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University of Hawaii at Manoa

In This Issue: FLOWER AND NURSERY INFORMATION
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PROPAGATION OF TROPICAL FLOWERS: ANTHURIUM, BIRD-OF-PARADISE, GINGER AND HELICONIA

Ed. Note: The author was unable to make this presentation at the 12th Annual Ornamental Short Course at the Hotel King Kamehameha in Kailua-Kona.

There are many tropical flowers of commercial importance, but the most important in Hawaii in 1988 include anthurium (wholesale value of $8,022,000), heliconia ($1,364,000), red ginger ($606,000) and bird-of-paradise ($378,000).

Anthurium

Seed propagation

While seed may be collected from chance pollinations, hand pollination is carried out by rubbing the pollen from the pollen-laden spadix onto the receptive spadix of the mother plant. The spadix becomes receptive soon after the spathe unfurls and this is evidenced by a sticky exudate on the surface of the flowers.

The berries mature in 5 to 6 months. While the berries may be sown directly, usually the seed is squeezed by hand from the pulp surrounding it onto the germination medium. We commonly used chopped hapuu (tree fern), but ground sphagnum moss and peat moss also are used.

Seeds germinate in about 2 weeks and the seedlings may be transplanted into community flats when 1 to 1½ inches tall. After 9 to 12 months, they may be transplanted to individual 6" pots to begin flowering. The first flowers are obtained 1½ to 3 years after germination.

Vegetative propagation.

Anthuriums grow slowly, producing only 6 to 8 new leaves and vegetative buds on a stem axis per year. Some cultivars readily produce suckers which can be detached and rooted. Suckers, tip cuttings, single node cuttings, and stem cuttings can be rootd in 3 to 4 weeks under mist.

Tip cuttings are preferable for fast results and should have 2 to 3 leaves. Because of disease problems, it is desirable to have a carefully-maintained Mother Block from which to harvest cuttings.

Single node cuttings may be used to bulk up plant numbers, but they are slower than tip cuttings because the axillary bud must first be activated into growth. Try to use stem section with a leaf, enlarged bud, and developing aerial root.

Heliconia

Seed.

Obtaining seed is the chief problem since many species do not seed naturally in Hawaii because their natural pollinators are not present. Little work has been done to determine which species will cross among the commercially desirable sorts grown here. At present, all we can suggest is to try hand-pollination.

The berry-like fruits take about 12 weeks to mature and will be blue or red in color at this stage and contain 1 to 3 stony seeds. The seeds are separated from the pulp and sown shallowly in flats or held in moist vermiculite or sphagnum moss in plastic bags until germination is observed. Germination occurs sporadically over a 3-month to 3-year period. Transplant when an inch or two

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in height to 6" pots and move out to the field when the roots begin to crowd the pot.

Vegetative propagation.

Division of the fleshly rhizome mat is the usual propagation method. Upright pseudostems are cut apart to obtain more plants, but for direct field propagation, a clump of 3 to 5 pseudostems will give faster regrowth.

For shipping rhizomes, the pseudostem is usually cut to about a foot in length, the soil is removed, roots and old leaf bases trimmed off, and the cut surfaces dusted with a fungicide. We have successfully started small pieces just by holding them in a plastic bag at room temperature for 3–4 weeks, during which time new roots develop and basal buds begin to swell. These units are planted into vermiculite while roots develop, then transplanted to 6" pots. Some species will flower in the pots while others need a greater root mass to nourish the large leaves and flower stalks. Flowering can often occur within a year after planting out into the field.

Gingers–*Seed*

Seed is seldom observed on the red and pink gingers (*Alpinia purpurata*) but other species set seed readily. The seed is borne in bright capsules which split open when the seeds are ripe. The seeds are black and somewhat oily, and may have a red aril. The seed is sown shallowly in a slightly acid, well-drained medium, and germinates readily, in contrast to the heliconias. The seedlings may be transplanted to larger pots as soon as they are large enough to handle.

Vegetation propagation.

The inflorescence of the red and pink gingers develops aerial offshoots in the bract axil. These offshoots may be used as the source of new plants. Some growers will bend the whole flower head into a pot and cover it with soil, severing the mass of rooted offshoots from the mother plant some weeks later. While the offshoots can be rooted individually without rooting hormones, we have found that medium-sized offshoots treated with about 500 ppm auxin (IBA or NAA) root a little faster. The cultivars Jungle Queen, Jungle King, and Kimi Ginger do not develop these offshoots and must be propagated by rhizome divisions.

The rhizomatous mat can be divided in much the same way as for heliconias. Either small clumps of 2 to 4 stems or individual stems can be used. If roots are not well developed on the horizontal rhizome, the upright stem must be cut back to reduce water loss. The individual pieces can be dusted with a fungicide and planted in vermiculite or other well-drained medium while roots and new basal shoots develop.

Bird-of-Paradise

Seed.

Seed is set naturally in Hawaii but crossing can be carried out by hand transfer of pollen. Fold back to two sides of the lower blue portions of the flower to scrape out the pollen. Transfer the pollen to the sticky tip of the lower blue petals. Seed matures 5 to 6 moths later. The seed is extracted from the woody pods and may be sown without further treatment.

Various means of scarification have not improved germination percentage or speed, which normally requires about 90 days. Our most successful results have come from treating the seed in concentrated sulfuric acid (at least twice the volume of acid to seed) for 5 to 10 minutes, then rinsing it in water and soaking overnight in 100 ppm gibberellic acid and sowing directly. The seed should be sown about one-half inch deep; we have used vermiculite, sand, peat, and combinations of media. With this treatment, germination in as little as 30 days has been observed. The root system develops to a greater extent then the top of the plant so transplant into 1 gallon pots once 4 to 5 inches of root have developed.

Vegetative propagation.

The origin of a leafy fan as used for division is at or just below ground level. After cutting apart the fans, strip off the outer leaves down to stem tissue, leaving 4 or 5 leaves on the fan. Trim off rotted stem tissue and treat with a fungicide. Plant the fan in a pot in a well-drained medium, taking care not to pack it too tightly as limited aeration reduces root development. Hold in the shade and water just enough to prevent moisture stress. Sufficient root development to permit transplanting occurs in 3 months.

Commercial growers will transplant a unit of 2 or 3 fan sections directly into the field with good take. The above single-fan system can also be used.

Concluding Remarks

The popularity of tropical cut flowers has created a demand for them among new and established commercial growers as well as home gardeners and hobbyists. Part of the popularity of horticulture lies in the satisfaction which comes from producing new plants from old ones. While seed is an easy way to go and may yield some new and different progeny, the surest way to increase a desirable form is through vegetative means such as cuttings and divisions. A little care and attention to critical phases of root development pays off in a high proportion of well-rooted plants.

Richard A. Criley
Horticulturist, UH–Manoa

COMING EVENTS

Plant Expo

The Hawaii Association of Nurserymen have rescheduled the New Plant Expo for January 9, 1990 from 4 to 7:00 p.m. at the McCoy Pavilion in Ala Moana Park. Mark Takemoto is serving as chairman with assistance from Pat Oka for this event. For further information contact the HAN office at 833-3369.

Landscape Contractors

The Associated Landscape Contractors of America will hold its 1990 convention at the Krystal Vallarta Hotel, Puerto Vallarta, Mexico, on February 4 to 7.

Environmental Concerns Conference

An Environmental Concerns Conference is being planned by the National Council of State Garden Clubs for February 6 to 8, 1990 in Honolulu. Contact Connie Riccio at 623-9958 for further information.

Ornamental Short Course

Tentative plans are to hold the 13th Annual Ornamental Short Course at the Ala Moana Hotel in Honolulu on March 20–21, 1990. Fred D. Rauch, 948-7256.

Flower Conference

A Cut Flower Industry Conference is being planned for March 29–31, 1990 in Hilo. This will include a two-day program, with emphasis on marketing, promotion and industry cooperation, followed by an all day industry tour. For further information contact: Kenneth Leonhardt, 3190 Maile Way, Honolulu, HI 96822. (808)948-8909.

Plant Show

The Annual Hawaii Association of Nurserymen (HAN) Plant Show and Sale is scheduled for the Neal Blaisdell Center in Honolulu on March 30 to April 1, 1990. A number of educational displays and seminars for the general public will be featured.

Interiorscape

The Interior Plantscape Division of the Associated Landscape Contractors of America will hold their Annual Conference and Trade Show on October 10 to 13, 1990 at the Boston Park Plaza, Boston, MA.

HAN Conference

The Hawaii Association of Nurserymen Annual Conference and Mid-Pacific Horticulture Show is tentatively scheduled for Hilo, Hawaii on October 15 to 17, 1990. For further information contact: HAN, P. O. Box 293, Honolulu, HI 96819 (808)833-3369.

ASHS Annual Meeting

The American Society for Horticultural Science (ASHS) will hold their 89th annual meeting at the Sheraton Waikiki Hotel and Sheraton Princess Kaiulani Hotel, Honolulu, Hawaii on July 31 to August 8, 1992. The meeting will be hosted by horticulture faculty at the University of Hawaii and include local industry tours.

AMA PANEL CONCLUDES ONLY TWO PESTICIDES CAUSE CANCER IN HUMANS

An American Medical Association Council on Scientific Affairs concluded that just two pesticide ingredients—arsenic and vinyl chloride—have been proven to be human carcinogens (Aug. 19 Journal of the American Medical Association). Arsenic is used in some wood preservatives, and vinyl chloride once was used as an aerosol propellent.

After reviewing studies on laboratory animals and records from human exposure to suspected carcinogenic pesticides, the AMA decided that further research should be conducted to determine the long term health effects from agricultural chemicals.

While the panel found that "a large number" of pesticides have shown evidence of genotoxicity or carcinogenicity in animals and in vitro screening tests, it observed that for all but two substances evidence to definitely link the substances to cancer in humans was lacking.

The report acknowledged that many chemicals used in pesticides have been shown to cause genetic damage or cancer in animal and laboratory tests, but said such tests cannot reliably predict the same effects on humans. Epidemiologic studies, the council concluded, offered only conjectural evidence at best that pesticides may be carcinogenic.

The Pesticide Label, 1988

EXTENSION CELEBRATES 75th ANNIVERSARY

May 8, 1989 marked the Silver Jubilee of the Smith-Lever Federal legislation that brought into being the Cooperative Extension System, public education services of UH Manoa's College of Tropical Agriculture and Human Resources (CTAHR). Extension programs, many of which assist urban and rural gardeners as well as farmers and agribusinesses, exist nationwide through the cooperation of the U.S. Department of Agriculture and land-grant universities like the University of Hawaii. County offices are found throughout the State and most celebrated the anniversary with open houses for the public.

PESTICIDE REGISTRATION

DIURON
The Hawaii Department of Agriculture has notified the Anthurium growers that the special local need (24(c)) registration to allow continued use of the pesticide DUPONT KARMEX DIURON WEED KILLER (Diuron) on anthuriums grown in hapuu and cinders was approved.

The EPA had ninety (90) days to disapprove, concur with, or modify the label. As a reminder, users must be in possession of label for any pesticide at the time of application.

TEMPO 2
Dr. Arnold Hara advises us the Tempo 2 EC (cyfluthrin), a synthetic pyrethriod from Mobay Corp., is now available to commercial growers in Hawaii. Tempo 2 has a general ornamental label and includes trees, shrubs, flowers and foliage plants.

Tests have shown that Tempo 2 is effective against the orchid weevil, *Orchidophilus aterrimus*, Chinese rose beetle, *Adoretus sinicus*, anthurium thrips, *Chaetanaphothrips orchidii*, and the green scale, *Coccus viridus*, and banana aphid, *Pentalonia nigronervose*, on flowering ginger. Tempo was effective as a barrier treatment against the Argentine ant, *Iridomyrmex humilis*, on raspberry frost protea, *Banksia menzeisii*, but not as effective as Dursban 50 WP. Tempo was also effective against the black twig borer, *Xylosandrus compactus*, but not as effective as Dursban 50 WP.

Tempo was ineffective against the western flower thrips, *Frankliniella occidentalis*, the green peach aphid, *Myzus persicae* and the anthurium whitefly, *Aleurotulus* sp. No phytotoxic symptoms were observed on anthurium, dendorbium, chrysanthemum, and red ginger, when Tempo 2 was applied at 4X the recommended label rate.

THIRAM
Dr. Mike Kawate, Assistant Specialist for Pesticide registration, advises us that the Hawaii Department of Agriculture has approved the registration of THIRAM (SPOTRITE 75 WDG Turf Fungicide, EPA Reg. No. 1001-60) for Phyllosticta Leaf Spot on orchids. This is a special local need (24(c)) registration for use in Hawaii only. The EPA has a ninety-day (90) comment period during which time they may disapprove or concur with the registration. Users must be in possession of the label at the time of application of the pesticide.

DIAZINON
From the Pesticide Label we learn that the EPA has banned the use of DIAZINON pesticides of golf courses and sod farms. This action concluded over a year of hearings concerning the scientific evidence on benefits and risks. The Final Cancellation Order, effective March 29, 1988 prohibits:

1. distribution and sale of all pesticide products containing DIAZINON, with directions for use on home lawns, turf, or grass, unless the pesticide product has a statement on the label which indicates the product must not be used on golf courses or sod farms and
2. use of any pesticide product containing DIAZINON on golf courses or sod farms.

This important information concerning the new restrictions against the sale, distribution, and use of DIAZINON pesticides is essential since any such activity in violation of the Final Order could result not only in substantial penalties, but continued risk to the bird population.

If you wish to keep up to date on the changes in the various pesticides, you may request to be put on the mailing list to receive future issues of THE PESTICIDE LABEL by sending your name and address to:

Agriculture Biochemistry
1800 East-West Road
Henke 329
Honolulu, HI 96822

Fred D. Rauch
Horticulture Specialist

PREPARATION OF ROOTING SOLUTIONS AND TALC DUSTS FOR PROPAGATION

Ed. note: This article is adapted and reprinted from Horticulture Digest No. 58, March 1981.

Nurserymen and gardeners alike know that some plants root easily and others with difficulty. Rooting of difficult-to-root plants can be stimulated with auxin-type growth regulators. While most plants produce their own auxin, sometimes the amount is insufficient or it is rapidly degraded, and poor rooting results. Synthetic auxins can supplement or replace the natural auxin. Two common synthetic auxins are indolebutyric acid (IBA) and naphthalenacetic acid (NAA).

Sources of IBA and NAA or their sodium or potassium salt forms are various horticultural suppliers, chemical companies*, and listings in

trade journals. Prepared talc dust formulations and liquid formulations are available for the grower who does not want to bother making his own. Some liquid formulations are difficult to ship by air because of their alcohol content and regulations limiting shipment of such flammable materials.

*Note: Because IBA is under an EPA examination for possible recall, chemical manufacturers are now reluctant to sell the pure crystalline form. Purchasers often must sign waivers or intention of use forms.

The concentrations used for propagation will vary depending on the maturity of the wood and the method of application. Because they are easily diluted, rooting solutions provide for a greater range of concentrations than do the powders.

Calculations of dilution and preparation of solutions and dusts are most easily carried out using the metric system. Some conversions which may be useful are:

%Solution (w, v)	Milligrams/liter	Grams/liter	Parts per million
%Concentration (w/w)	Milligrams/kilogram	Milligrams/gram	Parts per million
100	1,000,000	1000	1,000,000
10	100,000	100	100,000
1	10,000	10	10,000
0.1	1,000	1	1,000
0.01	100	0.1	100
0.001	10	0.01	10
0.0001	1	0.001	1

The number of parts per million (ppm) always equals the number of milligrams per liter. Percent x 10^4 equals ppm.

Some conversions from the English system of weights and volumes:

Weight

28.35 grams = 1.0 ounce
453.6 grams = 1.0 pound
2000.0 grams = 2.2 pounds

Volume

29.57 milliliters = 1 fluid ounce
4.805 milliliters = 1 teaspoon
14.70 milliliters = 1 tablespoon
473.16 milliliters = 1 pint
946.4 milliliters = 1 quart
3.785 liters = 1 gallon

ROOTING POWDERS

Materials needed:

Talc powder (not talcum powder)
IBA or NAA crystals
Methanol, ethanol, isopropanol (rubbing alcohol), or acetone
mortar and pestle or similar shallow glazed vessel; stirring rod or spoon
scale
bottle and label

Select the concentration of chemical you want to prepare. For instance,

500 ppm for herbaceous cuttings
1,000 ppm for softwood cuttings
3,000 ppm for intermediate wood cuttings
10,000 ppm for hardwood cuttings

In our example, we will choose 1,000 ppm. We want 10 grams of the final powder. Since each gram is to contain 1 milligram IBA, we need to weigh out 10 mg of IBA and 10 grams of talc.

Another way to look at it is to say of every gram of talc, you will need 1 mg of IBA. If you had one pound of talc (about 454 grams), you would need 454 mg of IBA to make a 1,000 ppm dust.

Dissolve the IBA in acetone or alcohol. Only a few milliliters are needed. Mixtures of IBA and NAA can be prepared by dissolving appropriate amounts of each in the solvent.

Place the talc in the mortar and pour on the alcohol solution of IBA. Rinse that container with alcohol and pour it on the talc also. Add enough alcohol to thoroughly wet every particle. Stir thoroughly until creamy in appearance.

Set the mix aside to dry for a few days. When it is thoroughly dry, the pestle may be used to grind the talc back into powder form again. Pour the powder into a bottle or jar, seal, and label with material, concentration, and date. Keep

this material dry and it will remain good for several years. It should be stored in the dark, but refrigeration is not necessary.

A variation of the procedure is to substitute 20 grams of a fungicide such as 50% WP benlate dust for 20 grams of talc in each 100 grams. This provides a mild fungicide for treatment of the cuttings–@10% benlate.

To use the dust formulation, pour a small amount of it into another shallow container. After use, discard the excess which may have become contaminated by contact with the cuttings.

The base of the cutting should be slightly moist so that it will hold some of the powder when dipped into it. Excess powder can be knocked off by tapping the cuttings against the side of the container. Usually, no more than one inch of the base of the cuttings needs to be treated and less is satisfactory.

LIQUID PREPARATIONS

Materials needed:

Methanol, ethanol, or isopropanol (rubbing alcohol); water

IBA or NAA crystals or salt forms: potassium salt of IBA, sodium salt of NAA

scale, graduated cylinder

bottle and label

There are two approaches which may be used. You may make up the final dilute solution (Table 1) or you may prepare a stock solution for eventual dilution with water.

Select the concentration of chemical you want. For instance,

up to	200 ppm	for herbaceous and softwood cuttings and for dilute solution soak method of application.
2,000 to	3,000 ppm	for intermediate wood, ripewood, and broadleaved evergreens.
4,000 to	6,000 ppm	for more mature wood, and difficult-to-root species.
7,000 to	10,000 ppm	for difficult-to-root species.

Instructions for using table:

1. Select from the left column the concentration (ppm) of the rooting-aid needed.
2. Select from the top of the table the volume of rooting-aid needed.
3. The value given where the concentration and volume needed intersect is the quantity (in milligrams of IBA needed).
4. The indicated quantity of IBA is dissolved in about 10 ml of alcohol (ethyl, methyl, isopropyl); bring up to the needed volume with distilled water (Dilute solution).
   The indicated quantity of IBA is dissolved in alcohol (50:50 alcohol:water) and brought up to the necessary volume with alcohol (ethyl, methyl, isopropyl): water mixture (quick dip method).
5. Store in a tightly capped bottle.

Adapted from Commercial Flower Growers' Notes (Georgia) July, August 1980

To prepare a final, ready-to-use solution of 1,000 ppm in one liter using crystalline IBA, 1,000 mg (1 gram) will need to be weighed out. Dissolve this in about 20 milliliters of alcohol. This solution is added to 980 milliliters of water to make one liter containing 1,000 ppm. Table 1 shows amount of IBA to use to make up dilute solutions (under 200 ppm) and concentrated solutions.

If you have a potassium or sodium salt of the chemical, it is already water-soluble. However, it is not considered to be 100% active so an adjustment in the amount to be weighed out must be made. The potassium salt of IBA is only 75% as active as the acid, so you must weigh out 1.33 times as much as for the IBA alone. The sodium salt of NAA is about 90% as active as the acid, so 1.12 times as much is needed as for NAA alone. The salt forms will dissolve in warm water with stirring.

As a more flexible method which will allow you to make up a wide range of dilutions from a single stock solution, it is possible to dissolve your IBA or NAA in alcohol and take small quantities of this for dilution. If refrigerated, some IBA or NAA may crystallize out of solutions, so warm the bottle to get it all back into solution before measuring anything out.

In this case, we may think of concentrated stock solutions of 10,000 to 100,000 ppm. A 10,000 ppm stock solution (1%) would contain 10,000 mg or 10 grams per liter. 100 milliliters would contain 1,000 mg or one gram. A 100,000 ppm stock solution (10%) would contain 100,000 mg or 100 grams per liter. 100 milliliters would contain 10,000 mg or 10 grams. In the 10,000 ppm stock one milliliter contains 10 mg, and in the 100,000 ppm stock, one milliliter contains 100 mg. Keep the bottle sealed tightly to prevent evaporation which might change the concentration.

To make up one half liter (50 ml) of a 2,000 ppm solution one should carry out a calculation to determine how many milligrams of IBA would be needed. In this case, one half liter contains 1,000 mg (a full liter contains 2,000 mg at 2,000 ppm); thus we need enough stock solution to supply 1,000 mg.

Table 1. **Rooting-aid solution. Quantities of IBA and distilled water needed to prepare different concentrations of the dilute solution rooting-aid (20–200 ppm). Quantities of IBA and alcohol (ethyl, methyl, isopropyl) needed to prepare different concentrations of a "quick dip" solution (500–10,000 ppm).**

Desired Concentration (ppm)	Total Volume (ml)									
	100	200	300	400	500	600	700	800	900	1000
	mg IBA									
20	2	4	6	8	10	12	14	16	18	20
40	4	8	12	16	20	24	28	32	36	40
60	6	12	18	24	30	36	42	48	54	60
80	8	16	24	32	40	48	56	64	72	80
100	10	20	30	40	50	60	70	80	90	100
120	12	24	36	48	60	72	84	96	108	120
140	14	28	42	56	70	84	98	112	126	140
160	16	32	48	64	80	96	112	128	144	160
180	18	36	54	72	90	108	126	144	162	180
200	20	40	60	80	100	120	140	160	180	200
500	50	100	150	200	250	300	350	400	450	500
1000	100	200	300	400	500	600	700	800	900	1000
1500	150	300	450	600	750	900	1050	1200	1350	1500
2000	200	400	600	800	1000	1200	1400	1600	1800	2000
2500	250	500	750	1000	1250	1500	1750	2000	2250	2500
3000	300	600	900	1200	1500	1800	2100	2400	2700	3000
3500	350	700	1050	1400	1750	2100	2450	2800	3150	3500
4000	400	800	1200	1600	2000	2400	2800	3200	3600	4000
4500	450	900	1350	1800	2250	2700	3150	3600	4050	4500
5000	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
5500	550	1100	1650	2200	2750	3300	3850	4400	4950	5500
6000	600	1200	1800	2400	3000	3600	4200	4800	5400	6000
6500	650	1300	1950	2600	3250	3900	4550	5200	5850	6500
7000	700	1400	2100	2800	3500	4200	4900	5600	6300	7000
7500	750	1500	2250	3000	3750	4500	5250	6000	6750	7500
8000	800	1600	2400	3200	4000	4800	5600	6400	7200	8000
8500	850	1700	2550	3400	4250	5100	5950	6800	7650	8500
9000	900	1800	2700	3600	4500	5400	6300	7200	8100	9000
9500	950	1900	2850	3800	4750	5700	6650	7600	8550	9500
10000	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000

From a liter of 10,000 ppm stock, we need 100 milliliters or from a liter of 100,000 ppm stock, we need 10 milliliters. This would be added to 400 milliliters or 490 milliliters of water respectively. Since these are alcohol solutions, they will mix readily with water at room temperatures. For sprays or quick dips we will use a final solution of 50% water and 50% alcohol as this penetrates the stem wall. Do not exceed the 50:50 mix as high alcohol concentrations will damage the tissues. For dilute soaks, less than 1% of the solution should be alcohol.

Commercial solutions will usually recommend dilution ratios; e.g., 1:4, 1:9, 1:19, with water the usual diluent. As a quick reference using a 1% stock solution, the following dilutions provide the designated concentrations:

parts stock: parts Diluent		
1:19	= 500	ppm (0.5 mg auxin in 1 ml)
1:9	= 1,000	ppm (1.0 mg auxin in 1 ml)
1:4	= 2,000	ppm (2.0 mg auxin in 1 ml)
1:1½	= 4,000	ppm (4.0 mg auxin in 1 ml)
1:1	= 5,000	ppm (5.0 mg auxin in 1 ml)

Application of liquids:

1. Dilute solution soak.
   The basal one inch of prepared cuttings is immersed in the dilute solution and allowed to stand for an appropriate time, usually 12 to 24 hours. During the soak, the cuttings are held in a shaded, humid, area at about 68–70° F. After removal, the bases of the cuttings are washed with water. It is not a good idea to

re-use the solution if you believe that it could have become contaminated.

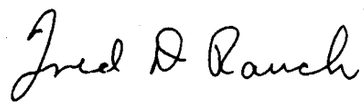
2. Quick dip method.
   After preparation of the solution (50% alcohol content), the basal ¼ to ½ inch of the cutting is dipped in it for 5 to 15 seconds. Do not wash the base of the cutting. Large volumes of solution are usually not necessary. Again, the used solution is not usually saved for re-use because of possible contamination.

3 Spray method.
   After preparation of the solution (50% alcohol), it is poured into an atomizer-type sprayer. A handful of cuttings, their bases bunched together, may be treated at the same time with just a few squirts from the mister. Less solution is used and the extras may be saved for later use since it has not been contaminated. The cutting bases are not washed before sticking the cutting in the propagation medium.

Note: A software program entitled HORMONES has been developed to aid the nursery operator in preparation of liquid and talc formulations of rooting hormones. For information, contact Dr. Dewayne L. Ingram, 2523 Fifield Hall, The University of Florida, Gainsville, FL.32611

Richard A. Criley
Horticulturist

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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