Hawaii Cooperative Extension Service

HORTICULTURE DIGEST

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Department of Horticulture
University of Hawaii at Manoa

In This Issue: FLOWER AND NURSERY INFORMATION
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Editor's Note: This special issue of the Horticulture Digest features many of the papers or summaries of presentations from the Cut Tropical Flowers session of the Fertilizer and Ornamentals Short Course held in Hilo January 9–11, 1986.

TABLE OF CONTENTS

HAWAII TROPICAL FLOWERS AND FOLIAGE ASSOCIATION

After months of discussion and several organizing meetings, a new organization was formed to foster interest in tropical flowers and foliage. The organization met and approved a set of By-laws at the Key Project in Kahaluu (Oahu) on March 7, 1986, to form the Hawaii Tropical Flowers and Foliage Association (HTFFA).

Officers of the organization are Billie Hughes, President; Ken Vinzant, Vice-president; Thomas Tew, Secretary; and Bill Chang, Treasurer. The mailing address of HTFFA is P. O. Box 817, Kaneohe, HI 96744. Dues were set at $20/person. Besides the officers, other Board of Director members are Myron Murakami, Jeff Hunt, and Winnie Chang.

HTFFA plans to meet quarterly on the third Friday of April, July (Annual meeting), October, and January. The purposes of the organization, as defined in their By-laws are: to cultivate friendship and fellowship, to foster and promote a greater appreciation of tropical flowers and foliage, and to represent and advance the social, economic, and educational interests of tropical flower and foliage enthusiasts. HTFFA is not restricted to the island of Oahu, nor to commercial growers. Educational programs are planned for each meeting.

HELICONIA PRODUCTION IN FLORIDA AND THE CARIBBEAN

Heliconia psittacorum is one of several hundred species of tropical herbaceous plants which comprise the genus *Heliconia*. In general heliconias have banana-like foliage, spread by means of a fleshy underground rhizome, and have erect or pendulous terminal inflorescences composed of 2 or more boat-shaped bracts arising from a central floral axis. Within each bract are several florets which open sequentially, each lasting a day or 2 before abscissing (*H. psittacorum*) or senescing (most other species). The bracts of most species are brightly colored and many also retain their color and shape long after cutting. *H. psittacorum* flowers possess not only these characteristics, but also are borne on long clean peduncles and are produced throughout the year.

Flower color in *H. psittacorum* ranges from pink, red, and orange to yellow. The primary method of propagating heliconias is by dividing the underground rhizomes. Single-eye rhizome pieces can be used to propagate heliconias, but the plants become established much more rapidly if rhizome clumps containing several eyes are

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planted. Clumps of rhizomes will fill in a bed in about 6–8 months if planted on 1 ft. centers, but single eye rhizomes will require somewhat longer. In ground beds, 4 in. is a good planting depth for *H. psittacorum* rhizomes.

Although heliconias can be grown in 14 in. or larger containers, the reduced drainage and restricted soil volume available for rhizome growth reduces the growth and flowering potential of these plants. They are best rhizomes from spreading into the aisles. A bed width of 30 in. is optimal for *H. psittacorum* production. Narrower beds make inefficient use of space and wider beds not only make flower harvesting more difficult, but also result in taller spindly plants in the center of such beds due to reduced light penetration through the dense foliage and subsequent plant stretching. Plant densities in 2-year old, 4-ft. wide beds grown in full sun exceeded 700 stems/yd^2. Under these extremely crowded conditions, plant height can exceed 8 ft. and flower size may be reduced as a consequence. In narrower beds where fewer plants are subject to such dense shading, plant height can usually be kept under 5 ft. and flowers produced under these conditions will be larger and stronger. Beds should be dug up, divided, and replanted after 2 years if crowding is severe. To help alleviate the crowding problem, the vegetative stalk should also be removed along with the inflorescence at harvest by pulling or cutting at ground level. Since heliconia inflorescences are terminal, a stalk which has flowered serves no useful function, but competes with newly emerging shoots for light, water, and nutrients.

Fertilization rates strongly affect growth and flowering of *H. psittacorum* under high light intensities (full sun). Under 63% shade, however, light is a limiting factor and increasing fertilization rate does not increase flower production. In crowded second year beds in full sun, light reduction due to crowding again limited plant response to increased fertilization. If overcrowding can be prevented, a fertilizer rate of 650 g N/m^{2}yr. is excellent for heliconia production. Incorporation of dolomitic limestone and a complete micronutrient fertilizer blend is also essential to prevent deficiences, particularly of Mg and Fe. Iron deficiency symptoms in heliconias may be induced by poor drainage, high soil pH (4.5–6.5 is excellent), root rot diseases, or by nematodes and will require treatment of the ultimate cause rather than just the Fe deficiency symptoms. Iron deficiency symptoms appear first on new foliage as uniformly yellow leaves. Magnesium deficiency symptoms appear first on older leaves as wide yellow bands along the leaf margins. Nitrogen deficient plants are light yellowish-green overall.

Light intensity appears to be one of the greatest limiting factors in heliconia production. Production under full sun is 2.5 to 3 times as great as under 63% shade.

Overhead irrigation is perhaps the most efficient method for heliconia beds in Florida, since water from irrigation heads installed at ground level seldom penetrate uniformly through the dense foliage to the center of the bed and trickle irrigation does not spread laterally in well drained soils. Although heliconias use substantial amounts of water, poor drainage is a major source of root problems and should be avoided by using a well aerated soil mix and growing in a well-drained site. Water stress in heliconias is indicated by longitudinal rolling of the foliage.

Since photoperiod has no effect on growth and flower production in *H. psittacorum*, production in the tropics or heated greenhouses is year round. In this species a terminal inflorescence is produced after 4–5 leaves have emerged. Flower production is therefore related to rate of vegetative growth as well as plant density. At optimal temperatures of 70–95°F, a flower can be harvested 8–9 weeks after emergence of the shoot. At temperatures below 70°F, growth rate is reduced proportionally until 50°F is reached. At this temperature all growth stops and cold damage symptoms appear, first as small black spots on the floral rachis near the point of bract attachment, and eventually as blackening of the entire inflorescence and necrosis of the foliage. Freezing temperatures will kill unprotected foliage back to the ground, but temperatures a few degrees below freezing will kill the rhizomes as well. Covering beds with polyethelyne tents is an excellent method for protecting heliconias from cold temperatures, but overhead irrigation for frost protection is not recommended since waterlogged soil will persist for some time afterward. At these cold temperatures, the roots take up little water and root suffocation and rotting often ensue. In south Florida then, heliconia production in outdoor beds generally begins in May or June and runs through November when minimum temperatures often drop below 50°F. Since temperature is not a limiting factor in the Caribbean, flower production there is year round.

Heliconia psittacorum appears to be relatively free of serious insect and disease pests under south Florida growing conditions. Aphids often infest flowers, feeding on the nectar, but are eas-

ily controlled with common insecticides. Mites, mealybuds, and thrips have been reported on this crop under greenhouse conditions, but we have never observed them on field grown plants. Heliconias are, however, susceptible to nematodes and appropriate control measures must be taken to prevent infestations of these pests. Planting clean plants in fumigated soil is a good method of nematode control in production beds. A leafspot disorder of unknown cause has been observed on *H. psittacorum*, but it does not appear to be a major problem in the culture of this crop.

Heliconia psittacorum flowers can be cut when 2 or 3 bracts are open, but tighter flowers can also be used effectively in floral arrangements. Flowers will not open further once cut, even if sucrose-containing bud opening solutions are used. Heliconia flowers must be stored at temperatures above 50°F to prevent cold injury. Flowers of recommended *H. psittacorum* cultivars ('Golden Torch', 'Andromeda', 'St. Vincent Red', etc.) maintain their bract color and shape for 14–15 days in tap or deionized water at 73°F. By cutting the flowers early in the day (before 10:00 AM) postharvest life can be extended to 21–24 days in these cultivars. Uptake of water or floral preservatives is minimal, hence silver or 8-hydrosyquinoline citrate-containing solutions have no effect on postharvest life of the cut flowers. Shipping of cut heliconia flowers has been successful as long as the packing material is not kept too moist or the temperature allowed to drop below 50°F.

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PROPAGATION OF TROPICAL CUT FLOWERS

Seed Propagation

Gingers. The seeds of *Catimbium, Nicolaia,* and *Hedychium* are borne in round or elongated capsules which split when the seeds are ripe and ready for dispersal. In some species a fleshy aril, bright orange or scarlet in color, covers the seed, perhaps to make it more attractive to birds.

The seeds of gingers are black, about 3 mm in length with an oily, tough seed coat. They may be sown shallowly in a slightly acid, well-drained medium. The timeframe for germination is variable, but the gingers may be considered to germinate readily, in contrast to the heliconias.

Seedlings may be transplanted to larger pots as soon as they are large enough to handle. They will tolerate full sunlight but require substantial irrigation to flourish.

Heliconia. About 2 to 3 months are required for the berry-like fruits to mature. Mature fruits will be bluish or red in color and contain 1 to 3 seeds with tough, stony seed coats. Seeds should be removed from the pulp of the fruit to make them easier to handle. Seed size varies but many are about ¼ to 3/8 inch long. In some species the pedicel subtending the fruit elongates to push it above the bract where it may be easily seen by fruit-eating birds. There is some suggestion that the embryo is poorly developed at fruit maturity, and that the seed coat itself may not harden up finally until just before ripening. The combination of rudimentary embryo and hard seed coat often means a long dormant period. Scarification of the seed coat has not been particularly helpful in hastening germination. In Hawaii and elsewhere, the seeds germinate sporadically over a long period, 3 months to 3 years.

It has been suggested that embryo development and germination are timed so that germination can occur at the onset of the next rainy season in their native wet-dry tropics. For this reason, a warm-moist stratification period may be helpful. Place the seed in moist vermuculite or milled sphagnum moss in a plastic bag; hold in shady warm conditions until germination activity is observed; and then sow the seeds in pots or flats. Some growers recommend a 1 gallon pot or larger for each seedling transplant.

Alternatively, seeds may be direct-sown shallowly on soil-based medium and allowed to "do their thing" which may be fast or slow. The flats can be struck on an out-of-the-way bench and examined for seed germination from time to time. We do not know if bottom heat will help or what temperatures favor germination.

Once sprouting occurs, seedlings should be provided moist, sunny conditions to favor growth. Feeding with soluble fertilizers (8 oz. of 20-20-20/100 gal.) can begin once a root system is evident. Subsequent growth is rapid.

Bird of paradise. Untreated seed may take 90 days or more to germinate while some chemical treatments have reduced the time to about 5 weeks. One problem lies in knowing how fresh (or old) the seed is. Fresh seed may be more prone to fast germination than old seed. The bright orange, fuzzy aril has no particular function in germination and may be left on or removed. Various means of mechanical scarification alone have not improved germination speed or percent. Treatments which have been used or determined effective experimentally include:

1. Soak fresh seeds in water for 48 hours, sow without drying.
2. Soak seed in 125°F water for 1 hour, let cool overnight and sow.
3. Treat the seed in concentrated sulfuric acid (at least twice the volume of acid to seed volume) for 5 to 10 minutes; then wash in running water and sow.
4. Soak in 200 ppm gibberellic acid for 24 hours; rinse and sow.
5. Treat with concentrated sulfuric acid 5 to 10 minutes; then soak overnight in 50 to 100 ppm gibberellic acid. Sow immediately.
6. Treat as in No. 5 and follow GA soak with 500 ppm ethephon (from Ethrel or Florel) for 24 hours. Sow immediately.

Sow the seeds and cover with enough medium that they will not dry out. Vermiculite is satisfactory as a medium, although sand, peat, sand and peat, peat and perlite, and soil have all been used successfully. Because the root system developes to 4–5 inches rapidly after germination, transplanting to deep pots or direct-sowing into pots is preferred.

Bird-of-paradise may take 3 years or more to flower from seed. It has been reported in France that production of young plants at warm temperatures (75–85°F) coupled with plentiful fertilizer and water speeds their rate of growth to flowering size. However, flower initiation seems to occur best at somewhat cooler temperatures (65–75°F), so plants should be moved to their permanent location after making a well-developed 1 gallon pot.

Vegetative propagation

Aerial offshoots of gingers. Inflorescences of the common red ginger and the Tahitian ginger and the pink 'Eileen MacDonald' produce aerial offshoots as they mature. The light pink 'Jungle Queen' and red 'Jungle King' do not develop many of these aerial offshoots although a few have been observed on very old inflorescences.

The larger and better developed aerial offshoots will already have developed root initials and may be removed from the inflorescence and planted right away. It is better, perhaps, to allow root systems to develop by holding the offshoots in vermiculite under mist or by starting them in peat pellets or foam propagation blocks. Roots develop in 2–3 weeks time. Transplant these into 6" pots or 1 gallon containers in a well-drained medium and fertilize and water them until a larger root system has developed.

Cuttings. Some of the species of *Costus* and *Tapeinochilos* may be propagated by cuttings taken from terminal or lateral shoots. A rooting compound such as Hormodin #3 is dusted on the base of a 6 to 8 inch cutting and the cutting is inserted into a perlite or vermiculite medium and placed under intermittent mist. Rooting occurs in about 4 weeks time.

Division. Gingers (and heliconias) have what is called a sympodial rhizome system. This means that branches do occur rather than a single linear rhizome system. Usually, new branches develop at the base of an upright pseudostem. While rhizome segments will propagate, regeneration is slow if dormant pieces are used, and the preferred unit is a 3–5 inch portion of a rizhome with 8–12" of its associated pseudostem.

The rhizome peice is trimmed of rotted portions and dead roots and dusted with a 50% captan or 50% WP benlate dust. We have used each. Observe the root systems closely for mealybugs and dip affected ones in diazinon (½ to 1 tbl 50% WP diazinon/gallon of water) or Sevin (1 to 2 tsp/gallon of water) if the insects are present. The rhizome pieces can be planted directly in the field or in 1-gallon containers or started in flats of moist vermiculite. New pseudostems develop from the base of the old one and the new roots develop in association with them. Similarly, from rhizome pieces without a pseudostem, new shoots develop which root at their bases. Root development takes about 4 weeks and activation of the bud 4 to 6 weeks.

Nematodes are controlled in banana propagation by trimming the fleshy banana "corm" so that no external tissue remains and subjecting the plant material after trimming to a hot water treatment (15–20 minutes in 125 to 130°F hot water) followed by a cold water rinse to cool the plant tissue quickly.) This temperature should be sufficient to kill nematodes. Other literature suggests that the hot water should be in the range of 122 to 125°F. Addition of a surface sterilant such as 5% commercial bleach (1 part bleach to 9 parts water and soak for 10–15 minutes) or 37% formaldehyde (1 part formaldehyde to 99 parts water) would also be effective in reducing microorganism contamination. The duration of exposure would have to be determined by trial and error, but 15 to 30 minutes should be adequate for small sized rhizome pieces.

After the hot water treatment, cold water rinse, and fungicide dust, the plant material should be handled to prevent re-contamination.

Do not replace in old contaminated bags. Use a sterile propagation medium.

Bird-of-paradise does not produce a running rhizome system but forms a dense crown of short, thick fleshy stems at or below gound level. The leaves arise from these stems in a fan. A great deal of work is necessary to be sure the stem is included when dividing a bird-of-paradise plant. Dig deep enough to cut roots below the stem and cut through the stem where 2 or more fans appear to join at their bases. After cutting apart the fans, strip off the outer leaves down to stem tissue, leaving about 5 expanded leaves. Trim the stem to remove discolored or damaged areas. Dust the base with 50% WP captan and plant in a well-drained medium. Avoid packing the medium too tightly as limited aeration reduces root development. Plants are watered and held under shade to reduce moisture stress. While root development is evident in about 6 weeks, 3 months should be allowed before transplanting. Bird-of-paradise divisions can begin flowering about a year later, in contrast to seedlings which will require 2 or 3 years at their most rapid development.

Tissue Culture

The edible ginger has been grown asepticaly from meristems (*1*) but most of the other gingers have not received attention. Heliconias have been tissue cultured by the Oglesby Plant Labs (3714 Southwest 52nd Ave, Hollywood. FL 33023) but the technique has not been published. Bird-of-paradise has been tissue cultured (*2*), but the technique is complicated and has not produced commercial quantities of plants.

1. Hosoki, T. and Y. Sagawa. 1977. Clonal propagation of ginger (*Zingiber officinale* Roscoe) through tissue culture. HortScience 12:451–452.
2. Ziv, M. and A. H. Halevy. 1983. Control of oxidative browning and *in vitro* propagation of *Strelitzia reginae*. HortScience 18:434–436.

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NEMATODES IN TROPICAL CUT FLOWERS AND THEIR CONTROL

Plant parasitic nematodes are one of the most serious pest problems with which growers of tropical cut flowers may have to contend. Presence and detection of these nematodes are not always easy because of microscopic size and that symptoms are frequently mistaken for those associated with other causal factors of plant stress. Four or more types are found with regularity. These are: Burrowing (*Radopholus similis*), lesion (*Pratylenchus coffeae*), reniform (*Rotylenchulus reniformis*) and root-knot nematodes (*Meloidogne* spp.). Although each has its peculiarities, approach to their control is similar. Of the four species, the burrowing nematode is by far the most damaging as well as the most frequently found. In surveys, over one-half of samples of cut flower species in the families of Musaceae and Zingiberaceae were infected with one or more of the four nematode species. Of these, frequency of the burrowing, root-knot, reniform, and lesion nematodes was 87, 67, 53, and 47 percent respectively. Therefore, care should be diligently exercised to avoid these nematodes whenever establishing a new planting of cut flowers.

Some of the more common ways that plantings become infected are: a)infected plants had been growing on the planting site; b)brought in on infected planting stock; c)brought in infested planting media; d)contaminated water from open irrigation ditches or surface run-off from surrounding infested areas; e)soil movement of any kind, e.g., landfill, equipment and implements, tire treads, shoes, animal paws and fur, hand tools, etc.; f)plants in and around planting site, e.g., bedding stock, landscape plants, adjacent cultivated hosts or native or weed hosts; g)etc. Burrowing nematodes may be found in most areas where bananas, heliconias and gingers grow. They have been recovered from remote areas on all islands where the ancient Hawaiians planted their crops.

The key to nematode control in any agricultural operation is to start with nematode-free plants in an area free from nematodes. Subsequently every effort should be made to practice sanitation, thus avoiding entrance of these unwanted pests. They are such formidable foes because of small size and wide host range. Once established, they are nearly impossible to eradicate because of their ability to live within roots, their migratory habits and ease with which they can be dispersed from one area to another by the aid of outside agents.

The following are major ways of nematode management:

A. Choice of planting site and media free of pathogenic nematodes (have plants and soil tested for nematodes*).
   1. Clean fallow–six months free of susceptible crops is generally sufficient to rid the soil of burrowing nematodes, others take longer.
   2. Pre-plant soil heat treatment of potting soil–(180°F/30 min).
   3. Pre-plant soil treatment with fumigants.*

B. Seed selection and treatment
   1. Always select clean, sound seed free of nematodes and other pathogens.
   2. Seed treatment
      a. *Hot-water treatment* (122°F/10 min) can be used with caution. Some plants are more sensitive to heat than others. Growing plants are more susceptible to heat than dormant plants.*
      b. *Chemical treatment*–although some may serve as a prophylactic treatment, no chemical has been shown effective in ridding infected plants of nematodes.

C. Cultural management
   1. Sanitation–(Avoid contamination)
      a. Control run-off water–contour to provide controlled irrigation and drainage.
      b. Irrigation–Trickle irrigation may eliminate nematode movement.
      c. Landscape with non-susceptible plants.
      d. Avoid recontamination from outside sources (see above).
      e. Maintain optimum culture (fertilization, irrigation, etc.)
   2. Chemical control–currently limited because of EPA registration and hazard. Only one systemic chemical is registered but must be reapplied on a regular basis (about once every four months) for effected control.*

Remember, for effective nematode control, "Start clean and stay clean."

**Oliver V. Holtzmann and Melvin Wong
University of Hawaii–Manoa

* Check with your County Agent for the latest recommendations.
** Plant Pathologist and County Extension Agent

GRADES AND STANDARDS FOR CUT FLOWERS

The standards presently on the books were developed 27 years ago. At that time cut flowers were sold primarily as take-alongs for tourists, and a long stem-length was not an important consideration. The regulations, however, were established to set quality export standards for retail and wholesale in two categories: Standard and Fancy. Since the retailers controlled some 98% of the market, and they objected to some of the requirements, they had the law amended to exclude them, but the written standards were not changed.

Thus, today's exporters are covered by out-of-date standards which are not applicable to today's market. Indeed yesterday's Fancy flowers would probably be considered as discards today on the basis of stem length and thickness accepted a quarter century ago. A whole generation of growers has come along who do not know the history of the standards.

Standards are the yardsticks for measuring quality. The growers used to be the ones who set the standards. Nowadays, there are many others who have inputs to the standards and the Hawaii State Department of Agriculture is charged with administering the standards. The DOA's coordinator is Tracy Lauder and it is his committee which would have to meet and hold hearings on changing the standards.

While the present grades are Fancy and Standard, many growers have additional grades, such as Number 1. Many terms are important to the definition of any particular grade: Clean, damage, farily well formed (colored or developed), injury, intact, length of spike, properly trimmed, well developed (colored or formed). These are defined in the grades and standards regulations, which are available from the Hawaii State Department of Agriculture, S. King St., Honolulu, HI 96814.

The present standards are as follows:

"Bird-of-paradise" means the stem and inflorescences of the *Strelitzia reginae* plant, consisting of one of two boatshaped bracts borne on the stem and the flowers which are held in the bract.

Hawaii Fancy birds-of-paradise consist of birds-of-paradise of similar varietal characteristics which are well developed, clean, well formed, intact, fresh, firm, well colored, properly trimmed, and free from injury caused by disease, insects, or mechanical or other means.

Hawaii Standard birds-of-paradise consist of birds-of-paradise of similar varietal characteristics which are well developed, clean, well formed, reasonably intact, fresh, firm, fairly well colored, properly trimmed, and free from damage caused by disease, insects, or mechanical or other means.

"Red ginger flower" means the flower spike,

stem, and any attached leaves of the species *Alpinia purpurata.*

Hawaii Fancy red ginger consists of red ginger flowers of similar varietal characteristics which are well developed, clean, well formed, intact, fresh, firm, well colored, properly trimmed, and free from injury caused by disease, insects, or mechanical or other means. Flower spikes shall be at least eight inches in length and stems shall be at least twelve inches in length.

Hawaii Standard red ginger consists of red ginger flowers of similar varietal characteristics which are well developed, clean, fairly well formed, reasonably intact, fresh, firm, well colored, properly trimmed, and free from damage caused by disease, insects, or mechanical or other Flower spikes shall be at least six inches in length and stems shall be at least eight inches in length.

It will be noted that the stem length standards are definitely not in conformity with today's marketing practices for red gingers.

"Heliconias" means the inflorescences of the several species of the heliconia plant, consisting of the stem, bracts, and flowers.

"Intact" means the heliconia has all parts normally present and these parts are whole, except that flowers may be removed.

Hawaii Fancy heliconias consist of heliconias of similar varietal characteristics which are well developed, clean, well formed, intact, fresh, firm, colored, properly trimmed, and free from damage caused by disease, insects, or mechanical or other means.

In order to allow for variations incident to proper grading and handling, not more than a total of five per cent, by count, of the heliconias in any lot may fail to meet the requirements of this grade, but not more than two-fifths of this amount, or two per cent, shall be allowed for defects causing serious damage.

Hawaii Standard heliconias consist of heliconias of similar varietal characteristics which are fairly well developed, clean, well formed, intact, fresh, firm, well colored, properly trimmed, and free from serious damage caused by disease, insects, or mechanical or other means.

In order to allow for variations incident to proper grading and handling, not more than a total of five per cent, by count, of the heliconias in any lot may fail to meet the requirements of this grade.

Duane Delima
Department of Agriculture, Honolulu
Summary prepared by R. A. Criley
Horticulturist

PACKING AND SHIPPING TROPICAL FLOWERS

We at Sunshine Farms have a different customer mix than most grower/shippers. Approximately 65% of our sales are direct to retailers. This makes packing a different challenge than the straight bulk type of packing. Generally larger, heavier stems such as birds, gingers, heliconias, and bananas are packed first. When packing these heavier items, we find out the length the customer has in mind so as not to ship unneeded weight.

There are many new items being grown and offered to the grower/shippers. Make sure to pass new items through the Department of Agriculture to be included on your PPQ stamp.

Since we guarantee all flowers and foliage, we take extreme care in packing. We make extensive use of 12 x 15 sheets of newsprint to wrap open birds and larger heliconias, bananas, etc. The common hotdog bag can be used to slip over closed birds. With a hole stamped in the closed end the stems of gingers can be passed through and heads enclosed in the bag. We have tried many ways to pack the anthuriums but have returned to the old standby of shredded newsprint which seems to be most widely used and accepted.

Rozak Bisel, Sunshine Farms
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PACKING AND SHIPPING OF CUT GINGER

There are many species of ginger grown in Hawaii. A selected number of species are grown commercially as cut flowers. At Puna Flowers, we market only the Red Ginger (*Alpinia purpurata*).

The Hawaii Agricultural Reporting Service statistics on Red Ginger for 1984 show the States annual production to be 82,000 dozens with a sales value of $267,000. Surprisingly, 65% of the production was on Oahu. As should be expected, 90% of the sales were out of state.

Richard Criley of the University of Hawaii sets production, on a controlled small plot basis, at 12,500 to 15,000 dozens per acre per year. If we cut this back a bit to account for the problems of farming on a larger scale and estimate annual production per acre at 7,500 to 9,000 dozens, and apply a farm value of $3.00 per dozen, the annual gross revenue to the farmer per acre would be $22,500 to $27,000. We grow some of our own Red Ginger, but do not have the production records to verfy this.

We harvest our Ginger on a weekly basis. All of the leaves are removed in the field (we feel that leaf removal extends shelf life). Optimum stem length is 36 inches, however, flowers with a stem length down to 24 inches are marketable. Flowers are cut immature (not fully open). An immature flower has a longer shelf life than a mature flower, and is therefore more desirable.

Flowers are placed in a commercial preservative (Floralife) once they reach the packing shed and are thoroughly washed before packing. It is extremely important for growers to have good sanitation and pest control measures, as hand washing is very time consuming.

Ginger is packed with Anthurium and other tropical flowers and foliage. Flowers are packed in shredded newspaper with unshredded newspaper separating layers. An insulated box is used the year round to protect all of the tropical flowers and foliage from temperature extremes.

The finished product is shipped by either the U.S. Post Office (priority, special delivery), Purolator Courier Service, or Federal Express. Both Purolator and Federal Express have been responsive to the problems of shipping a perishable product, the Post Office generally has not.

We are marketing Red Ginger, along with Anthurium and other tropical flowers and foliage primarily to the Retail Florist on the U.S. Mainland. In this particular market, the demand remains high. Puna Flowers is currently supply limited and has not been able to test the depth of the market.

I believe that present and future demand for Red Ginger will support additional plantings in Hawaii. Gradual production increases can be absorbed with present market efforts. Those attempting large scale plantings should develop a marketing plan for production.

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GROWER PANEL ON PACKING AND SHIPPING CUT FLOWERS

Grayson Inouye: the larger heliconias.

One must assess the market–how far away, how much handling is involved? Are you shipping to Honolulu, LA, or New York? For my talk, I am assuming a carton of assorted heliconias and direct flight service, so there is a minimum of handling. The shipment might include *H. humilis* (or lobster claw), Caribaea, and Rostrata. We used a 54" long box.

The lobster claw is packed with damp newspaper shreds. We pack with more moisture when shipping to warm areas. The Caribaeas have to be wrapped because they bruise more easily than the lobster claw. They are worth more on the market and this justifies our extra labor in wrapping them. Then, we pack in damp shreds. Since they are large and heavy, they're put in the lower half of the box. We may also wire them down to the bottom of the box so they don't shift. We use a lot of damp newspaper shreds to cushion the flowers and to keep them from dehydrating. In our experience, the lighter 'Parakeet' should be shipped dry.

At the other end, the flowers should be put in water to rehydrate them, but don't put the flowers in a cooler or they will be damaged. We need to pack instructions with our flowers.

Raymond Tanouye: Bird-of-paradise

We grow about 96% of what we ship. We cap the birds in the field (with paper bags) as color shows. We harvest by pulling instead of cutting. The birds which are ready (as the first flower pops) are pulled every morning. We let them dry out a day before packing to reduce their moisture content. The birds are dry-packed. We find that the paper caps reduce our labor and also damage the flowers. Our boxes are lined with newspaper rather than plastic. We ship on all the airlines which fly between Hilo and the mainland.

Question and Answer Session:

How do you go about controlling ants in the flowers? Several similar questions came up and the answers are pooled in this reply.

California is very strict and their inspectors will condemn a whole box if they see even one ant. We hand-wash every flower when it comes in from the various growers. Some growers are more careful than others. We use a light dip in diazinon, then rinse in fresh water and wash them in fresh water. If you use diazinon or malathion at all, you have to wash it off or it will burn (the flowers). We prefer to use fresh water and avoid the insecticide when possible. We dip large heliconias–a little stronger than mild solution of malathion to be effective–but only for California. We'd prefer to sell our product other than in the state of California.

Do you trim the end of the bird-of-paradise after pulling?

No, only if necessary to fit the box.

Is there a preference to wet or dry pack?
It depends on the flowers. With some, like the birds, if they are shipped wet, you wind up with rotted flowers on the far end.

Summary prepared by
Richard A. Criley
from tape recordings

HELICONIA COLLECTION AT WAIMEA ARBORETUM

Gary described the layout and tourist volume of the park as some 800 acres under development with a half million visitors a year. One of the most popular collections has been the heliconia and ginger collection, and expansion up a side valley is planned for these groups of plants. Waimea has about 400 taxa and they are planted in groups by size (height) in 14 sections. The purpose of the collection is to serve as living taxonomic reference for botanists, horticulturists, and nurserymen, to serve as floral exhibitions for visitors, and to serve as a germplasm repository for heliconias being destroyed in their native habitats. Waimea does not necessarily try to grow the main cultivated species, but when they have the same ones as the commercial growers, they try to append the commercial name, at least as used in Hawaii. Waimea has sent plant materials all over the world, but they are not providing commercially available plants (as for starting up a nursery).

Gary showed slides of some of the unusual materials from the Waimea collection.

Gary Powell, Waimea Arboretum
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Summary prepared by Richard A. Criley
from tape recordings

HELICONIA PSITTACORUM–AN INTERESTING CUTFLOWER FROM THE BANANA FAMILY

Editor's Note: This is a translation of a 1974 German article on heliconia production appearing in Gartenbauliche Versuchsberchte, pages 174–178. Acknowledgement is made to Doris Rodriquez and Xenia Wolff, graduate students in Horticulture, and Dr. Mueller-Dombois for assistance with the translation.

Origin

This plant originated in tropical and subtropical South American rainforests. We must keep this in mind in the culture of this plant, especially in regards to soil structure, humidity, fertilization and light requirements. There the plant lives in close contact with a variety of ground cover plants, for example *Marantaceae*, mosses and ferns.

Marketability

The marketability is similar to *Strelitzia reginae*, yet in the area of flower arranging this plant is better and more elegant to work with. The keeping quality, depending on maturity and cultural requirements and practices, is 10 to 14 days. Since these flowers are not always available in sufficient quantities, they are not yet readily available to florists. They have been shipped into Western Europe via air for several years already, but this product is easily damaged and its keeping quality lowered, thus making it not always ideal for the wholesaler and retailer. The importance of *Heliconia psittacorum* will increase for the industry, and therefore the freshness of the product and its continual availability is of prime importance.

Soil requirements

According to our tests, the soil must have a stable structure, meaning it must be able to withstand some degree of impact without compacting. Since this plant is grouped under the category of shallow-rooted plants, the soil should be well-drained and special care taken that the top layer of soil (20–25 cm) has a good structure and adequate nutrient content. The best pH level, depending on soil type, is between 5.4 and 6.0. An organic matter content of 4 to 6% is recommended. A very heavy type of soil is not recommended for heliconia production, while lighter soils with a high organic matter content are desirable. As a rule of thumb it can be said that for every 100 m^2, 20 to 30 sacks of organic matter should be incorporated into the soil. For easily compacted soils 3–5 sacks of perlite should be incorporated.

Light requirements

Light requirements are dependent on plant condition and relative humidity. Newly planted propagules should be grown under light shade until secondary root growth occurs, since a good root system must develop first. Later no more shading is required. In order to prevent leaf scorch, a high relative humidity is required.

Temperature (Glasshouse conditions)

The plants require a constant ground temperature for optimal growth. Depending on light conditions, soil temperatures should be in the range of 18–23°C. From time of planting until the end of October the temperature should be (20–23°C. After this the ground temperature can be dropped to 18°C. Cooling must occur only if temperatures rise above 28°C. Air temperatures can be dropped to 15°C at night during short daylength seasons.

Water requirements

Irrigation should best occur from above because this can be controlled better than irrigation applied from below the plant. A sprinkler irrigation system which does not cause droplets on the leaves is preferred. It is important to remember that it is better to irrigate several times with low water quantities than to give one long watering in order to keep up the high relative humidity. The relative humidity should not drop below 60%, to avoid leaf edge rolling. The optimal RH in culture lies between 75 and 90%.

Fertilization

No definite fertilization requirements have been established but extension studies have demonstrated the following:

- –The soil must have a balanced distribution of nutrients; however plants should not be fertilized at planting time for better establishment.
- –For every 100^2 of growing area, after the secondary root growth, 15 kg of a nitrogen rich complete fertilizer should be applied every 3–5 weeks after the second flush of growth.
- –Beginning at the end of August, about 10 kg/100 m^2 of a potassium-rich complete fertilizer should be applied every four weeks.
- –Present recommended rates according to the Doppellaktatmethod:

pH = 5.4–6.2
P_2O_5 = 80–100 in mg/100 g soil
K_2O = 30–40
soluble N = 20–30

Planting

The normal time of planting is March to the end of April. The earlier the planting the earlier flowering occurs. The rhizome should be shallow planted, 5–7 cm.deep. Care should be taken that the plant is watered immediately after planting. It takes about 3-4 months from time of planting to time of flowering. This depends on the planting material and the prevailing cultural conditions.

The success of the culture depends at this time on the purchased young plants. The plants are still much too expensive to order plants without seeing the juveniles in the distribution center beforehand. It is better to be convinced of its quality beforehand than to observe the results later. Plant and row spacing depends on the available greenhouse facilities. A continuous planting is recommended. For early plantings in March, 6 plants are needed per square meter, for plantings from April, 7 to 8 plants per square meter. 3 or 4 rows per bench can be planted. Within row spacing should be 30–35 cm while width between rows should be about 60 cm. The plants will grow into the between row space beginning in August, meaning those plants which hinder easy harvesting should be cut away.

Propagation

Propagation occurs after a rest period of 1–2 months from March to April. The rhizomes should be separated with a sharp knife or razor blade. Every new propagule should have an upright shoot initiated, which may have already bloomed. If it is necessary to delay planting, rhizomes can be planted temporarily in pots. Selection of desirable plants should be undertaken before propagation.

Diseases

Little is presently known about diseases in this form of cultivation; however, leaf lice, aphids, red spider mites, snails, and caterpillars can cause serious damage. Pest control should be undertaken after consultation with the local extension agent, since control depends on each individual situation. Fungal diseases include *Pythium* and *Fusarium*.

Harvest

It has been demonstrated that the plants which are harvested should have opened their blossoms sufficiently to allow for good keeping quality. The plants reach on the average, a height of 1.50 to 1.80 m. At harvest they are cut at soil level, otherwise the foliage becomes too thick and causes lower production of flowers. Harvest should take place in the late evening or in the morning, because the keeping quality, especially of the leaf, is improved. Before being sorted, they should be placed into water for at least 4 hours.

The leaf is more sensitive (tendency to roll) than the blossom.

Quality control

Recommendations for grading are not yet available for these exotic plants. Since the size of the blossom should have a certain relationship to the length of the stem the following sorting recommendations are provided:

1st quality: Should be free of leaf, stem, or blossom damage and disease free. Stem length should be 75–80 cm.

2nd quality: Should be free of leaf, stem, or blossom damage and disease free. The blossom and stem could be overall lighter in weight. Stem length should be 60–75 cm.

3rd quality: The plants may have slight leaf, blossom or stem damage. No diseases should be apparent. Stem length should be 50–75 cm.

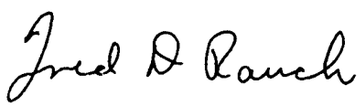
4th quality: All lower quality flowers are classified into this category.

For packing material clear plastic bags are recommended, in 1 m lengths or 80 cm lengths for the lower qualities. The plastic should not be too thin, in order to prevent damage in shipping. Place five to ten flowers per bag with two leaves per flower. The bag must be securely closed at the top and bottom.

The price range is very dependent on market demand. Best prices are gotten in wholesale markets. As of August the price range is best at the auctions. Profits per m^2 are very variable, since they depend of the situation and the quality of *Heliconia psittacorum*.

J. Armbruster
Straelen, West Germany

NOTE: The use of trade names is for the convenience of readers only and does not constitute an endorsement of these products by the University of Hawaii, the College of Tropical Agriculture and Human Resources, the Hawaii Cooperative Extension Service, and their employees.



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