The Effects of Phthalimides And Gibberellic Acid On The Flowering Of Cyclamen

Paul A. Thomas, John E. Preece, & Gerald D. Coorts
Department of Plant & Soil Science
Southern Illinois University, Carbondale

Cyclamen are popular pot plants which, when grown properly, can be produced in 7 months. Formerly, it took 15 months to produce this crop; however, the program known as the "Minnesota Fast Crop Method," which was developed by *Dr. R. E. Widmer* and his students at the Univ. of Minnesota, has resulted in a quicker, more economical crop.

This method includes the timely application of gibberellic acid (GA_3) to accelerate flowering. Cyclamen plants vary in their response to GA_3. F_1 hybrids generally require a concentration of 10 ppm, whereas all other cultivars require 25 ppm. It has been observed that at some concentrations, plants treated with GA_3 developed "propeller" shaped rather than normally reflexed flowers; additionally, gibberellic acid can cause abnormally long, thin peduncles to form which will cause the flowers to hang over the sides of the pots. Growers must therefore mix gibberellic acid carefully to avoid applications of too high concentrations.

Phthalimides are a group of synthetic plant growth regulators that have some gibberellin-like activity. We were interested in the response of cyclamen to phthalimides in the hope of finding an effective chemical with a broader margin of activity but with no adverse effects.

The objectives of this study were as follows:

1. To determine the effects of available phthalimides on the growth and flowering of *Cyclamen persicum* F_1 hybrids.
2. To determine if phthalimides can be used as a replacement or modifier for GA_3 when applied to *Cyclamen persicum* F_1 hybrids.
3. To determine the influence of different pot sizes and cultural techniques on cyclamen production, combined with the use of growth regulators.
4. To compare treatment differences across cultivars, and to determine which cultivars might be compatible with the Southern Illinois environment.

Materials And Methods

A. Experiment I.

The experiment began Sept. 1, 1981, at the Southern Illinois University-Carbondale campus greenhouses. Plants were arranged using a randomized complete block design. There were 56 treatments resulting from a 7 × 2 × 2 × 2 factorial combination (all possible combinations) of phthalimides AC-94377, and AC-99524, at 0, 10, 100, and 1000 ppm; Gibberellic acid (GA_3) at 0 and 10 ppm; cultivars 'Swan Lake' and

'Carmen'; and the plastic pots (sizes 3 in. & 5 in.). There were 3 blocks, 1 replication per block, resulting in a total of 168 plants.

Treatments were applied Nov. 1; each plant was given 10 ml of the specific chemical treatment, in 5, 2-ml aliquots sprayed from different angles directly onto the crown, with care taken to avoid any spray contact with the foliage.

At the time of treatment, flower bud initials were approximately 1 mm in length throughout the population. Plants were not watered until 48 hours after treatment.

B. Experiment II.

Seeds of 4 hybrid cultivars of *Cyclamen persicum*, 'Rosamunde,' 'Gypsy,' 'Merry Widow,' and 'Swan Lake,' were sown in nutrient-amended peat moss, after the seeds were pretreated with 48 hours of aerated soaking in distilled water at 68°F. Seeds were spaced 2½ in. × 2½ in. in a large wooden flat. The seeds were sown approximately ½ in. under the surface of the peat moss. The flats were kept moist and seeds were allowed to germinate in a dark growth chamber at a constant temperature of 68°F. Germination occurred within 90 days. Minimum germination was 81%. Plants were then grown in a growth chamber under a 16-hour photoperiod, with an approximate total photosynthetically active radiation of 30-34 watts m^{-2}, supplied by a fluorescent light source for 3 weeks. Seedlings were then placed in a greenhouse under natural light. Night temperatures were kept at 68°F (+ 4°).

Plants were first transplanted into 3 in. plastic pots on Feb. 23, 1981, and then again into 4 in. pots on Mar. 28, 1981.

Plants were arranged using a randomized complete block design. There were 108 treatments, resulting from a 9 × 3 × 4 factorial combination (all possible combinations) of phthalimides, AC-99524 and AC-92803, at 0, 30, 100, 1000, and 3000 ppm; GA_3 at 0, 5, and 10 ppm; and cyclamen cultivars 'Rosamunde,' 'Swan Lake,' 'Gypsy,' and 'Merry Widow.' There were 3 blocks, 1 replication per block, with 324 plants in all.

Chemical treatments were applied Apr. 26, 1981, using the same procedures as in Experiment I.

Conclusions

Of the cultivars tested, 'Merry Widow' displayed an ability to consistently develop normally under the

Southern Illinois environment, although its maturation period was longer than other cultivars tested. It took 'Merry Widow' approximately 1 year from the time of sowing seeds to obtaining a flowering plant. 'Carmen' grew well, in a much shorter time than the other cultivars, but with somewhat poorer quality in the flowers. It took 'Carmen' approximately 285 days from the time of sowing seeds to flowering. Selection of cultivars which can be successfully grown under the predominantly warmer conditions in Southern Illinois, and the southern region of the U.S., may alleviate problems with production and the adverse effects of plant growth regulators.

Cultural techniques, such as the choice of pot size, appeared to be more important to the production of fast maturing, well developed, high quality cyclamen than the application of plant growth regulators. Plants grown in the smaller container sizes developed more quickly, yet produced fewer flowers, with shorter, thinner peduncles, than plants grown in the larger pots. The plants which were grown in the 3 in. pots flowered in approximately 290 days after seeds were sown, and those in 5 in. pots took about 305 days to flower. Cyclamen are very sensitive to underwatering; the leaves will turn yellow (chlorotic) during times of stress. Although production time can be cut with smaller pots, watering must be carefully monitored.

Gibberellic acid (GA_3) generally stimulated flowering approximately 1 week earlier in cyclamen; however, plants treated with 10 ppm GA_3 developed abnormally thin, long peduncles, and produced "propeller" shaped flowers which were of poor quality. These plants were not considered to be of marketable quality. We found that under our growing conditions, 5 ppm of GA_3 was as effective in hastening production as 10 ppm; however, the adverse effects of the higher concentration were avoided. The effectiveness of the 5 ppm concentration on F_1 hybrids indicates that successful reduction of production time can be accomplished in warmer regions of the U.S. where cyclamen may be temperature sensitive to the application of GA_3 and other plant growth regulators. It would appear from the results of this study that the threshold level response to GA_3 may in fact be environmentally mediated in F_1 hybrids of cyclamen.

Total flower production was significantly increased when the phthalimides AC-99524 and AC-92803 were applied to cyclamen. The range of 30 to 100 ppm looked most promising. 'Merry Widows' responded favorably to the 100 ppm concentration by producing significantly more high quality flowers than did other cultivars treated with phthalimide compounds. Higher concentrations of Phthalimides appeared to be ineffective or inhibitory on most cultivars tested.

In general, the bioactivity of phthalimides was low in the cyclamen tested. However, no detrimental effects were seen on phthalimide treated plants.

Based on our studies, the cultivar 'Merry Widow' grown in 3 in. pots and treated with 5 ppm GA_3 would

be best for the southern portions of Illinois. Growers should be warned that cyclamen are sensitive to drying out, and watering would have to be done very carefully to prevent drying of the medium, especially when using small pots. Because cyclamen grow better in cooler winter temperatures, seeds should be sown in the summer for sale in late winter or early spring of the next calendar year.

(EDITOR'S NOTE: The research reported in this article was supported, in part, by funds from the I.S.F.A. Research Fund. Since this research was completed, one of the three authors, Dr. G. D. Coorts, has accepted a position at Tennessee Technical Univ., Cookeville, TN.)