescence (speciosum=splendid or showy)

Common name: ?; Flowering & Fruiting: July- November..

*Hedychium wardii*

**9. *Hedychium wardii*
C.E.C. Fisch.**

It was described by Cecil Ernest Claude Fischer in 1936 from a specimen collected in present-day Arunachal Pradesh. It can be easily distinguished by its long, 'ellipsoid-cone' inflorescence and sessile anthers.

Distribution: India (Arunachal Pradesh), China

Etymology: The specific epithet honours its collector, Frank Kingdon-Ward (1885-1958), an eminent British plantsman.

Synonym: *Hedychium efilamentosum* Hand.-Mazz.

Common name: ?; Flowering & Fruiting: July-October.

*Hedychium ziroense*

10. *Hedychium ziroense* V. Gowda & Ashokan.

It was described by Vinita Gowda and Ajith Ashokan in 2019. It can be easily distinguished by its dense cylindrical spike, pubescent inflorescence rachis, folded bracts, 2-3 flowers per cincinnus, and deeply cleft labellum.

Distribution: India (Arunachal Pradesh)

Etymology: The specific epithet is derived from the type locality 'Ziro', the closest town to where the species was found.

Common name: ?; Flowering & Fruiting: July-October.

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References are listed on the HSI website at www.heliconia.org

Gilbert S. Daniels: A Tribute to a Pioneer in the Taxonomy of Heliconia

W. John Kress, Ph.D.

Distinguished Scientist and Curator Emeritus
National Museum of Natural History
Smithsonian Institution, Washington, DC

One would think that we would know everything about the plant diversity of an intensely-studied tropical country like Costa Rica. Not true. Botanists have been collecting and describing new species of plants for decades if not a century in that part of the world. But we really knew nothing about the diversity of Heliconia until Gilbert S. Daniels, a botanist, and F. Gary Stiles, an ornithologist, put their minds and efforts to an inventory of the species of that genus in the 1970's and tracked down every form and variety in Costa Rica. The publication in 1979 of "The Heliconia Taxa of Costa Rica: Keys and Descriptions" put to rest the idea that Heliconia was a well-known group of plants. Published in the journal *Brenesia* produced by the Departamento de Historia Natural del Museo Nacional de Costa Rica (Supplement to Volume 15), this seminal work set the stage for a completely new understanding of the diversity and distribution of Heliconia in Latin America. I am the proud owner of one of the first copies!

In the 1970's Gil Daniels was the Director of the Hunt Institute for Botanical Documentation in Pittsburgh, PA, an old and venerable library of plant taxonomic literature and art. I first met Gil there when I was a graduate student at Duke University after I had decided to work on the taxonomy and evolution of the genus *Heliconia* for my Ph.D. dissertation. He could not have been warmer and more forthcoming in sharing his knowledge about Heliconia during the few days I spent with him at the Hunt Institute.

But before I knew it, we were together again in the field in Costa Rica in 1976. Wow. Little novice graduate student me with the great and esteemed director of the Hunt Institute tracking down the taxa of Heliconia in Costa Rica. And it could not have been better because we were accompanied by Dr. F. Gary Stiles from the Universidad de Costa Rica, ornithologist extraordinaire and authority on the relationships of these plants to their hummingbird pollinators. Together for two weeks we found every species of Heliconia in the country.

From my field books I have plenty of notes recounting my experiences with Gil and Gary during those days searching for plants. Two of the first heliconias we collected were what they called *Heliconia vellerigera* and *Heliconia curtispatha*. Ironically they had misidentified both of these species, which I later realized were actually new to science. I eventually named them *Heliconia danielsiana* and *Heliconia stilesii* in honor and recognition of their work in Costa Rica!

Unfortunately, Gil died on 14 April of this year in Athens, Ohio, at the age of 92. He was born in Brooklyn, New York on 19 June 1927. To recap his life's achievements I

quote in part from his obituary in the Indianapolis Star of 14 April 2020. “Gil’s lifelong love of horticulture and botany began at an early age when he became the youngest participant (at age 7) in the Brooklyn Botanic Garden children’s program. He continued to participate until leaving for college at the age of 17. In 1944 he was one of 40 students from across the U.S. to be selected as a winner in the 3rd Annual Science Talent Search for the Westinghouse Scholarships with his paper titled “Research in the Drug Industry” which focused on the future use of plants in pharmacology. Graduating from Brooklyn Technical High School that same year, Gilbert went on to attend a Navy pre-med program at Cornell University, then majored in physical anthropology at Harvard University. His next stop was the Air Force where he was project engineer (physical anthropologist) in the Aero-medical Laboratory at Wright Patterson Air Force base in Dayton, Ohio, where he met his first wife, Kathleen, and had his first exposure to early 1950s computers. This led to a series of positions in the computer industry over the next 12 years when, in 1965, he quit the computer rat race and began his pursuit of the Doctorate of Botany at UCLA. In 1965 Gilbert became Assistant Director of the Hunt Botanical Library at Carnegie Mellon, then Director from 1970 to his retirement in 1977. As director he transformed the Hunt Library into the Hunt Institute for Botanical Documentation, expanding the collection to include botanical art and artists, and other ephemera.”

I learned so much from Gil Daniels during those two weeks in Costa Rica in 1976. I often re-evaluated some of his taxonomic decisions, but I never doubted his observations and his insights into the natural history and beauty of these plants. I am indebted, we are all indebted, to Gil Daniels and his love of *Heliconia*.

Plant Profile: *Heliconia danielsiana* Kress

Carla Black
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Heliconia danielsiana is an impressive heliconia, large in both height and bulk. The huge hairy inflorescences spark more curiosity than admiration of beauty, but *H. danielsiana* is a welcome addition to any collector’s garden. At first, Gil Daniels thought it belonged in the South American species, *H. vellerigera*. But the differences in flower details and an unlikely geographical jump from Peru led John Kress to publish it five years later as a new species.

This is an especially adaptable species, growing from sea level to 1200 m in forest, borders, or clearings; in full sun to 60% shade. It flowers all year, though there are more blooms from April to September.

H. danielsiana is almost endemic to Costa Rica, but plants simply don’t respect national borders, and it also exists just inside the border of Panama. In Costa Rica it is found in the southwest part of the country, from the border north to Quepos, and in Panama it is limited to the border with Costa Rica on the Pacific slope.



At left, *H. danielsiana* on the roadside on the Panama-Costa Rica border. At right, closer look at inflorescence.

H. danielsiana is similar to *H. vellerigera*, but *H. danielsiana* bracts are woollier with longer hairs and the flowers are more densely covered in fine hairs. A close look at the flowers and staminodes reveal very distinct features. *H. magnifica* also resembles *H. danielsiana*, but *H. danielsiana*’s hairs are longer and pale colored.

References:

Daniels GS, Stiles FG, (1979) The *Heliconia* taxa of Costa Rica. Keys and descriptions. *Brenesia* 15(Supl.): 1-150

Kress WJ (1984) Systematics of Central American *Heliconia* (Heliconiaceae) with pendent inflorescences. *Journal of the Arnold Arboretum* 65: 429–532.



H. danielsiana flower



H. vellerigera flower



H. danielsiana staminode



H. vellerigera staminode

Yep, its that time again. You can renew your membership at:

www.heliconia.org



Gilbert Daniels

F. Gary Stiles
 Universidad Nacional de Colombia

I have not had contact with Gil for many years, and I have not done more studies with *Heliconia* either! However, I remember with pleasure my days with Gil, collecting *Heliconia* and observing their relationships with birds both as pollinators and fruit dispersers, and dismembering many inflorescences to take detailed morphological data for descriptions of various species. So many trips on barely passable roads, so many stops when Gil roared, "stop the car!" seeing an interesting site or a rare inflorescence. I fondly recall the trips to San Vito and Bob Wilson's gardens to plant bags of heliconia rhizomes, putting together our live plant reference series, and enjoying lively conversations with Bob and Catherine. Thus, my memories of Gil are of an always-active and enthusiastic fellow adventurer. I am glad that our work has been profitable for those who followed us.

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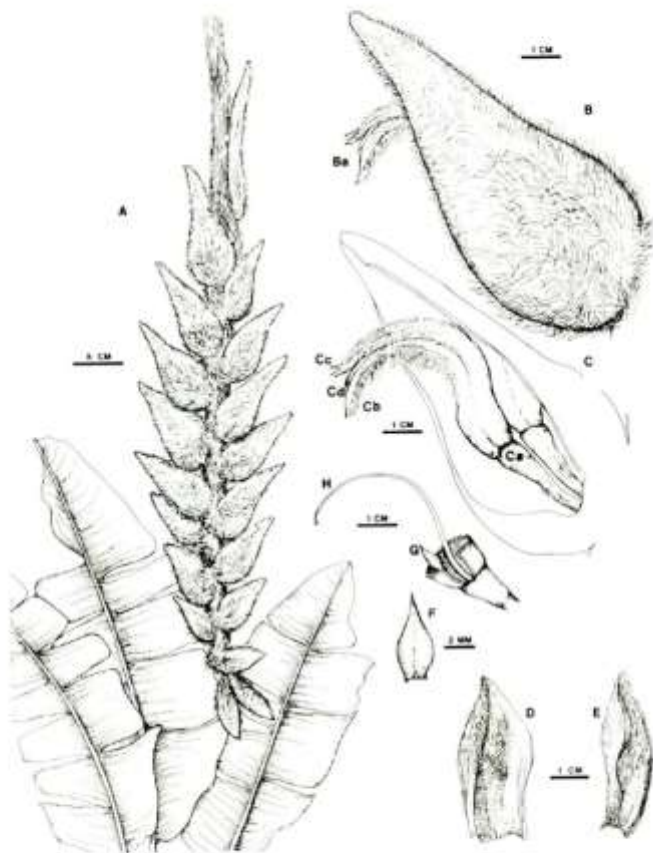


FIGURE 13. *Heliconia danielsiana*. A, inflorescence. B, C, cincinnal bracts: B, entire (Ba, flower protruding at anthesis); C, cut-away, floral bracts removed showing flower at anthesis (Ca, ovary; Cb, free sepal; Cc, fused sepals, slightly reflexed; Cd, anthers, included in apex of corolla tube). D, E, floral bracts: D, abaxial view; E, lateral view. F, G, staminode: F, abaxial view; G, position relative to style, lateral view. H, style and stigma.



H. stilesii, named for Dr. F. Gary Stiles, at Wilson Garden with Endre Guttman and Angel Rodriguez



Covid-19 Plant Business Strategies HSI members around the world

The coronavirus pandemic impacts the ornamental horticultural industry all around the world. Each country adopted different strategies to stop the spread of COVID-19 that affected the floriculture industry by partial or complete close of the gardens centers, flower shops operations and floriculture farms. This short survey share the business strategies adopted by some of our HSI members, producers, growers and researchers to sell their products, adapt their business and solve their problems during this Pandemic period. Our best regards and be strong. "

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Cut flowers for the local market

Life was pretty normal till March 2020 when the entire world came to standstill due to Covid pandemic. Indian floriculture industry crumbled due to sudden lockdown. Mumbai being prime hotspot of Covid 19, everything got very chaotic and confusing. Actually April-May being wedding season in India followed by August (for Lord Ganesha festival) is most crucial period for flower sale. Due to the pandemic all big events were cancelled. All big hotels were shut. All businesses were affected including floriculture which was hit even harder as products are considered non essential and perishable too.



Floral arrangement with ferns and *Tapeinochilos ananas-sae* of two colors and with the apex of the inflorescences removed

At that time is summer and most of heliconia and gingers were in full bloom. The whole situation was quite devastating and we had to think out of the box and made some difficult decisions. So with heavy heart we decided to remove heliconia clumps from part of farm and replace it with vegetables.



A floral creation by Minal Patil

However, every problem teaches us something valuable. We decided to preserve the rhizomes of heliconia and gingers. I had realized that many people in India actually don't know about these beautiful and elegant flowers of Zingiberales, though the rhizomes of some members are extensively used in Indian cuisine. I developed a new hobby of making flower arrangements using these flowers during lockdown. Gradually I started making videos of them and uploaded the same on YouTube channel so that more and more people will be aware of them, and the results have been wonderful. Now gradually the unlock process has begun. Markets are open for flowers and foliage. However it will take some time to be back on track. We know that yesterday was history, tomorrow is mystery and today is God's gift. So let's work for the good old days.



Floral arrangement with *Etilingera elatior* and leaves of palms and *Cordyline*



Floral arrangement with *T. ananassae* and *E. elatior* and leaves of palms and ferns.

Herman Jongkind
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Growing *Heliconia* and *Alpinia* for the New Zealand cut flower market

This season has been such a challenge with the lockdowns and closing of the borders for tourists. With the first lockdown we had, I was not allowed to sell flowers at all for 4 weeks, after that it was changing with the different levels. Biggest problem is still the closed borders. With no tourists, no hotel sales, hardly any corporates and no big events because of limited gathering numbers. That shrunk the market by 75%! Flower shops are not busy and often limited in how they can trade. The big supermarkets have had no limitations because they need to feed the population and as such have been very busy. They all have their corner with flowers and that has been our best outlet. Normally they are not bothered with exclusive tropical flowers but in these changing times they were quite willing to try. Although it is not the same lucrative market, it has kept us in business hoping for more normal times.

Vivian Loges

Floriculture professor and tropical flower researcher
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Since the pandemic began, the university flores (UFRFE) was closed and we were prevented from having access to laboratories, experimental fields and classrooms. From March to May I tried to update the publication of forgotten articles, participate in lives, courses and events online. Finally, when we were allowed to teach classes online starting in August, it was a challenge and we had to train and adapt the entire system before being present for virtual classes. The months of June and June were for this adaptation.

Regarding the tropical flowers producers in Pernambuco, I had the testimony of Maria do Carmo and her family, owners of the Fazenda Mumbecas Flores Tropicais, where we develop our research with heliconias, gingers and alpinias. To face the crisis, they started to use digital media as a sales tool. This led to a change in the focus of customers who were previously decorators, distributors and florists that deliver flowers and arrangements for homes and stores. They started posting videos guiding how to make floral arrangements with their flowers and foliage. They also came into contact with new markets in Brazil. According to Maria do Carmo, "This has profoundly changed our company's production and management operations. The company was re-invented and we continue to adapt to the new rules. We can only thank everyone who contributed and believed in this joint effort."

Now, in November, I see how this pandemic required so many changes, some of which are valid and useful. One of them is the possibility of online meetings and events with people from all over the world. Maybe we could organize a virtual HSI meeting one of these days!

Bruce Dunstan
Brisbane, Australia
Bromeliad and anthurium grower for collectors

Covid has made me sell online which has been a huge increase in what I used to do both in turnover and prices, both of which have gone through the roof due to a much larger range of customers and the crazy indoor plant craze that is sweeping the world. For example, previously when we had an in-person plant sale we would have 700-800 people walk through and buy plants. Online the Tillandsia Facebook group has over 5000 members, so a vendor with 140 plants can sell out in 20 minutes. It keeps my daughter and her boyfriend busy doing all the administration and posting, which is great. I've been selling Anthuriums by auction and only sell once a month to keep demand high. It's crazy how people are now selling seeds of *A. crystalinum* or *A. magnificum* hybrids and are getting \$50 AUS per seed = \$35USD per seed. I'm also starting to see interest in other anthuriums now that people have been collecting velvet-leaf species and are looking for more variety.

Colton Collins
 Hilo, Hawaii
www.plantgrouphawaii.com
 Rhizomes, cut flowers and agrotourism.

This pandemic has had a significant on business. In the initial phase of the outbreak we were unsure if we would be allowed to operate. Luckily, under the new laws we qualified as an essential business! Through our website, our weekly interisland and mainland rhizomes shipments remained steady. We also provide flowers to local florists but they have been hit especially hard. Many of the family owned florists have closed temporarily, reducing our cut flower sales by 90%. Over the past year we branched into agrotourism and began offering overnight stays on our farm through Airbnb. This new endeavor was going quite well with high monthly occupancy rates and excited visitors wanting to experience tropical farm life. Due to COVID, that portion of the business needed to shut down completely.

In addition to effects felt by the pandemic, our weather has been unusually dry. While drier weather is not favorable for these plants, it also attracts feral pigs. Desperate for water, feral pigs search for young *Heliconia* shoots to feed on. They managed to create a hole in our fence, allowing them to completely eat and dig out seven varieties overnight. The pigs seek out specific species (*H. bihai*, *H. caribaea*, and *H. stricta*) while ignoring most others. Varieties we lost that night were *H. bihai* 'Lobster Claw II', *H. bihai* x *caribaea* 'Big Orange', *H. bihai* x *caribaea* 'Manoa Midnight', *H. caribaea* 'Red', *H. caribaea* 'Yellow', *H. stricta* 'Boquerón', and *H. stricta* 'Wag'. While a few of these varieties are easy to find, others are harder to obtain.

We expect the pandemic and unusually dry weather to continue for some time. To make up for reduced cut flower sales and Airbnb bookings, we have focused on advertising rhizome orders. We have also increased prices of varieties that sell out quickly. This strategy has been working for us so far. Looking forward, our plan is to increase the number of varieties in our collection and protect them with more secure fencing and irrigation. Given that many businesses are closing, we are fortunate to remain open and thankful to our customers for supporting us.

While the pandemic has had a significant effect on business, it is compounded by the impact of feral pigs remains. *Heliconia stricta* 'Wag' is one of seven varieties lost in one night after pigs breached our hog wire fence.

Heliconia Society International
 web site is at
www.heliconia.org



At left, 'Wag' and at right 'Boqueron' that Colton lost to pigs

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I usually hold an annual heliconia plant sale in my garden, to help cover maintenance expenses. For the last 12 years, the sale has been on the first weekend in July. Not this year, of course. Gatherings of a large number of people were not allowed, and I preferred to reduce my exposure, too. My two workers live on the farm, so the two months of total lockdown did not suspend their work.

I already had a website and had accepted pre-orders for many years. So it was an easy decision to shift all customers to online orders, with in-person pick up or shipping inside the country. It was a hair-raising challenge to add an order form to the website, but I was able to do it, though about two weeks later than I hoped.

I expected lower sales, because there would be no impulse buying. But after two months of steady announcements on FaceBook and email, I reached my normal income totals! The sale has taken longer, and probably required more effort on my part. But I am fortunate and extremely satisfied with the new sales dynamic in this Covid year. I will certainly consider repeating this method next year.

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Prolonging the life of vase Heliconia: How to achieve it?

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This summary part of the work reported in the Journal Ornamental Horticulture, V. 25, No. 1, 2019 p. 74-79. The reader is referred to the original article by the link <https://ornamentalhorticulture.emnuvens.com.br/rbho/article/view/1987>

The supply of water in the production of heliconia is a determining factor in obtaining quality floral stems at the time of cutting. Additionally, the floral stem requires other inputs to maintain the quality that a commercial stem demands. Another relevant factor is maintaining the longevity of the floral stem post-harvest and achieve success in commercialization (Leite et al., 2015). In this regard, most common solutions to postpone the vase life of this ornamental are: the use of sucrose, silver nitrate, calcium chloride, gibberellic acid, citric acid (Costa et al., 2015; Malakar et al., 2019; Sardinha et al., 2019) and organic solutions of aloe vera (*Aloe vera barbadensis*) or moringa (*Moringa oleifera* Lam.) (Shokalu et al., 2019). Moreover, it is necessary that performed procedures do not require a lot of time and capacity to be applied. Accessible costs are taken into consideration mainly for florists, who surprise with their extraordinary creations using this tropical ornamental.



Figure 1. Dr. Ariadna Linares Gabriel, crop researcher, holding a heliconia flower stalk.

Evaluate vase life

The flower stems used for the experiment were obtained from a three-year-old culture, established in a clay-textured soil. The site (coordinates 17.80 ° NL, 94.91 ° WL and 40 meters above sea level) presents a warm sub-humid climate of type Aw1. The inflorescences were cut 5 cm from the base. After cutting, they were moved to a shady place for conditioning. Initially, the inflorescences were placed in 20 L containers filled with water to 70% of their capacity. Later, they were washed using a sponge and water, rubbing gently to remove any foreign material brought from the field. The inflorescences were disinfected by horizontal immersion for 3 minutes and dried in the open air. Finally, they were transferred to makeup with mineral oil (for aesthetic flower stems) and left to dry. In the drying of water and makeup, the inflorescences were placed downwards.

In the study conducted, vase days were evaluated in 36 inflorescences of *Heliconia psittacorum* x *spathocircinata* tropics and *Heliconia wagneriana* Peterson (Figure 2, p 12).

The treatments used were: 10% sugar diluted in water, only water and control (dry treatment). A measurement scale was used in this process: Score 0 (zero) related to excellent overall appearance (freshly harvested appearance); Score 1 (one) to good general appearance (signs of senescence not very characteristic, with loss of brightness); and Score 2 (two), regular general appearance (with emergent small spots or discrete darkening of the bracts). The score 2 was used to determine the maximum number of vase days (Figure 3).



Figure 3. Appearance of flower stems at the end of the evaluation.

Important findings

The study showed relevance in two aspects: First, sealing cells of the flower stem using mineral oil. Second, the absence of water to achieve the greatest number of days in the vase with the best possible appearance.



Figure 2. *Heliconia psittacorum* x *spathocircinata* 'Tropics' and *Heliconia wagneriana* without hydration (A and D), with only water (B and E) and with hydration + sugar (C and F), respectively.

This achieved to up to 26 days of vase life with *Heliconia psittacorum* x *spathocircinata* 'Tropics' (Table 1) The findings are primarily attributable to the length of the stems and the number of bracts of both cultivars. For instance, the stems of *Heliconia psittacorum* x *spathocircinata* 'Tropics' measured 130.8 cm compared to 106.1 cm of *Heliconia wagneriana*. For *Heliconia psittacorum* x *spathocircinata* 'Tropics', the average number of bracts was 3.4 and 7.2 for *Heliconia wagneriana*.

A positive aspect of these results is that without the use of water, no bad floral odors were manifested which translates into the absence of bacteria or the presence of mucilage. Therefore, it is shown that hydration does not guarantee more days in the vase, so the dry treatment is an alternative to reduce the excessive use of water. To this extent, vase life is not determined by the interaction of the flower stem and hydration. It is important to take into account the characteristics of the cultivars and for this reason, detailed studies are necessary.

Table 1. Levels of significance and comparison of means for the variable evaluated in heliconia

Specie	Treatment	Days in vase
<i>Heliconia psittacorum</i> x <i>spathocircinata</i> 'Tropics'	Without hydration	28.5 a
	With hydration (only water)	27.6 a
	With hydration + sugar (water + sugar)	23.3 a
<i>Heliconia wagneriana</i>	Without hydration	6.8 a
	With hydration (only water)	10.8 a
	With hydration + sugar (water + sugar)	9.3 a
Level of significance		0.0494

Means with the same letter within each column do not differ statistically (Tukey, $P \leq 0.05$).

***Hedychium* in Ubatuba, São Paulo, Brazil**

Some *Hedychium* species are invasive in Brazil, putting areas of native vegetation of the Atlantic Forest at risk. This is also true in the Hawaiian Islands, particularly in high rainfall areas and along stream banks.



Images of beautiful *Hedychium* species and hybrids



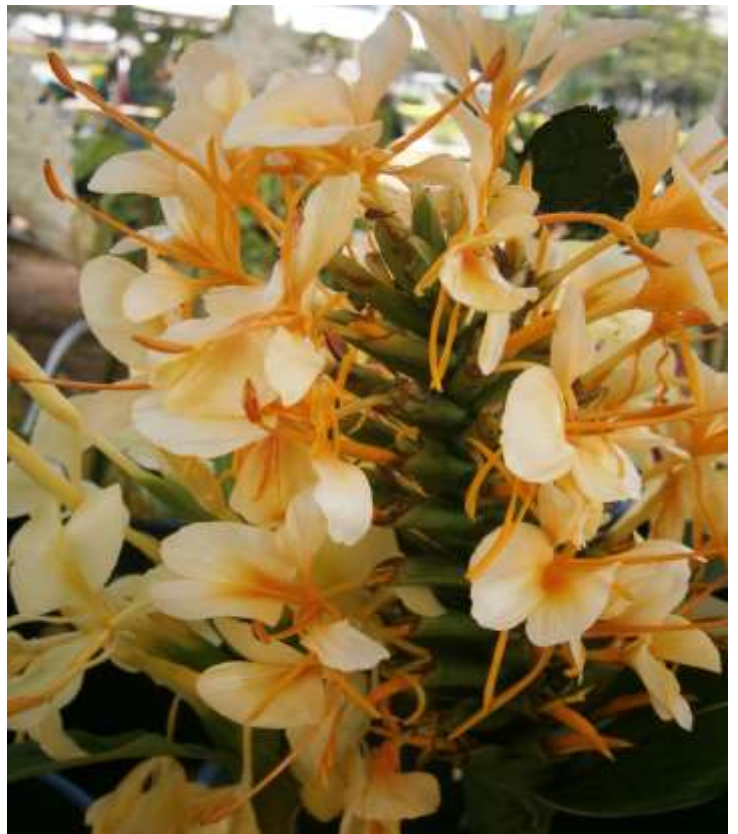
Hedychium 'Betty Ho'



H. coccineum X *H. gardnerianum* 'Annie Bishop'



Hedychium coccineum 'Tara'



Hedychium 'Dr. Moy'

Ornamental Horticulture: the Journal of the Brazilian Society of Floriculture and Ornamental Plants

The Journal "Ornamental Horticulture", until 2014 known as "Brazilian Journal of Floriculture and Ornamental Plants" (Revista Brasileira de Floricultura e Plantas Ornamentais - SBFPO) was created by the Brazilian Society of Floriculture and Ornamental Plants in 1995 with the purpose of disseminating the scientific and technical works with floriculture, ornamental plants, landscaping and landscapes. Content is developed by the members and researchers, establishing a strong connection between research and productive sector. For two decades articles were published in Portuguese, Spanish or English, but since 2017 only articles in English are accepted. It makes the journal unique in Brazil and Latin America. Since 2018 the journal has been supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES).

Many articles are about species in the Order Zingiberales, for example: cut flowers; landscaping; ornamental plants; propagation; characterization; selection; breeding; post-harvest; storage temperature; conditioning solution; photoperiod; propagation; potted plants and hormones; taxonomy; shading; production; nutrition; etc.

The journal and articles are available to the public for reading and downloading. You are invited to visit the homepage of Ornamental Horticulture (<https://ornamentalthorticulture.emnuvens.com.br/rbho/issue/archive>) and of SBFPO (<http://www.sbfpo.com.br>). You may also submit articles for consideration via the website.



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HELICONIA
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