BROMELIADS, PART FIVE

Flower Induction

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Assuming that house plant lovers have sufficient interest in bromeliads as indoor plants, two problems exist for the commercial producer: (1) failure to come true from seed and offshoots and (2) imprecise flowering times. If clonal selections are purchased, the first problem may be avoided. It is regrettable that information is not available regarding "better" clones and varieties, or their distributors. However, there is a partial solution for imprecise flowering times. Some bromeliads flower once a year, during the same season, but others grow for years with only vegetative increment. This irregular flowering may be corrected by several inducing techniques. The commercial grower could benefit greatly by year-round and holiday sales.

Commercial pineapples are frequently subjected to chemical flower induction and the family as a whole is easily managed by this method. Fertilization is stopped three months before induction (Sheehan and Conover 1973) and only healthy plants large enough to flower are used. Careful handling when removing algae and rinsing cups is necessary to prevent damage to leaves and the growing point. Foliar spray and "well-drench" methods are used, the former requiring a dry surface. Long and short day species exist and conditions may be so controlled as to sustain vegetative growth until induction.

Recently much experimentation has been done with Omaflora (Beta-hydroxyethylhydrazine-BOH). Evidence of leaf burn at dosages above 2500 ppm occurred

with Billbergia pyramidalis during experiments by Cathey and Taylor (1972). The well-drench technique was used (fill the rosette "well" with solution) with severe injury to the growing tip occurring at concentrations above 2500 ppm. Flowering occurred in 28, 32 and 40 days when grown in temperatures of 60, 65 and 70 respectively. Smaller dosages at intervals did not encourage flowering. Omaflora was less effective as a foliar spray. It promoted flowering at 5000 ppm with some leaf damage. Death to the growing tip resulted above concentrations of 10,000 ppm. In an earlier article on the same topic, Drs. Cathey and Downs pointed out that photoperiod need not be controlled after induction (1965).

Calcium carbide (1 tsp/gal) dissolved in water, and added to the tube after fizzing stops, prevents two difficulties despite its success in inducing flowering (Graf 1963)--scales may become clogged and an unsightly white precipitate remains. The gas released upon hydrolysis is acetylene, while with BOH it is ethylene.

The apple-in-the-bag method leads to initiation in six to fourteen weeks (Milstein 1971), the initiator being ethylene released by the apple. The plant is drained and placed in a transparent, airtight plastic bag with a large, ripe apple for four or five days after which time the fruit is removed and water replaced.

The exact biochemistry of flower induction is not known, although it is strongly suspected that the two aforementioned gases stimulate inhibitory concentrations of the auxin, indole acetic acid, halting vegetative growth (Gruelech 1973). Subsequent evidence indicates that ethylene, which is also a natural plant

"phytohormone," is in turn controlled by auxin levels in the plant (Gruelech 1973). The Pineapple Family is unique in this promotion of flowering, since every other plant group is inhibited from flowering by artificial ethylene induction (Gruelech 1973).

Claims have been heard from time to time that flowering can be encouraged by growing plants dry, particularly with the popular Aechmea fasciata. One must question the practice of subjecting plants to conditions other than those optimal for the photosynthetic and respiratory processes of growth. Wood smoke, auto exhaust, smog, herbicides and auxins such as 1-Napthalene Acetic Acid and 2,4-Dichlorophenoxyacetic Acid have occasionally promoted flowering (Cathey and Downs 1965).

Results obtained by Cathey and Taylor (1972) were as follows: Flowering was promoted in the dosage range tested (500-10,000 ppm) with leaf damage only at 5,000-10,000 ppm; none flowered below 500 ppm although the "red lips" of Neoregelia carolinae 'variegata' were darker and prematurely formed. Like Omaflora, ethephon proved less effective applied as a spray. A concentration of 2500 ppm was necessary for flowering. Unlike Omaflora, no tip or leaf damage was severe enough to noticeably detract from the plant's appearance, even at 10,000 ppm.

Utilizing Billbergia pyramidalis, Cathey and Taylor (1972) also noted the following results with the spray method. Age of the plants greatly influenced the effectiveness of foliar sprays. Offshoots treated prior to severing from the mother were unresponsive. Partially-developed offshoots were erratic in forming

flowers. Only developed offshoots (actively growing with visible well and clasping leaves) responded as mentioned previously. It was similarly concluded that effectiveness is proportional to size of the specimen since the amount of spray necessary to cover the plant increases significantly with increased plant size.

Experiments with much weaker concentrations of Ethrel (Cathey and Taylor 1972) applied to plants which were in plastic bags indicated that much of the chemical is lost to the air and that perhaps flowering occurs at much lower concentrations than previously indicated.

Finally, it was concluded that erratic results (Cathey and Taylor, 1972) may be experienced when: (1) fertilization is not withheld for a sufficiently long period beforehand, (2) plants are not mature enough, (3) photoperiod is not adjusted beforehand, (4) the chemical solution stands before use for a period of over 24 hours, (5) plants are not cleansed of algae, or (6) multiple sprays at lower concentrations than 2500 ppm (1000 ppm for Aechmea and Ananas) were employed.

Tests in the UConn greenhouses have been conducted using ethephon (Florel or Ethrel). The technical name is 2-chloroethane phosphonic acid (active ingredient 3.9%). Severed pups have been repotted and grown in conditions identical to those of the mother plants for seven months. The potting mix is coarse perlite (1 part), sandgrit (1 part), leaf mold (1 part), fir-bark chips (2 parts) and sphagnum peat (2 parts). No limestone was added because its need has not yet been ascertained. The pH is 4.5 with most of the acidity derived from the 3.2 peat. This may be too low although the plants are epiphytes.

Since repotting, many specimens have acquired a vigorous appearance along with throwing pups, and several flowered within a month after detachment from the mother plant. However, repotting took place during the last week of March and the influence of daylength is plausible.

Forty-two plants of four different species were given "well drench" treatments--16 Billbergia 'Santa Barbara,' 8 Vreisia 'Foster's Favorite,' 10 light-green Aechmea sp., and 8 very large yellow-green Aechmea sp. These were paired up according to size and visible age, which ranged from immature to a size identical to mother plants.

Induction was on October 28 at 11:00 a.m. on a sunny morning with greenhouse temperatures at 65-70°F. Florel was diluted with lukewarm water to a concentration of 3000 ppm. Forty ml. was poured into each "well" with the exception of the large Aechmeas where 120 ml. was given.

Fertilization was not withheld nor was photoperiod controlled. All plants appeared healthy and no flowers were visible when the chemical was applied.

After six weeks, the best results were evident on the smaller Aechmeas and Vreisias. Out of eleven induced plants, one small one failed to flower. Out of seven controls, two flowered. It is reported (Cathey and Taylor, 1972) that both the genera Aechmea and Vreisia are winter flowerers (short-day plants). This may deter the results of the study although in four cases two "sister" plants (off of the same mother) of comparable size were paired with the control showing no flower while the induced plants sent up glorious spikes. It would appear also that the chemical is not translocated from one pup to another.

The eight larger Aechmeas showed less successful results with three inductions out of four failing although no controls flowered either. Billbergia 'Santa Barbara' is a long-day plant (Cathey and Taylor, 1972) and it alone produced negative results after treatment. Out of the eight induced, two formed flowers; out of eight controls, two flowered. The flowers, although induced to form a recognizable shape and spike, remained inside the "well" and aborted before maturation.

These results indicate that: (1) since flowers were observed at the four-week post-treatment stage, more rapid induction is possible than that observed by Cathey and Taylor (1972); (2) concentration, at least with Billbergia 'Santa Barbara' should be reduced to 2500 ppm; (3) very probably the chemical is not translocated from pup to pup when they are on either side of a mother plant; (4) photoperiod may be important, as concluded by Cathey and Taylor (1972) although withheld fertilization may not; (5) significantly larger specimens may require much larger amounts of the chemical for induction to occur; (6) most important, I believe, are the two cases in both Vreisia and the smaller Aechmeas where one treated "sister" plant flowered while the control did not. To confirm the reliability of this method of induction, plans include treatment of all species at a local retail shop. Truly, treatment with ethephon deserves further trials by greenhousemen and researchers during both long and short days so that more evidence may be accumulated.

Bibliography

Cathey, Henry and Downs, R. J. Regulating the flowering of bromeliads. The Exchange, Vol. CXL11, No. 10, March 6, 1965.

Cathey, Henry and Taylor, R. L. Flowering of bromeliads. Southern Florist and Nurseryman, February 4, 1972.

Graf, Alfred B. Exotica 3. Copyright 1963 by Roehrs Co., Rutherford, N.J.

Gruelech, Victor A. Plant Function and Structure. Copyright 1973 by The Macmillan Co., N.Y.

Milstein, George. Short Course on Bromeliad Growing Under Lights. Published unreferenced at Longwood Gardens Library. Dated 1971.

Sheehan, T. J. and Conover, C. A. Bromeliads. Florida Cooperative Extension Service Circ. No. 300-A. Univ. of Florida, Gainesville (no date given).