



PGR Rates and Timing for Plug Production

Application rates and timing of Bonzi was put to the test in this Michigan State University research.

By Catherine Whitman and Erik Runkle

Increasingly, greenhouse growers are applying plant growth retardants to bedding plants during the plug stage. Spraying plants when they are in the plug stage is a very efficient way to treat them, since there are so many in a small area. It's also easier to make a uniform application because the plants are not overlapping. Compact plugs are easier to handle and ship, and finished plants are more attractive if their elongation is controlled early in development.

Some greenhouse growers have been hesitant to use powerful growth retardants, such as Bonzi, on bedding plant plugs. One reason is that few controlled studies have been performed with bedding plants in northern U.S. climates. Another is a fear that flowering could be delayed. Thus, we performed studies in two consecutive springs to determine effects of Bonzi application timing and rate on four common bedding plant species during the plug stage.

TREATMENTS

The plants used in these experiments were dianthus 'Rosemarie Fire', marigold 'Janie Flame', petunia 'Ultra Lilac' and salvia 'Salsa Scarlet Bicolor'. The recommended label rates for Bonzi spray applications to bedding plant plugs range from as low as ¼-5

ppm for New Guinea impatiens to 10-20 ppm for other species. For the species we studied, the recommended concentration is 5-10 ppm for petunia and salvia and 10-20 ppm for snapdragon and dianthus.

The first year, we used a range of rates from 2-12 ppm and made either one or two applications. We also tested the effect of volume of solution applied by comparing a spray versus a srench. We defined a spray as one pass with the sprayer, enough to thoroughly wet the foliage without any drip; applying a volume of 2 quarts per 100 ft². We defined a srench as two passes with the sprayer, applying 4 quarts per 100 ft². The second year we used rates between 4-16 ppm, and all treatments were applied as sprays in a single application.

The first year, applications were made 3, 16, 26 or 33 days after sowing. The second year, sprays were made 3, 10, 17 or 24 days after sowing.

Plants were sown into 288-cell flats by Raker's Acres in Litchfield, Mich., on March 21, 2001 and for year two, on April 23, 2002. We made the soil spray applications at Raker's three days after sowing. Plants were brought to the Michigan State University Research Greenhouses and placed in a glass greenhouse at a constant 68° F. Remaining applications were made at Michigan State University.

Plugs were evaluated 43-46 days (year one) or 26-36 days (year two) after sowing by measuring total plant height from the soil surface, and they were examined for phytotoxicity. Eighteen plugs of each species from each treatment were then planted into 1801 flats and grown on at a constant 68° F to determine the residual effect of the Bonzi treatments. When

Figure 1. Optimal rates for Bonzi application.

Species	Application timing	application rate
Dianthus	10-17 days after seed sow*	6-10 ppm
Petunia	10-17 days after seed sow*	6-10 ppm
Salvia	10-17 days after seed sow*	8-12 ppm
Marigold	Before seedling emergence	More than 16 ppm

* Higher rates and/or later applications may delay subsequent flowering.

The effect on final plant height and flowering of a single Bonzi spray to dianthus plugs. Bonzi was applied 17 days after seed sow at 0 (control), 4, 8, 12 or 16 ppm. Photo was taken 72 days after seed sow.



Height of dianthus plugs 35 days after sowing. The plug on the bottom right was not treated; remaining plugs were sprayed with Bonzi at 4, 8, 12 or 16 ppm 3, 10, 17 or 24 days after sowing. (All photos courtesy of Erik Runkle)



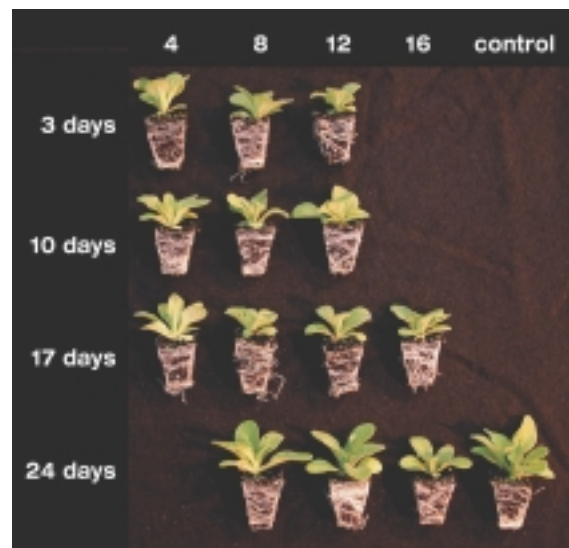
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the first flower on each plant opened, the date, plant height and number of nodes and flower buds were recorded. Time from sowing to opening of the first flower was also calculated.

RESULTS

Rosemarie Fire. All treatments reduced plant

Height of petunia plugs 36 days after sowing. The plug on the bottom right was not treated; remaining plugs were sprayed with Bonzi at 4, 8, 12 or 16 ppm 3, 10, 17 or 24 days after sowing.



height in the plug stage. In year one, the maximum control was achieved with a 12-ppm spray applied 26 days after sowing, which reduced plant height by approximately 50 percent. In year two, the maximum height reduction was about 44 percent, in response to the 12-ppm spray applied three days after sowing.

At the time of first flower, Bonzi still had some effect on plant height. Treated plants were often shorter than untreated plants, but only by 1-1½ inches.

Year one, Bonzi delayed flowering, especially in plants treated with the highest rates. The

The effect on final plant height and flowering of a single Bonzi spray to petunia plugs. Bonzi was applied 24 days after seed sow at 0 (control), 4, 8 or 12 ppm. Photo was taken 72 days after seed sow.



maximum delay we observed in dianthus was two weeks, in response to a 12-ppm spray applied 26 days after sowing. A late application of Bonzi also reduced flower bud number. Untreated plants averaged 14 buds and those receiving the 12-ppm spray 33 days after sowing had nine buds.

In year two, the flowering delay was three days or less. Bonzi did not affect the number of flower buds; plants in all treatments averaged 13-15 buds.

Ultra Lilac. Most treatments reduced plant height in the plug stage. Year one, the most effective treatment was the 4-ppm sprinch

made 26 days after sowing, which reduced height by 60 percent. In year two, the maximum reduction in height was about 40 percent, in response to 12-ppm sprays made three or 10 days after sowing, or 16 ppm applied 17 days after sowing.

Bonzi had little

residual effect on height at first flower. The most compact treated plants were only about 10 percent shorter than untreated plants in year one, and in year two, all plants were of similar height when they flowered.

In year one, plants in most treatments exhibited some flowering delay. The greatest delay was nine days in plants treated with an 8-ppm spray 33 days after sowing. In year two, Bonzi had less effect on time to flower, and the delay we observed averaged about three days. Bonzi had no effect on the number of flower buds in either year.

Salsa Scarlet Bicolor. Most treatments reduced plant height in the plug stage. In year one, the most effective treatment was an 8-ppm spray made 26 days after sowing, which resulted in a height reduction of about 40 percent. In year two, the maxi-

mum height reduction was 27 percent, in response to the 12-ppm spray made 10 days after sow or the 16-ppm spray made 17 days after sowing.

At first flower, the effect of Bonzi was still evident, especially in year one. Plants that had been treated 26 days or later after sowing were up to 34 percent (approximately 1¼ inch) shorter than untreated plants. The response was less evident in year two, but the plants treated with the 16 ppm spray 17 days after

The effect on final plant height and flowering of a single Bonzi spray to salvia plugs. Bonzi was applied 17 days after seed sow at 0 (control), 4, 8, 12 or 16 ppm. Photo was taken 50 days after seed sow.



sowing were 18 percent (approximately 1 inch) shorter than untreated plants.

Bonzi did not influence time to flower or flower bud number. Treated plants flowered within two or three days of untreated plants.

Janie Flame. The marigold plugs grew very rapidly, and Bonzi only reduced

Height of salvia plugs 31 days after sowing. The plug on the bottom right was not treated; remaining plugs were sprayed with Bonzi at 4, 8, 12 or 16 ppm 3, 10, 17 or 24 days after sowing.



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seedling height slightly. In year one, the maximum effect was a height reduction of 15 percent in response to a 12-ppm spray 26 days after sowing. In year two, the most effective treatments were the 16-ppm sprays made 10 or 17 days after sowing, which resulted in a reduction of about 19 percent. At flowering, heights of plants in all treatments were similar, varying by $\frac{1}{2}$ inch or less.

We observed a slight delay in flowering of 2-3 days in most treatments, but there was no effect on the number of flower buds.

The effect on final plant height and flowering of a single Bonzi spray to marigold plugs. Bonzi was applied 10 days after seed sow at 0 (control), 4, 8, 12 or 16 ppm. Photo was taken 50 days after seed sow.



CONCLUSIONS

These experiments demonstrate the effectiveness of a very early Bonzi application, made just three days after seed sow. With this type of application, plants have developed little or no leaf area, so the soil receives a majority of the chemical. An advantage to early applications is that there is reduced potential to delay subsequent flowering.

Higher rates generally resulted in better height control. Applications were made from 3-33 days after sowing, but timing of application did not have a consistent effect on the level of height control achieved in these experiments. We observed no phytotoxicity on any plants, and none looked excessively small.

The volume of solution had a slight influence on height control effectiveness. For dianthus, petunia and salvia, applying the solution as a sprench reduced plug height by an additional $\frac{1}{4}$ - $\frac{1}{2}$ inch. Our sprench application volume was probably less than what a commercial grower might use as a sprench since in our trials there was little chemical run-off into the soil. A greater chemical volume would most likely limit growth further.

The magnitude of most responses was smaller in year two than in year one, despite the use of higher rates. The first year, seeds were sown on March 21, and the second year, seeds were sown on April 23.

Since the experiment began almost a month later the second year, perhaps higher light levels and/or higher temperatures contributed to smaller treatment effects in 2002. These results illustrate the importance of producers conducting their own trials to identify appropriate rates and timing for their crops and growing conditions.

One concern with the use of Bonzi is the potential for a carry-over effect, which could result in excessively small plants or a delay of flowering in the finish container. Most of the rates and application times used in this experiment resulted in only slight flowering delays, probably not a concern for growers or consumers. The first year, the higher rates and later applications of Bonzi delayed flowering of dianthus by up to 14 days and petunia by nine days. In year two, Bonzi had little effect on time to flower, and the maximum delay we observed was three days. Late applications (made more than 26 days after sowing) have an increased potential to delay flowering.

Marigold was the species most difficult to control in both years. Future experiments are needed on soil sprays with higher rates. In addition, applications need to be made within one day of seed sow.

RECOMMENDATIONS

In both year's experiments, the effectiveness of Bonzi clearly varied by species. Petunia and dianthus responded more strongly than salvia or marigold. Many other factors can also influence the effectiveness of Bonzi, including cultivar and environmental conditions. Based on the results of these experiments, the application times and rates on page 38 are suggested as a starting point for producers in Northern climates during production in early spring (March and April). Rates may need to be reduced during cool, dark conditions (during January and February), and increased in warmer and brighter climates. GPN

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