Hawaii Cooperative Extension Service

HORTICULTURE DIGEST

HITAHR · College of Tropical Agriculture and Human Resources
U. S. Department of Agriculture Cooperating

Department of Horticulture
University of Hawaii at Manoa

In This Issue: FLOWER AND NURSERY INFORMATION
No. 74, November 1984

TABLE OF CONTENTS

SHORT COURSE DATES SET

The dates of March 28–30, 1985 have been set for the Annual Ornamentals Short Course to be held at the Maui Community College, Kahului, Maui. As in the past, this program will be held in conjunction with the annual Fertilizer Conference. Tentative plans are to hold the educational sessions on Thursday and Friday, March 28–29, and have the industry tour on Saturday.

EFFECTS OF METHOD OF APPLYING FERTILIZER ON ANTHURIUM FLOWER PRODUCTION, A PROGRESS REPORT[1]

Many anthurium nurseries in Hawaii have installed irrigation systems in their saranhouses to supplement their water needs during the dry seasons. Along with this development has come the desire to inject fertilizers through the irrigation system and the question of how this method would compare to the conventional application of solid fertilizers to the media surface. Certainly, labor costs would be saved.

Nutritional studies on anthurium have indicated that applications of approximately 300-400 lbs of N, P and K/A/year are needed for good flower production, size and stem length (*1,2*). Poole, et al. (*3*) found no difference in flower yield, flower size or stem length between potted anthurium (cv. Uniwai and Marian Seefurth) plants fertilized with either liquid or solid fertilizer. To determine whether plant response in the field would be affected by different application methods of equal amounts of N, P, K/A/year a study was initiated at the Waiakea Agricultural Experiment station. Liquid, solid or a combination of liquid and solid fertilizer applications of 100, 200, 300, and 400 lbs N, P, K/A/year were tested in this current study.

The experiment was set up in a randomized complete block design with four replicates. Black cinder beds 2' x 24' were constructed on the soil surface. Each bed was subdivided into four 2' x 6' subplots using fiberglass dividers. Each subplot was planted with 10 mature 'Ozaki Red' anthurium plants. The subplots were given the following fertilizer treatments:

1. Solid fertilizer (Osmocotes 14-14-14) at 400 # N/A/yr
2. Solid fertilizer (Osmocote 14-14-14) at 300 # N/A/yr
3. Liquid fertilizer (Peters 20-20-20) at 400 # N/A/yr
4. Liquid fertilizer (Peters 20-20-20) at 300 # N/A/yr
5. Liquid fertilizer (Peters 20-20-20) at 200 # N/A/yr
6. Liquid fertilizer (Peters 20-20-20) at 100 # N/A/yr

[1] Partially funded by GACC

COOPERATIVE EXTENSION SERVICE · 3050 MAILE WAY · UNIVERSITY OF HAWAII · HONOLULU, HAWAII 96822

7. Solid fertilizer (Osmocote 14-14-14) at 200 # N/A/yr + Liquid fertilizer (Peters 20-20-20) at 200 # N/A/yr
8. Solid fertilizer (Osmocote 14-14-14) at 100 # N/A/yr + Liquid fertilizer (Peters 20-20-20) at 100 # N/A/yr

(Note: Fertilizer rates are calculated and reported at # N, P_2O_5, K_2O/A/yr.)

The annual solid fertilizer rates were divided into 4 equal amounts and evenly applied to the black cinder surface 4 times a year. The soluble liquid fertilizer rates were divided into 26 equal amounts and applied with a hand pump sprayer to the plants every 2 weeks. Although the liquid fertilizer was applied primarily to the leaves, there was significant runoff onto the medium. Minor elements found in Peters liquid feed fertilizer were compensated for in the solid Osmocote fertilizer treatments by applying solid minor elements in amounts approximate to that found in the Peters formulation, to the medium surface. Approximately 0.49 acre-inch/day irrigation was applied at midday. Plants were grown under 80% shade and a maintenance program of fungicide and insecticide sprays was applied as required. Data were gathered on flower production, length of flower stem and flower size. Length of flower stem was measured from the base of the stem to the point of attachment to the spathe. Flower size is presented as the product of the length and width of the spathe. All data were taken from the original mother plant only. Side shoots were left to emerge freely. The plants were grown for 6 months in the experimental plots before data were taken. The experiment will run for 3 years. This publication is a progress report after 2 years of data collection.

Results and Discussion

Flower Production: The influence of method of fertilization on flower production is shown in Table 1. Solid slow release fertilizer at 400 and 300 # N/A/yr, soluble liquid fertilizer at 300 and 400 # N/A/yr, and the combination of the solid and liquid fertilizers at 200 or 100 # N/A/yr each resulted in good yields. These results show that application of the liquid fertilizer alone and in combination with the solid at # N/A/yr rates comparable to the solid fertilizer can produce as many flowers as application of the solid ground fertilizer. The availability of nutrients to plants over a period of time, which is made possible by the slow release property of the solid fertilizer, then can also be provided for by applications of a liquid fertilizer, such as Peters, every other week for equal flower production. This is a significant fact for the growers as the cost of labor per acre to apply solid fertilizer can be reduced or eliminated if fertilizer can be applied through the irrigation system. The soluble liquid fertilizer given at both 100 # and 200 # N/A/yr resulted in reduced yields. Apparently, rates of 100 # N/A/yr even if available every two weeks was not sufficient to sustain high yields, whereas 200 # N/A/yr resulted in acceptable yields only if applied in a combination of 100 # liquid and 100 # solid N/A/yr. The results show that the most economical treatment of the three fertilizer methods tested, in terms of amount of N/A/yr required for good flower production, were the slow release solid fertilizer at 300 # N/A/yr by ground application, the soluble liquid spray at 300 # N/A/yr, or the combination application of the solid at 100 #N/A/yr + liquid at 100 # N/A/yr.

Flower Size: The influence of method of fertilization on flower size is given in Table 2. Ground application of the solid fertilizer at 300 and 400 # N/A/yr gave significantly larger flowers than the soluble liquid fertilizer spray at all rates given alone. The combination of the solid and liquid fertilizers gave intermediate results between that of each type alone. The results show that the solid fertilizer seems to have a major influence in producing large flowers as compared to the liquid fertilizers. The continual availability of nutrients provided by the slow release solid granules is apparently an influential factor on flower size as compared to a biweekly availability of nutrients with the soluble liquid fertilizer which are also more easily leached from the media. Perhaps a weekly application of the liquid fertilizer may prove comparable to the slow release solid fertilizer.

Flower Stem Length: The influence of application of slow release solid or liquid fertilizers on flower stem length is given in Table 3. Solid slow release fertilizer at 300 # and 400 # N/A/yr and the combination of the solid and liquid fertilizer at 200 # or 100 # N/A/yr each gave longest stem length. Again, as in flower size, ground application of the solid fertilizer gave better results, producing significantly

Table 1. Influence of Type of Fertilizer on Flower Production of 'Ozaki Red' Anthurium.

Treatment	No. of flowers/plant/yr.
Solid Fertilizer 400 # N/A/yr	3.8 a[z]
Solid Fertilizer 300 # N/A/yr	3.8 a
Solid 200 # N/A/yr + Liquid 200 # N/A/yr	3.7 ab
Solid 100 # N/A/yr + Liquid 100 # N/A/yr	3.6 abc
Liquid Fertilizer 300 # N/A/yr	3.5 abc
Liquid Fertilizer 400 # N/A/yr	3.5 abc
Liquid Fertilizer 200 # N/A/yr	3.3 bc
Liquid Fertilizer 100 # N/A/yr	3.2 c

[z] Mean separation by Duncan's Multiple Range Test, 5% level.

Table 2. Influence of Type of Fertilizer on Flower Size of 'Ozaki Red' Anthurium.

Treatment	Flower Size (sq. inches)
Solid Fertilizer 300 # N/A/yr	31.1 a[z]
Solid Fertilizer 400 # N/A/yr	29.1 ab
Solid 100 # N/A/yr + Liquid 100 # N/A/yr	26.6 bc
Solid 200 # N/A/yr + Liquid 200 # N/A/yr	26.4 bc
Liquid Fertilizer 400 # N/A/yr	25.4 c
Liquid Fertilizer 300 # N/A/yr	25.2 c
Liquid Fertilizer 200 # N/A/yr	21.6 d
Liquid Fertilizer 100 # N/A/yr	20.8 d

[z] Mean separation by Duncan's Multiple Range Test, 5% level.

Table 3. Influence of Type of Fertilizer on Flower Stem Length of 'Ozaki Red' Anthurium.

Treatment	Flower Stem Length (inches)
Solid Fertilizer 300 # N/A/yr	20.8 a[z]
Solid Fertilizer 400 # N/A/yr	20.0 ab
Solid 200 # N/A/yr + Liquid 200 # N/A/yr	19.2 ab
Solid 100 # N/A/yr + Liquid 100 # N/A/yr	18.5 bc
Liquid Fertilizer 400 # N/A/yr	17.9 bcd
Liquid Fertilizer 300 # N/A/yr	17.8 bcd
Liquid Fertilizer 200 # N/A/yr	16.6 cd
Liquid Fertilizer 100 # N/A/yr	15.9 d

[z] Mean separation by Duncan's Multiple Range Test, 5% level.

longer stems than the liquid fertilizer given as a spray at any rate. The controlled release solid fertilizer, in providing a continual availability of nutrients to plants, apparently has a major influence in producing long stems in addition to its influence over flower size.

In summary, the experiment seems to indicate that taking into consideration the factors of yield, flower size and flower stem length, ground application of a solid fertilizer at 300 and 400 # N/A/yr gave all around best results, followed by the combination of the solid and liquid fertilizers at 200 or 100 # N/A/yr each. The liquid spray alone at 400 and 300 # N/A/yr gave comparable results to the slow release solid fertilizer or the combination of both in yield, but poorer results in stem length and more so with flower size.

Tadashi Higaki
Horticulturist
Joanne Imamura
Research Associate

Literature Cited

1. Higaki, T. and R. T. Poole. 1978. A media and fertilizer study in anthurium. J. Amer. Soc. Hort. Sci. 103 (1): 98–100.
2. Poole, R. T. and B. A. Greaves. 1969. Nitrogen, phosphorus and potassium fertilization of *Anthurium· andraeanum* 'Nitta' and 'Kaumana'. Proc. Amer. Soc. Hort. Sci. Tropical Region. 13: 367–372.
3. Poole, R. T., R. Sakuoka and J. A. Silva. 1969. Nutrition of *Anthurium andraeanum*. Proc. Amer. Soc. Hort. Sci. Tropical Region. 12: 284–287.

NURSERY NOTES

"Big Island" Awaits '85 ALCA Show

The Kona Surf Resort Hotel in Kailua-Kona, Hawaii, will be the site of the Associated Landscape Contractors of America Annual Convention and Trade Exhibit, January 20–24.

Educational sessions based on the theme, "Profit in the Pacific" will be January 21, 23, and 24. The trade show, featuring equipment and table top exhibits, will be January 22 and 23.

Informational brochures on the convention and trade show will be available shortly. Exhibit space is available now and can be reserved by calling the ALCA office, (703) 821-8611.

Changes in the Dutch Auction (Ball, 1983):

"Almost half of the ornamentals that go through Aalsmeer are *not* sold by the famous clock auction!"

A large volume is sold through BMB– an acronym for a long Dutch word which means, in effect, a wholesale pot plant business. About 40% of the sales of potted plants and foliage sold at Aalsmeer goes through BMB: This translates to about $45 million a year. BMB receives plants from Holland and the world over. BMB is proud of the movement of bigger (5' to 15' tall) Florida foliage plants through BMB. The Florida plants are acclimatized after arriving via 12-day surface shipment.

According to BMB manager, Peter Nagtegaal, "In most cases we have a sample here (in the BMB's 50' x 100', "sample" greenhouse at Aalsmeer) of the growers' lot of plants. The sample is guaranteed to be a fair representation." BMB sales people have a computer display before them constantly; a basic weekly list of availability is there plus hourly or up-to-the-minute updating from all sources.

BMB is grower-owned, grower-controlled. There is a total staff of 40 people including 17 salesmen. The grower pays 5% for selling through BMB.

Ornamentals Northwest
July–Sept. 1984

AAN's "Discover" Gains Momentum

Retail and landscape member firms of the American Association of Nurserymen are discovering new selling possibilities through the AAN's "Discover the Pleasure of Plants" promotion program, begun early this year.

Although the consensus of those members polled on the efficacy of the plan thought its success or failure was "too early to tell," they did say business trends seem to be on the upswing. Since the program's activity is designed, in part, to help extend the purchasing season beyond spring into summer and then reinforce the fall planting promotions, AAN spokesmen believe more indications of results should be available later on.

The "Discover the Pleasure of Plants" promotion program is designed by the AAN to coordinate with this year's international advertising action of the Nursery Marketing Council which began Memorial Day weekend this spring and Labor Day weekend in the fall, with network radio spots, tie-in commercial tape for local use and, new this year, ads both spring and fall in four major consumer magazines.

Weeds, Trees & Turf
Vol. 25, August 1984

Horticulture Student Wins Award

Michael Gallant, a senior in horticultural science at the University of Hawaii-Manoa, has won a National Council of State Garden Clubs Scholarship of $2,500. The announcement was made by Mrs. August Riccio, president of the Hawaiian Federation of Garden Clubs.

Speaking of Pesticides

Do you sometimes wonder if your land would be worth more if sold for development rather than operating a greenhouse? In California, an environmental impact report says a former nursery site slated for 182 factory-built homes is contaminated with residues of insecticides, herbicides, fungicides, plant-growth inhibitors and other toxic chemicals like gasoline and oil. Specific chemicals included chlordane, DDT, orthene, malathion, parathion, carbaryl, paraquat, diquat, Banrot, benomyl, captan, Truban, Cycocel and B-Nine (sound familiar?).

If the State Department of Health Services designates the property site as a hazardous-waste site, the California Health and Safety Code would prohibit development on the land.This situation emphasizes your need for proper pesticide use and disposal!

Florist's Review
March 8, 1984

Market Development Notes from DOA

The Governer's Agriculture Coordinating Committee recently approved the Hawaii Anthurium Product Promotion Committee's proposal for anthurium product promotion. This $45,000 program will consist of trade advertising, public relations activity, and trade show participation; the bulk of which will be accomplished by the Honolulu Branch of the advertising agency of Ogilvy and Mather.

Bob Morimoto, of the Department of Agriculture, has recently coordinated a contract with Herb Mitchell and Associates of California to study the feasibility of a U. S. mainland distribution center for Hawaii's floriculture industries.

Tom Freeman, of the Department of Agriculture, met with representatives of the floral lei industry in late June to form a statewide organization. At this meeting, the name Hawaii Floral Lei Association was selected, officers were elected, and by-laws were adopted. The new officers are: Ellarene Yasuhara, President; John Lichnovsky of Molokai, Vice-President; Maile Lee, Secretary; and Geraldine Gilbert, Treasurer. This new organization (formed to foster the orderly growth of the industry, and to promote the use of floral leis made with Hawaii-grown lei flowers) has applied for non-profit corporate status with the State, and will soon propose a promotional program to the Governor's Agriculture Coordinating Committee.

SIGN OF THE TIMES

During the 70's the trend was for "Big" companies to come into the floriculture industry through the acquisition of existing firms. More recently the trend seems to have reversed itself.

In the spring of 1979 the Ralston Purina Company announced its intention to eventually dispose of its Green Thumb division. Green Thumb was a monster foliage operation in Florida, having maybe one-third of all of Florida's foliage production. It was disposed of because it "does not have the potential to measure up to our requirements. In addition, the disposition of these assets will eliminate on-going operational losses."

Campbell Soup Co. announced in late 1983 that its Pepperidge Farm subsidiary has agreed in principle to sell its four Lexington Gardens industries, with 100% financing, to the managers of each unit at a total cost of about $5 million.

This spring '84 George Todd (who with Bud Leisey established Speedling Inc. in 1969) returned to Speedling after it was purchased by Celanese Corporation in 1981. In September '83, Celanese (a Fortune 500 company) decided to divest itself of Speedling, giving Todd an opportunity to reacquire the company.

And now we have Amfac's announcement calling for divestiture of its eight Horticultural Group units. Other "groups" of Amfac, a New York Stock Exchange listed company, include: wholesale distributers of drugs, electrical and mechanical supplies; hotel and resort ownerships; food processing; retailing; agriculture and asset management. Revenues for the 1984 second quarter were $602 million! Why is Amfac divesting all of its horticulture operations? According to Myron DuBain, President and CEO, "while these horticulture activities do not fit our growth plans, we and our investment bankers believe that they are attractive and desirable to others in their respective industries."

"For Amfac," says Mr. DuBain, "horticulture has proven to be a series of small businesses which we do not believe to be conducive to effective corporate management."

"The nurseries' segment of our business has been our biggest horticulture problem over the past two years... Amfac's long-range plan will divest operations that have shown losses or low returns in recent years."

So what does all this mean? It suggests that while the ornamental horticulture/floriculture industry still has growth and profit potential it is not conducive to large corporate management. It appears to operate best as a series of small businesses. There also appear to be some unanswered questions. Is there an optimum size for such firms and are there some alternatives for more effective marketing?

Fred D. Rauch
Horticulture Specialist

Adapted from article by A. O. Voigt in Flower Marketing Information, Aug. 1984.

AVAILABLE PUBLICATIONS

The proceedings of the Fifth Annual Ornamentals Short Course held at the Makaha Resort in 1982 is now available. This publication, Research Extension Series 043, contains most of the presentations divided into 2 major sections: Crop Management–culture, production, handling and Business Management–marketing, promotion, finance, tax. Those wishing to have a copy should contact the Horticulture Department, 3190 Maile Way, Room 102, Honolulu, Hawaii 96822.

COMPARISON OF SEVERAL SLOW-RELEASE FERTILIZER FOR FICUS PRODUCTION

The use of slow-release fertilizers has become a standard practice in the production of high quality foliage plants. Several material are currently available in Hawaii and this study was established to compare some of these on the growth of ficus.

Uniform rooted cuttings of *Ficus benjamina* 'Exotica' were planted one per pot in 6-inch (155 mm) plastic azalea pots in a 1:1 (v:v) peat: perlite potting mix, amended with 8 lbs. dolomite, 1.5 lb. Micromax (a micronutrient blend manufactured by Sierra Chemical Co., Milpitas, CA), and 1 lb. treble superphosphate

Table 1. Slow-release fertilizer materials and rates.

Fertilizer	Analysis	Rate (gm/cu ft)[2] Low	Medium	High
1. Resin coated (RC)	18-6-121	85	142	198
2. Resin coated (RC)	17-7-12	141	198	255
3. Urea Formaldehyde & Fritted Potassium (UF & FK)	10-10-10	117	144	168
4. Isobutylidene Diurea (IBDU)	20-5-5	42	63	76

[z] Based on manufacture's recommendations

Table 2. The influence of selected slow-release fertilizers on growth of *Ficus benjamina* 'Exotica'.

Treatment[z]	Height increase (cm)—months 1	2	3	4	5	6
RC 18-6-12	16.3 a[y]	24.1 a	37.9 a	46.5 a	55.3 a	56.5 a
RC 17-7-12	13.6 ab	22.9 a	34.4 b	42.0 b	50.4 b	51.5 b
UF + FK 10-10-10	11.7 b	16.0 b	29.3 c	34.7 c	42.5 c	44.9 c
IBDU 20-5-5	13.0 b	16.4 b	17.4 d	16.9 d	18.0 d	18.4 d

[z] RC = resin-coated (Osmocote); UF + FK = urea formaldehyde with fritted potassium; IBDU = isobutyledene diurea.

[y] mean in columns followed by the same letter are not significantly different.

per cu. yard. Slow-release fertilizer sources consisted of 2 resin-coated (RC) materials (Osmocote) 18-6-12 and 17-7-12, urea formaldehyde with fritted potassium (UF + FK) 10-10-10, and isobutylidene diurea (IBDU) 20-5-5 at 3 rates (low, medium, and high) as recommended by the manufacturer (Table 1), incorporated into the media for each treatment. In addition, the UF + FK material was supplied again as a top dressing at a rate of one level teaspoonful 3 months after the start of the experiment.

The plants were grown in 80% saran shade in the Magoon Research Facility saranhouse at the University of Hawaii at Manoa Campus. Temperatures ranged from 21-32°C during the experiment. The experiment was set-up in a randomized complete block with 10 replicates.

Evaluation of the plants consisted of monthly measurements of plant heights taken from pot rim to the tip of the longest shoot. In addition, two samples of approximately 20 recently matured leaves each were taken monthly from each of the twelve fertilizer treatments for tissue analysis.

Analysis of the results show that the rates used in this study for the 4 slow-release fertilizers had no effect on the growth of ficus. The data from the 3 rates were combined for each fertilizer source. After 2 months, plants grown with RC fertilizers were taller than with the other 2 fertilizer sources (Table 2). The 2 RC materials produced similar growth curves, but after 3 months there was a significant difference in height between the RC sources with the 18-6-12 formulation resulting in slightly taller plants.

The plants treated with the UF + FK fertilizer were of good quality with dark green color but were 20% shorter than those receiving the 18-6-12 RC fertilizer. Plants receiving the IBDU fertilizer made very little growth after the second month and were very yellow and chlorotic.

The tissue analysis results indicate that reduced levels of nitrogen in the foliage tissue of plants treated with IBDU were probably the cause of the poor growth with this fertilizer (Table 3). The nitrogen levels in the foliage for the other 3 fertilizers were within the ranges

Table 3. Influence of slow-release fertilizer source on elemental tissue analysis of *Ficus benjamina* 'Exotica.'

Treatment[z]	Months	% Elemental tissue analysis–dry weight		
		Nitrogen	Phosphorus	Potassium
RC 18-6-12	3	2.60[y]	0.26	2.44
	4	2.34	0.26	2.17
	5	2.37	0.25	2.01
	6	2.16	0.19	1.53
RC 17-7-12	3	2.41	0.28	2.62
	4	2.23	0.26	2.03
	5	2.30	0.24	1.79
	6	2.11	0.20	1.49
UF + FK 10-10-10	3	1.35	0.20	2.26
	4	2.68	0.30	2.57
	5	2.24	0.23	1.77
	6	1.92	0.20	1.44
IBDU 20-5-5	3	1.12	0.18	1.60
	4	0.88	0.14	1.27
	5	0.94	0.12	1.08
	6	0.92	0.14	0.93
Suggested foliage levels (Florida)		1.3–1.6	0.10–0.20	0.6–1.0

[z] RC = resin-coated (Osmocote); UF + FK = urea formaldehyde with fritted potassium; IBDU = isobutyledene diurea.
[y] Mean of 6 observations.

suggested by Henley (1) for Florida grown plants. The levels of phosphorus and potassium in the tissue were either within or exceeded the suggested Florida ranges.

The results of this experiment show that good quality plants can be produced with either the RC or UF + FK fertilizers but the best growth was obtained with the 18-6-12 formulation of Osmocote. It also appears that the applied rates of the IBDU material were too low and a higher rate might produce acceptable ficus plants.

Philip A. Davis
Former Graduate Student
Fred D. Rauch
Horticulture Specialist

Literature Cited

1. Henley, R. W. 1977. Foliar analysis of tropical foliage plants. Fla. Foliage Grower 14(8): 1–3.

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.

Fred D. Rauch
Extension Specialist in Horticulture