e-GRO Alert

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Daminozide Dilemmas: Avoiding Flower Bleaching in Spring Bedding Plants

Daminozide is a widely used plant growth retardant (PGR) for producing compact spring flowering bedding plants; however, growers should be aware that it can induce flower bleaching or breaking in flower color.

Plant growth retardants (PGRs) are useful tools for controlling plant height in greenhouse floriculture crops. There are several PGR products available to control plant height including those with active ingredients of ancymidol, chlormequat chloride, daminozide, flurprimidol, paclobutrazol, and uniconazole. Each of these PGRs vary in their relative activity and efficacy which are influenced by factors such as application method and concentration, plant species and growth stage, and environmental conditions.

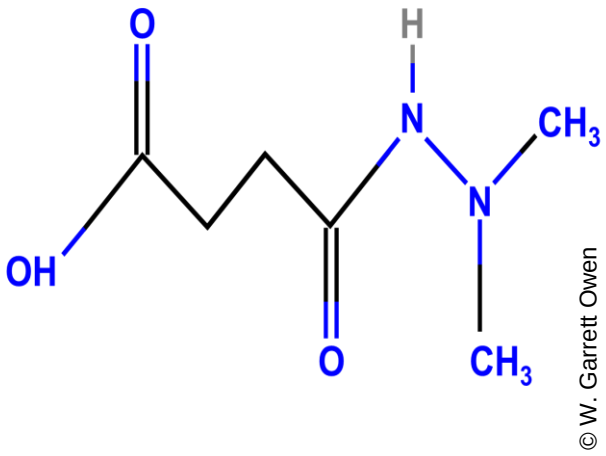

Figure 1. Molecular structure of daminozide ($C_6H_{12}N_2O_3$). Figure by: W. Garrett Owen.

Of the PGR products available, those formulated with the active ingredient daminozide (Fig. 1) are widely used on spring flowering bedding plants to control internode elongation resulting in compact plants (Figs. 2 and 3). It can also delay flowering. Daminozide is effective as a foliar spray and most effective under cooler conditions.

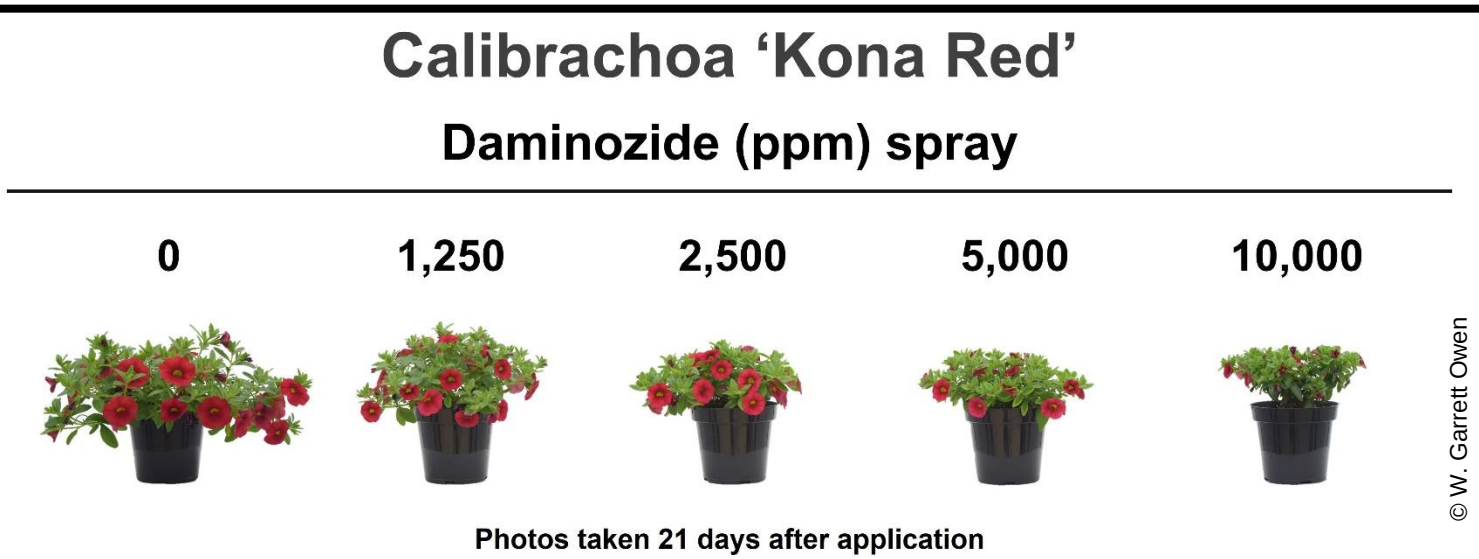

Figure 2 Daminozide foliar sprays applied at increasing concentrations to control growth of calibrachoa 'Kona Red'. Plants were sprayed with 0, 1,250, 2,500, 5,000, or 10,000 ppm daminozide at a volume of 2 qt. per 100 sq. ft. Flower bleaching did not occur but time to flower was delayed above 5,000 ppm daminozide. Photo by: W. Garrett Owen.

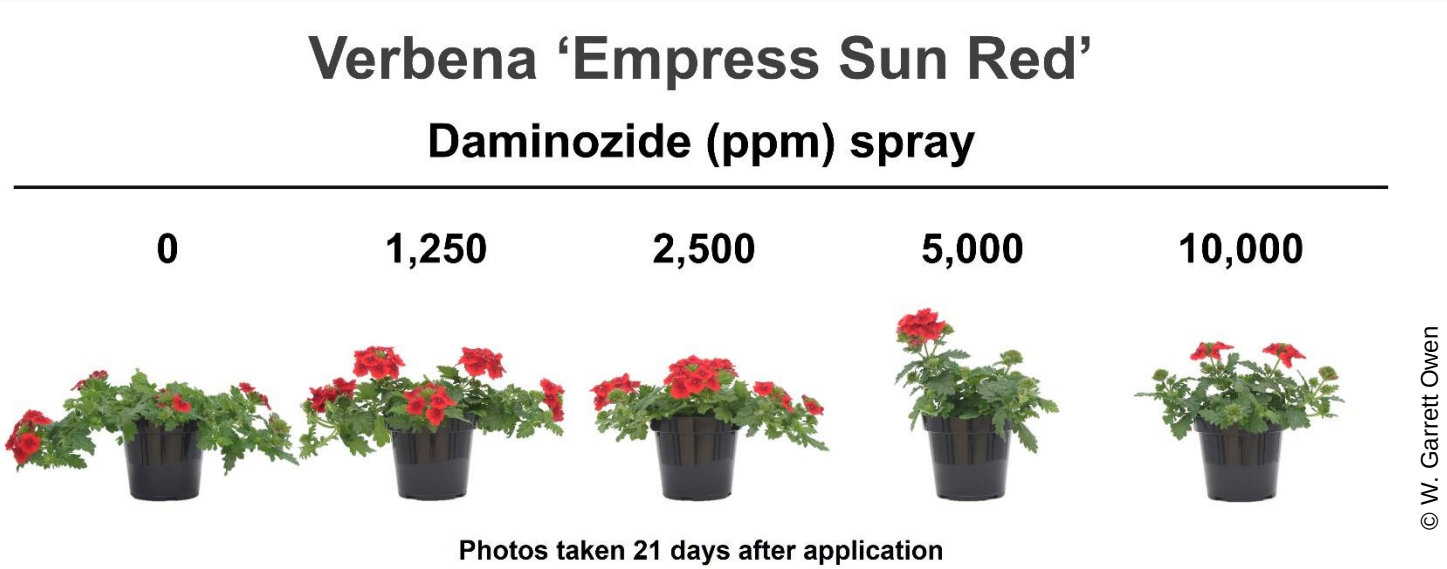

Figure 3. Daminozide foliar sprays applied at increasing concentrations to control growth of verbena 'Empress Sun Red'. Plants were sprayed with 0, 1,250, 2,500, 5,000, or 10,000 ppm daminozide at a volume of 2 qt. per 100 sq. ft. Flower bleaching and color breaks were observed at 5,000 and 10,000 ppm daminozide. Photo by: W. Garrett Owen.

Upon spray application, daminozide is absorbed by leaf tissue and translocated throughout the plant. Daminozide interferes with gibberellic acid biosynthesis thereby reducing the production of active gibberellins, leading to a decrease in cell elongation and thus plant height.

While daminozide is used to control plant height, growers should be aware that it can lead to flower bleaching (Fig. 3) and/or color breaks (Fig. 4), especially in plants with red, blue, or purple flowers. Additionally, high concentrations of daminozide can cause flower bleaching and color breaks (Fig. 5). Daminozide's primary mechanism involves inhibiting the flavonoid biosynthetic pathway, which is essential for producing flavonoids, particularly anthocyanins responsible for red, blue, and purple hues in flowers. Consequently, this inhibition leads to a decrease in anthocyanin synthesis and an increase in anthoxanthins, which are flavonoids that do not contribute to red, blue, or purple hues. As a result, flowers exhibit diminished intensity of these colors, resulting in a bleaching effect.

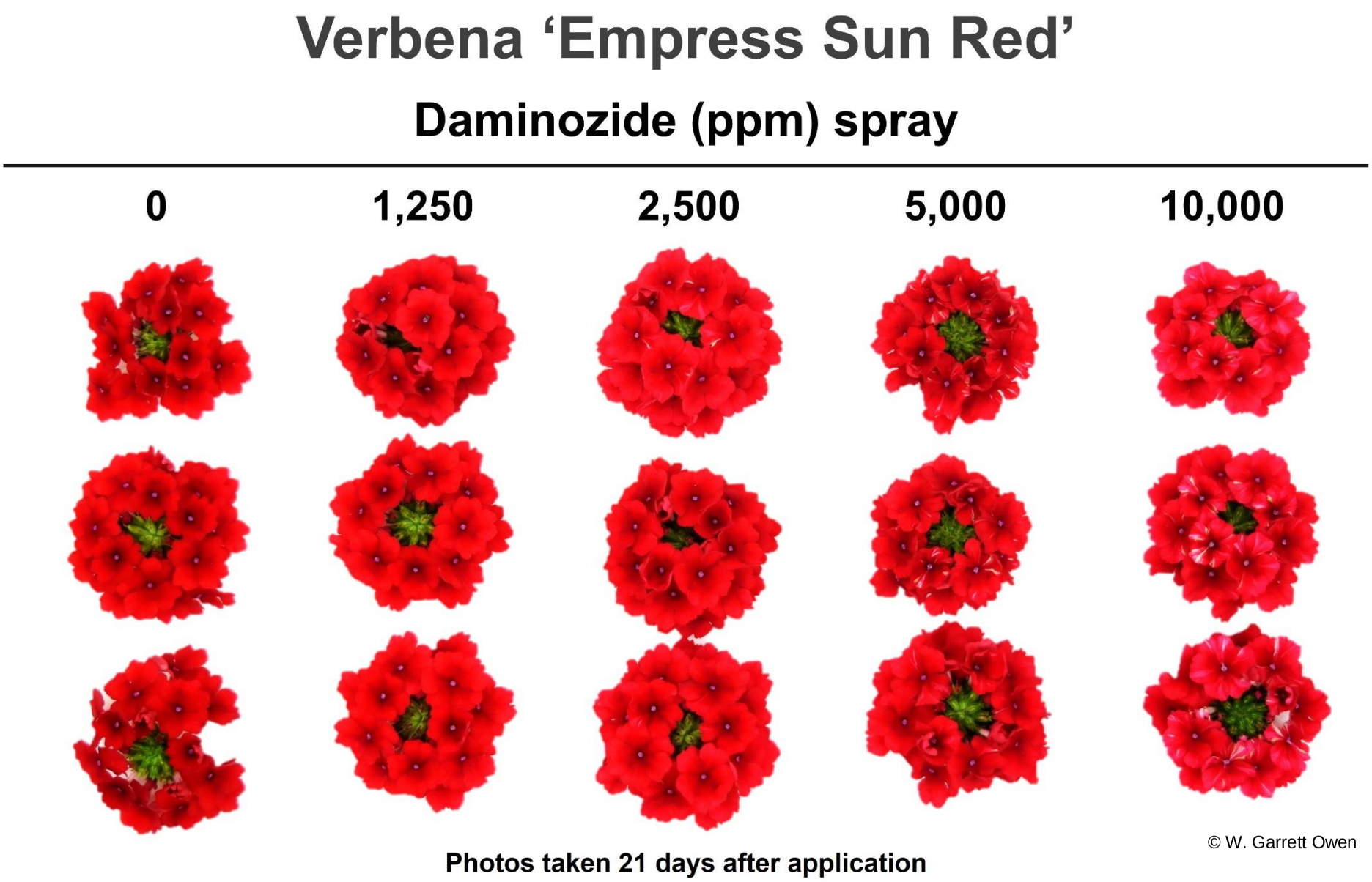

Figure 4. Daminozide foliar sprays applied at increasing concentrations to control growth of verbena 'Empress Sun Red'. Plants were sprayed with 0, 1,250, 2,500, 5,000, or 10,000 ppm daminozide at a volume of 2 qt. per 100 sq. ft. Flower bleaching and color breaks (white streaks) were observed at 5,000 and 10,000 ppm daminozide. Each flower represents a different plant. Photo by: W. Garrett Owen.

Verbena 'Empress Sun Red'

Figure 5. Verbena 'Empress Sun Red' sprayed with 0 (left) or 10,000 (right) ppm daminozide at a volume of 2 qt. per 100 sq. ft. Flower bleaching and color breaks (white streaks) were observed at 10,000 ppm daminozide. Photos by: W. Garrett Owen.

To prevent daminozide-induced flower bleaching, greenhouse growers can adopt specific best practices for using daminozide and consider using alternative (PGRs). Here are a few strategies to consider:

1. **Review Plant Culture Sheets**: Check plant- or cultivar-specific culture sheets for caution statements avoiding the application of daminozide.
2. **Optimal Application Conditions**: Apply daminozide under conditions that enhance its absorption and efficacy. This includes spraying during high humidity, on cloudy days, at lower temperatures, and when the air is calm to ensure slow drying on the leaf surface, which facilitates better absorption.
3. **Proper Plant Preparation**: Ensure plants are well-watered but with dry leaves at the time of application. Wilted plants may absorb less PGR, and wet leaves can dilute the concentration, reducing effectiveness.
4. **Avoid Overhead Irrigation Shortly After Application**: To prevent washing off the PGR before it has been absorbed by the leaves, avoid overhead irrigation soon after applying daminozide.
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6. **Timing and Concentration**: Apply daminozide just as plants begin to rapidly elongate and carefully follow the mixing instructions on the product labels to deliver the desired concentration. Adjust the spray rates based on the plant's growth stage, with typical spray rates for young plants ranging from 1,500 to 2,500 ppm and higher rates of up to 5,000 ppm for finish plants.
7. **Trial**: Conduct an in-house trial to determine the foliar spray concentration rate and if flower color bleaching occurs.
8. **Use Daminozide Alternatives**: Use other PGRs that inhibit gibberellin biosynthesis such as ancymidol, chlormequat chloride, daminozide, flurprimidol, paclobutrazol, and uniconazole.

By implementing these best practices and considering alternatives to daminozide, greenhouse growers can effectively manage plant growth while minimizing the risk of flower bleaching or breaks.

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