Application of Cycocel as an Aerosol Spray[1]

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The usual procedure for the foliar application of growth retardants is for one to use a hand-held or backpack sprayer, and to apply the chemical until a surplus runs off the margins of the leaves. The volume of material applied to the plants usually is not known, droplet size varies as the spray pump pressure goes down, marginal burning of the foliage often occurs, and expensive growth regulators can be wasted. Even distribution of the material is not easy to achieve, and irregular growth and flowering would indicate to one just how uneven the application really was. It would be better if the material could be very uniformly distributed to all plants which are to be treated, if run-off and waste were kept to a minimum. Small droplets would be preferred, as they can reach parts of the plants often inaccessible to larger particles.

We tried applying Cycocel to seedling geraniums this past winter, with a "fogging" machine which was originally intended for application of insecticides and/or fungicides. It was a Model DC-3 Dyna-Fog Electric Chemical Applicator, loaned to us by the manufacturer.

Materials and Methods

Seeds of geranium cvs. Sooner Red and Smash Hit were sown in "plug" flats and Jiffy-Mix with a Vandana seeder on January 5, 1983. Seeds were germinated according to standard cultural procedures. After germination, trays were placed at 65°F night temperature and fertilized as needed with Peters 15-16-17 (150 ppm N).

Seedlings were transplanted into 11 cm plastic azalea pots and Metro-Mix 350 on February 5, and the medium drenched with Lesan (0.3 g/1) and Terraclor (0.9 g/1). The fertilization program consisted of Peters 15-16-17 (536 ppm N) in irrigation water once per week. STEM (0.6 g/1) was applied on February 11. Osmocote 14-14-14 (2 g/pot) was applied as a top dressing on February 16. Plants were grown in a randomized complete block design with 5 replications per treatment. Two applications of Cycocel were made using the Model DC-3 Chemical Applicator. Cycocel was diluted to concentrations of 2500 and 5000 ppm and applied at 1, 4.5 and 9.5 ml/m^3. A control treatment of water at 9.5 ml/m^3 was included. The first application was made on February 19 when average plant height was 3.0 cm, and the second application on March 3. For application of treatments, geraniums were placed in a greenhouse bench enclosed by blackcloth to contain the droplets. Fifteen minutes were allowed to elapse before sprayed plants were removed, to allow for settling of the droplets.

Days to flowering, vegetative and total plant heights (from pot rim), plant diameter, and number of inflorescences and axillary shoots with a growing point greater than 1 cm from the stem were recorded on the first day of floret opening.

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[1]Geranium seed were donated by Geo. J. Ball, Inc., West Chicago, Ill., Geo. W. Park Seed Co., Greenwood, SC. Cycocel was provided by American Cyanamid, Princeton, NJ. Fertilizer was donated by Robert B. Peters and Metro-Mix 350 was given by the W. R. Grace Co.

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Results and Discussion

'Smash Hit': Days to flowering, vegetative and total heights, plant diameter, and number of inflorescences and axillary shoots are shown in Table 1. Except for the 1 ml/m^3 Cycocel treatment at 5000 ppm, Cycocel-treated plants flowered in significantly less time than control plants (127 days). Plants treated with 9.5 ml/m^3 (5000 and 2500 ppm) flowered approximately 2 weeks earlier than the control plants (114 and 113 days, respectively). At 4.5 ml/m^3, plants treated with 2500 ppm Cycocel flowered 6 days later (122 days) than plants treated with 5000 ppm Cycocel (116 days). At 1 ml/m^3, plants treated with 2500 ppm Cycocel flowered 6 days earlier (121 days) than the control plants.

A similar trend was observed with vegetative height. All treated plants, except the 1 ml/m^3 Cycocel at 5000 ppm, were significantly shorter than control plants. The highest volume, 9.5 ml/m^3, produced the shortest plants at both concentrations, 16.8 cm at 5000 ppm and 14.8 cm at 2500 ppm. Plants receiving 4.5 ml/m^3 were approximately 7 cm (5000 ppm) and 4 cm (2500 ppm) shorter than control plants (23.4 cm).

Application of Cycocel was slightly less effective on total height. Neither concentration at 1 ml/m^3 produced plants significantly shorter than control plants (32.0 cm). At 4.5 ml/m^3, plants treated with 5000 ppm Cycocel averaged 6 cm shorter than the control plants while plants treated with 2500 ppm Cycocel were only 2 cm shorter, an insignificant reduction in height. Within the 5000 ppm concentration, increasing the volume of spray from 4.5 to 9.5 ml/m^3 did not result in a significant decrease in height. However, at 2500 ppm, plant height decreased from 29.8 cm at 4.5 ml/m^3 to 23.2 cm at 9.5 ml/m^3, a reduction in height which was significant.

Similar results were observed with plant diameter as with total height. The most effective treatment, 9.5 ml/m^3 at 2500 ppm, produced plants with an average diameter of 25.6 cm compared to 33.0 cm for control plants. At 5000 ppm, plant diameters were similar (approximately 27 cm) for plants treated with both 4.5 and 9.5 ml/m^3.

There were no significant differences in number of inflorescences between Cycocel-treated plants and control plants. Within concentration, increasing the volume of Cycocel did not result in increased number of inflorescences. The highest number of inflorescences per pot (6.0) was observed on plants treated with 2500 ppm (4.5 ml/m^3) Cycocel. Control plants averaged 3.8 inflorescences per pot. Other treatments averaged between 4 and 5 inflorescences per pot.

Regardless of concentration, as volume of growth retardant increased, number of axillary shoots decreased. This decrease was significant for plants receiving the higher volumes (4.5 and 9.5 ml/m^3) when compared to control plants. The range between the highest and lowest number of axillary shoots was 13.6 for untreated plants and 9.4 for plants receiving 9.5 ml/m^3.

'Sooner Red': Days to anthesis, vegetative and total heights, plant diameter and number of inflorescences and axillary shoots are shown in Table 2. Although treated plants flowered up to 5 days earlier than control plants, there were no differences in days to flowering between treated and untreated plants. The earliest plants to flower (121 days) were those treated with the highest volume of growth retardant (9.5 ml/m^3). Plants treated with less than 9.5 ml/m^3 flowered in 123 to 125 days.

Vegetative height of all treated plants were significantly shorter than control plants. The shortest plant (19.0 cm) was recorded with the 4.5 ml/m^3

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(5000 ppm) treatment. This treatment produced plants approximately 8 cm shorter than control plants (27.2 cm). Increasing the volume to 9.5 ml/m^3 did not result in a decrease in plant height. At 2500 ppm, plants treated with 1 and 4.5 ml/m^3 were similar in height, 22.4 and 23.0 cm, respectively. The shortest plant within this concentration was observed with the highest volume (9.5 ml/m^3), with plants averaging 19.8 cm.

A similar trend was observed with total height. The most effective treatments (4.5 and 9.5 ml/m^3 at 5000 ppm) produced plants with average heights of 28.4 and 28.0 cm, respectively. Plants treated with 9.5 ml/m^3 at 2500 ppm were only 1 cm taller, a measurement in height which was non-significant when compared to the 5000 ppm treatment at that same volume. At a volume as low as 1 ml/m^3 (2500 ppm), a significant reduction in height was observed (31.0 cm) when compared to control plants (35.2 cm).

A similar trend as with 'Smash Hit' was observed for plant diameters. Regardless of concentration, plants treated with 1 ml/m^3 Cycocel were not significantly more compact than control plants. A volume of 4.5 and 9.5 ml/m^3 at 5000 ppm or 9.5 ml/m^3 at 2500 ppm was required to produce plants significantly more compact than control plants. However, although significant, the difference was small, approximately 3 cm.

Control plants had the smallest numbers of inflorescences (3.8), but there were no differences between treated and untreated plants. The 4.5 ml/m^3 (5000 ppm) treatment had the highest number of inflorescences (5.2), only 1.4 more than control plants. Remaining treatments averaged approximately 4 inflorescences per pot.

Results with number of axillary shoots were similar, and there were no differences between treated and untreated plants. Untreated plants averaged 12 axillary shoots per pot while treated plants averaged approximately 11 axillary shoots per pot. No trend relating to volume applied or concentration was observed.

Results from the application of Cycocel with the Model DC-3 Chemical Applicator were encouraging. Volumes of 4.5 and 9.5 ml/m^3 effectively controlled height of 'Sooner Red' and 'Smash Hit' geranium plants.

Results of vegetative heights for both cultivars show that when Cycocel was applied at 2500 ppm, increasing the volume from 4.5 to 9.5 ml/m^3 was as effective as doubling the concentration to 5000 ppm at the lower volume. The most effective treatments (9.5 ml/m^3 at both concentrations) generally produced plants with average vegetative heights approximately 8 cm shorter than control plants.

Height control was similar with total height as with vegetative height. Plants averaged approximately 7 cm shorter than control plants.

The most startling results were observed with days to flowering. When applied to geranium cv. Smash Hit, up to 2 weeks earlier flowering occurred at the higher volume (9.5 ml/m^3). Results were not as dramatic with 'Sooner Red', but when Cycocel was applied at 9.5 ml/m^3 at both concentrations, treated plants flowered 5 days earlier than control plants. It is interesting to note that although the 1 ml/m^3 treatments were generally ineffective in controlling height, they did result in earlier flowering, particularly when applied to Smash Hit. This raises the possibility of applying small volumes of growth retardants for earlier flowering even though height control may not be necessary.

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Treated plants were more compact than control plants, but the differences were small and application of Cycocel should not be used to substitute for improper spacing.

Analysis of the number of inflorescences per pot for both cultivars revealed no differences between treated and untreated plants. However, control plants averaged 3.8 inflorescences compared to an overall average of 4.6 for treated plants.

Results with the number of axillary shoots varied with cultivar. Although volumes of 4.5 and 9.5 ml/m^3 resulted in 'Sooner Red' geranium plants with significantly less axillary shoots when compared to control plants, foliage still appeared dense due to the reduced height.

Plants in both experiments were rated for phytotoxicity symptoms. In all cases, chlorosis due to application of Cycocel as an aerosol was minimal and symptoms were not visible at flowering. There was no pattern of phytotoxicity related to droplet size.

Overall, treated plants were of better quality than untreated plants. Because plants were shorter and more compact, foliage was considerably more dense. Leaves of treated plants were smaller and darker green than those of control plants which resulted in plants that were aesthetically more pleasing.

In deciding on which method to use for growth retardant application, the bottom line is economics. Which method is less expensive? To assist the grower, a cost analysis was made comparing the conventional method of application with aerosol application. To do this several assumptions were made. A 25'x96' quonset greenhouse with ridge height 10'10" was used in determining floor area and volume. To determine bench area, the assumption was that the bench area occupied 80% of floor area. Cycocel was applied at 1967 ppm at $112.00 per gallon. For the conventional method of application, Cycocel was applied at 1/2 gal. of spray per 100 ft^2. (Volume will vary depending on crop and stage of growth). Results are shown in Table 3.

In conclusion, use of an aerosol sprayer for application of growth retardants appears promising. Spraying with the fine particles was quickly and easily done, and no difficulties were encountered.

Table 1. Days to flowering, vegetative and total heights, plant diameter, and number of inflorescences and axillary shoots of geranium cv. Smash Hit.

Volume ml/m^3	Concentration (ppm)	Days[z] to Flowering	Vegetative Height (cm)	Total Height (cm)	Plant Diameter (cm)	Number of Inflorescences	Number of Axillary Shoots
1	2500	121	20.2	30.8	30.8	4.0	12.4
4.5	2500	122	19.6	29.8	30.0	6.0	10.4
9.5	2500	113	14.8	23.2	25.6	4.8	9.4
1	5000	123	22.0	33.5	32.8	4.8	11.2
4.5	5000	116	17.0	25.8	27.4	4.8	9.8
9.5	5000	114	16.8	26.0	26.2	5.0	9.4
9.5	----	127	23.4	32.0	33.0	3.8	13.6
LSD 5%		4	2.1	2.3	3.1	2.3	2.5

[z]Days to first day of floret opening from potting date.

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Table 2. Days to flowering, vegetative and total heights, plant diameter, and number of inflorescences and axillary shoots of geranium cv. Sooner Red.

Volume ml/m^3	Concentration (ppm)	Days[z] to Flowering	Vegetative Height (cm)	Total Height (cm)	Plant Diameter (cm)	Number of Inflorescences	Number of Axillary Shoots
1	2500	123	22.4	31.0	31.4	4.6	11.2
4.5	2500	124	23.0	33.2	31.0	4.2	12.4
9.5	2500	121	19.8	29.4	28.6	4.2	10.6
1	5000	125	24.6	33.6	31.4	4.0	12.0
4.5	5000	125	19.0	28.4	29.0	5.2	11.0
9.5	5000	121	20.0	28.0	28.8	4.0	11.3
9.5	----	126	27.2	35.2	32.6	3.8	12.0
LSD 5%		6	2.2	2.0	3.5	1.6	N.S.

[z]Days to first day of floret opening from potting date.

Table 3. Cost analysis of conventional vs. aerosol applications of Cycocel[z]

Method of Application	Volume Applied per Greenhouse[x]	Cost per Greenhouse
Conventional[y]	606 ml	$17.92
Aerosol	37 ml	$ 1.09

[z]Cycocel applied at 1967 ppm, at $112.00 per gallon.
[y]Backpack or hand sprayer, applying ½ gal/100 ft^2.
[x]Quonset greenhouse, 25'x96'.

FLOWERING POINSETTIAS IN R-10 TRAYS

Roy A. Larson and Beth Thorne

Last year we propagated some poinsettia cuttings in R-10 styrofoam trays. We also finished some plants in those containers, primarily single-stem poinsettias in the Eckespoint C-1 series. Plants propagated in mid-September were an ideal height by early December and we had many favorable comments about this approach to growing poinsettias. The trays made excellent centerpieces, and they could be placed horizontally or vertically, in other display areas.

We did have to enclose the trays in film plastic, prior to placing in the home, office or at the departmental Christmas party, as R-10 trays do have drainage holes in them.

This method does add to the poinsettia mix a grower can provide to customers. The entire 10-plant unit could be sold, or the tray could be divided into shorter segments. We also could have planted the finished plants in different sized pots, if more potted plants had been needed.

Growers propagating their own cuttings often have high quality cutting material available in mid-September but it is late for propagating plants which are to be pinched. Economics of production are leading more and more growers away from single-stem production.

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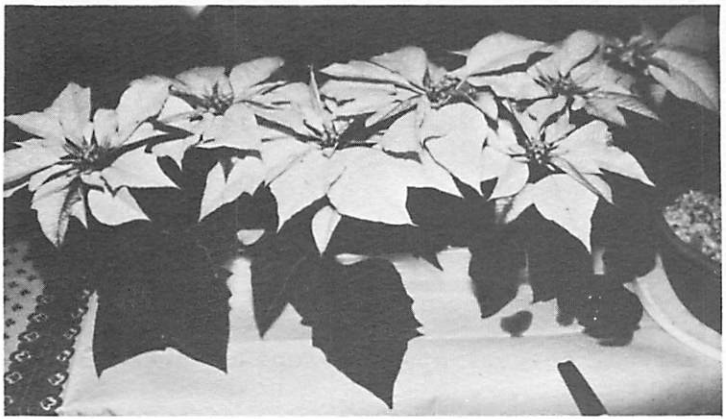
We would not suggest keeping the R-10 trays if they will cause a spacing problem for the rest of your crop. We saw enough crowded poinsettias in 1982.



Eckespoint C-1 plants in R-10 trays, a versatile product