

# Comparing PGRs

Do plant growth regulators with the same active ingredient perform the same?

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**C**ONTROLLING plant height is an essential aspect of producing greenhouse crops. Plant growth retardants (PGRs) are often used to suppress stem extension and produce a more compact, higher quality plant. Several new PGRs have become commercially available for use on ornamental greenhouse crops to inhibit stem elongation.

In Table 1 (see page 44), we have listed many of the PGRs labeled for floriculture crops with their active ingredient, trade name and manufacturer. Similar to pesticides, PGRs can be grouped according to their chemical class and mode of action. As seen in this PGR comparison table, many products contain the same active ingredient. For example, Concise (Fine Americas) and Sumagic (Valent USA) both contain uniconazole as the active ingredient.

One may ask: Are there any differences in the response between PGRs with the same active ingredient? To address this question, we have performed several experiments at Purdue University (PU) and Michigan State University (MSU) to compare the response of PGRs with the same active ingredient. Here, we summarize our research results and conclusions.

## Comparison Of Citadel +/- Dazide To Cycocel +/- B-Nine

The objective of these experiments was to compare two products containing chlormequat chloride (Citadel from Fine Americas and Cycocel from OHP) with or without two products containing daminozide (Dazide from Fine Americas, and B-Nine from OHP). Plugs of celosia (*Celosia plumosa* 'Fresh Look Red'), dianthus ('Bouquet Purple'), geranium (pelargonium 'Merisnow'), cape daisy (osteospermum 'Margarita White'), salvia (*Salvia farinacea* 'Blue Bedder') and verbena ('Obsession Lilac') were received from a commercial grower, transplanted into 4½-inch pots and grown in research green-

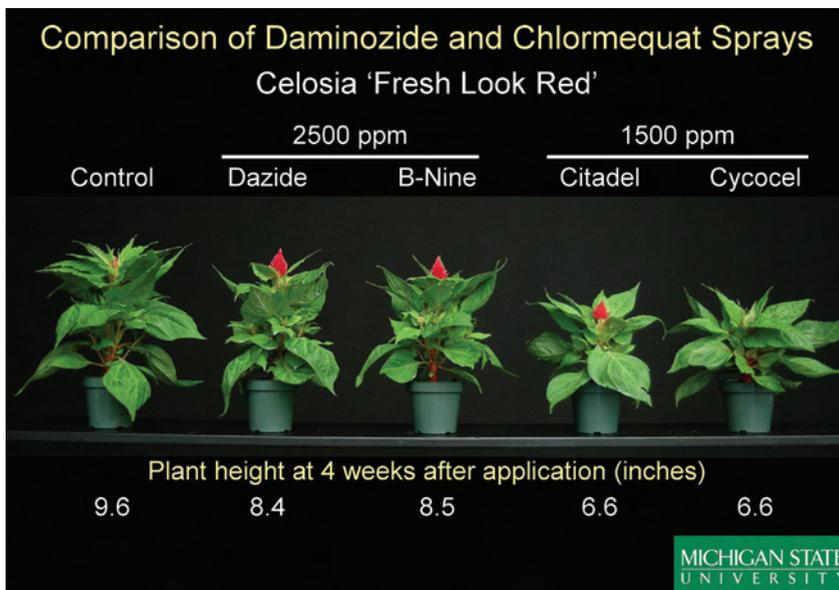


Figure 1. Celosia (*Celosia plumosa* 'Fresh Look Red') was sprayed with either Dazide (daminozide, Fine Americas), B-Nine (daminozide, OHP), Citadel (chlormequat chloride, Fine Americas) or Cycocel (chlormequat chloride, OHP) seven days after plugs were transplanted into 4½-inch pots and grown at 68°F.

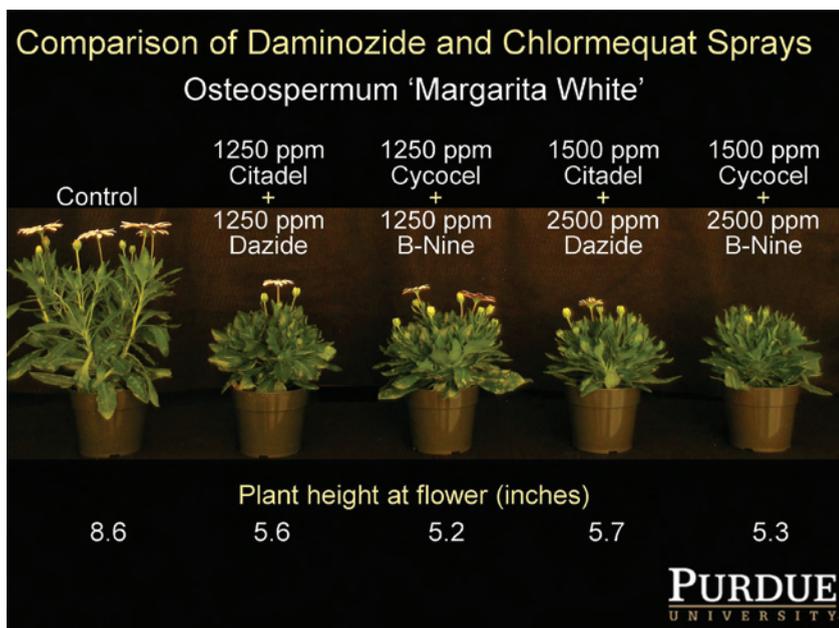


Figure 2. Cape daisy (osteospermum 'Margarita White') was sprayed with either Citadel + Dazide (chlormequat chloride + daminozide, Fine Americas) or Cycocel + B-Nine (chlormequat chloride + daminozide, OHP) 14 days after liners were transplanted into 4½-inch pots and grown at 70°F.

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houses at PU and MSU.

On the day of application, seven or 14 days after transplant, plants were randomly assigned to treatments according to the experimental protocol and a single foliar spray of B-Nine, Citadel, Cycocel, Dazide, Dazide + Citadel or B-Nine + Cycocel at a volume of 2 quarts/100 ft<sup>2</sup> was applied. Spray concentrations ranged between 750 to 1500 ppm for Cycocel and Citadel and 1250 to 5000 ppm for B-Nine and Dazide. For each species, a group of plants that were not treated with chemicals were designated as the control.

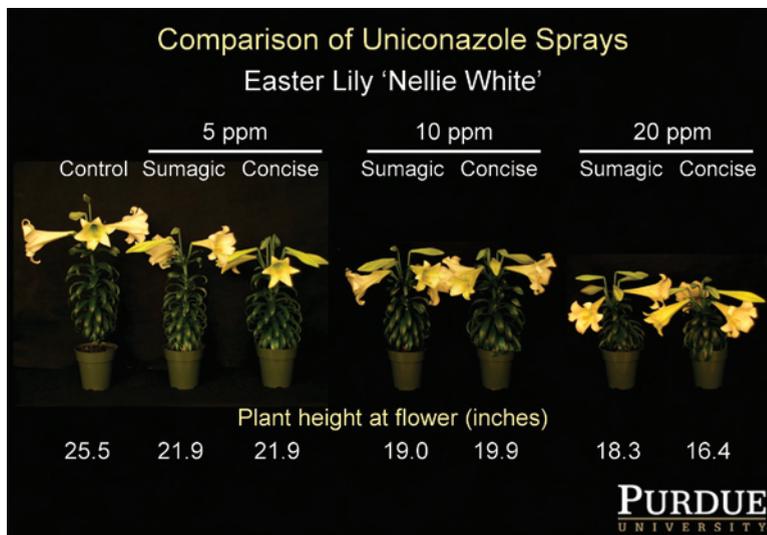
### Results

In all species tested at PU and MSU, there were no statistical differences in growth retardation between chemicals with the same active ingredient (e.g., Citadel and Cycocel). For example, height of celosia at four weeks after application in plants treated with 1500 ppm Citadel or Cycocel was similar, both at 6.6 inches (Figure 1). Similarly, celosia treated with B-Nine or Dazide at 2500 ppm had similar height suppression. We also determined that a tank mix of Citadel + Dazide or Cycocel + B-Nine applied on cape daisy produced a similar response and plants were 2.9 to 3.4 inches shorter than control plants when measured four weeks after application (Figure 2).

In blue salvia and cape daisy, symptoms of phototoxic-

ity were observed among plants sprayed with Citadel or Cycocel. The phytotoxicity was displayed as a pale yellow burn on the leaf margins of a couple leaves per plant and symptoms were similar to that observed in zonal geranium after a chlormequat chloride application. Although the chlorosis on leaf margins never completely faded, there was no decrease of aesthetic quality.

Stem elongation of geranium and dianthus was inhibited with a single spray application of Citadel or Cycocel at 1000 or 1500 ppm. In verbena, at four weeks after application, height



**Figure 3.** Easter lily (*Lilium longiflorum* 'Nellie White') was sprayed with either Concise (uniconazole, Fine Americas) or Sumagic (uniconazole, Valent USA) 37 days after bulbs were transplanted into 6-inch pots and grown at 60 to 66°F.

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was similar among plants sprayed with a tank mix of Citadel + Dazide or Cycocel + B-Nine (Figure 4). Some chemical treatments delayed flowering by two to 11 days in celosia, cape daisy, dianthus, blue salvia and verbena, but there were no differences between products that contain the same active ingredient. Plants treated with these PGRs had a similar number of flowers and flower buds for all species studied.

### Comparison Of Concise And Sumagic

The objective of these experiments was to compare two products containing uniconazole: Concise from Fine Americas and Sumagic from Valent USA. Bulbs of Easter lily (*Lilium longiflorum* 'Nellie White') and a hybrid lily

('America'), and liners or plugs of calibrachoa (*Calibrachoa xhybrida* 'Callie Yellow'), verbena (semi trailing 'Lanai Blue'), bacopa (*Sutera cordata* 'Bridal Showers'), catmint (*Nepeta xfassenii* 'Walkers Low') and delphinium (*Delphinium grandiflorum* 'Summer Blues'), were provided by commercial

growers and grown at PU and MSU.

Bulbs or young plants were transplanted into 4½- to 6-inch pots (depending on variety) and were sprayed once with Concise or Sumagic at rates that ranged from 2 to 45 ppm. In addition, Easter lily was drenched with Concise or

Sumagic at 1, 2, or 4 ppm and a volume of 4 fluid ounces per 6-inch pot.

### Results

In all species we tested except catmint, there were no significant differences in growth retardation among application rates of either chemical (e.g., Concise applied at 10 ppm produced a similar response as Sumagic applied at 10 ppm). For example, plant height at flower in Easter lily was 19.9 or 19.0 inches in

plants sprayed with 10 ppm Concise or Sumagic, respectively (Figure 3). A spray application of Concise or Sumagic at 2 ppm produced a similar response in calibrachoa (6.6 and 6.9 inches) and bacopa (5.6 and 5.3 inches).

In the hybrid lily 'America' and delphinium, Sumagic and Concise at 6 and 5 ppm effectively suppressed plant height when compared to control plants at flowering. In catmint, none of the PGR spray applications had a statistical effect on stem extension when measured four weeks after application except for Concise at 45 ppm, which were 8.1 inches shorter than untreated plants.

Concise and Sumagic had no effect on time to flower in all species except for delphinium, which was delayed by Sumagic by an average of three days compared to untreated plants. We did not observe any symptom of phytotoxicity or differences in the number of flowers among any treatments for all species.

### Conclusions

The results of our studies comparing products that contain chlormequat chloride or daminozide indicate that they are equally effective at controlling

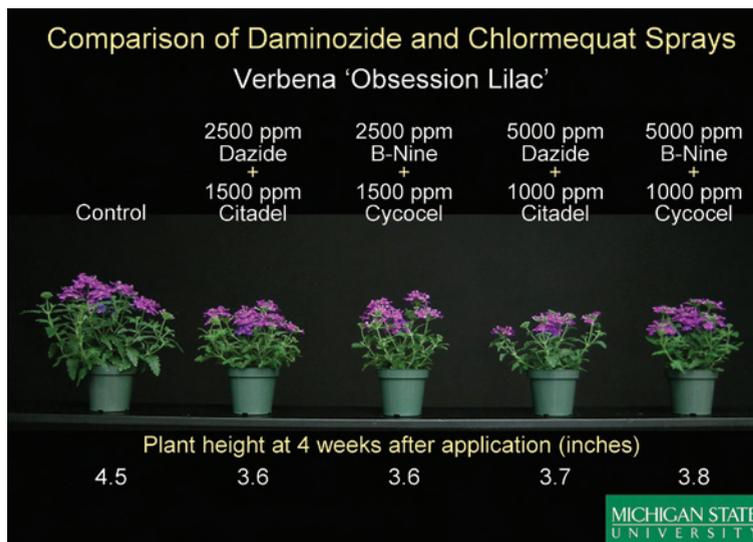


Figure 4. Verbena ('Obsession Lilac') was sprayed with either Citadel + Dazide (chlormequat chloride + daminozide, Fine Americas) or Cycocel + B-Nine (chlormequat chloride + daminozide, OHP) seven days after liners were transplanted into 4½-inch pots and grown at 68°F.

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stem elongation in the bedding plants, perennials and bulb crops we evalu-

ated. When symptoms of phytotoxicity or flowering delay were observed, they were similar in both products.

Additional PGR studies performed at MSU, PU and other universities, have also reported little or no difference in the efficacy of PGRs with the same active ingredient.

Therefore, when comparing products with the same active ingredient, the decision on which PGR to choose should be based on other considerations such as comprehensiveness of the product label, customer support, company investment in research and development and product cost.

#### Disclaimer

Reference to PGRs is not intended to be an endorsement, nor is criticism meant for products not

mentioned. These results should be considered for Northern U.S. conditions and rates for other climates and crops could vary. Growers are encouraged to perform their own trials on a small scale to determine desirable rates for their growing conditions and specific crops. **GG**

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**Table 1. Examples of plant growth regulators labeled for floriculture crops in the United States with their active ingredient, trade name and manufacturer.**

Active ingredient	Product	Manufacturer
Ancymidol	A-Rest	SePRO Corp.
	Abide	Fine Americas, Inc.
Chlormequat chloride	Chlormequat E-Pro	Etigra, LLC
	Citadel	Fine Americas, Inc.
	Cycocel	OHP, Inc.
Daminozide	B-Nine	OHP, Inc.
	Dazide	Fine Americas, Inc.
Flurprimidol	Topflor	SePRO Corp.
Paclobutrazol	Bonzi	Syngenta Crop Protection
	Downsize	Greenleaf Chemical, LLC
	Paczol	OHP, Inc.
	Piccolo	Fine Americas, Inc.
Uniconazole	Concise	Fine Americas, Inc.
	Sumagic	Valent USA Corp.



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