

# THE RESPONSE OF PETUNIA HYBRIDS TO B-NINE AND DMSO<sup>1</sup>

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Petunias are one of the most important bedding plant crops in the floral industry. Peak of the sales season may be anytime from late April until early June, depending upon weather conditions. The grower often finds it difficult to hold bedding plants for extended periods in their small packs and keep them attractive and salable. If the plants become too tall, they require pinching, and flowering is delayed for many weeks. Pinching is not a cure and a more satisfactory treatment is needed.

Working with petunias, Cathey (1) indicated that varietal response to treatment with B-Nine ranged from 0 to 50 percent reduction in height. Cathey (2) reported that overtreatment with B-Nine resulted in reduced flower size in some petunia varieties. Treatment of double flowered zinnias resulted in the development of flower heads with one, two, or three rows of petals. Some foliage damage was noted on several marigold varieties. Duration of effectiveness of B-Nine was approximately 4 weeks.

The growth retardant B-Nine (N-dimethyl amino succinamic acid) is readily applied as a foliar spray. Effective rates for growth regulation vary considerably with both species and varieties.

DMSO (dimethyl sulfoxide) is an unusually effective penetrating agent. Sullivan (3) reported that DMSO mixed with dyes and injected into full-grown trees facilitated dye uptake and the whole tree was dyed. Two properties of DMSO were of interest in connection with this study: (a) its high systemic penetration and (b) its remarkable compatibility with a wide range of substances (4).

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Mussell (5) reported severe burning to plants when high concentrations of DMSO were used. If DMSO were used in combination with herbicides, this would not be undesirable. If DMSO were used in combination with a growth retardant, damage to the plant could render it unsalable.

The objective of study 1 was to determine the DMSO tolerance of petunias. Study 2 involved three trials to determine (a) if DMSO increased the effectiveness of B-Nine and (b) the most effective stage of growth for B-Nine application.

Materials and Methods

Seedlings of Cavalier sown on February 16, 1965 were used in Study 1. Seedling of four varieties, Cavalier, Comanche Improved, Coral Magic, and White Cascade, sown on March 29, 1965 were used in Study 2. The seedlings were handled in the regular commercial manner with nine plants per pack grown at a night temperature of 65° F.

All treatments were applied with a plastic hand sprayer. Plants were sprayed to runoff. The soil was moist upon application and the foliage was kept dry for 24 hours after the application to avoid washing off the B-Nine and DMSO.

Results and Discussion

Study 1.

Five treatments and six concentrations of DMSO were applied to plants of the variety Cavalier as indicated in Table 1. Dreft was used as a wetting agent, where indicated, at the rate of 1 teaspoon per gallon of water.

Table 1. Response of Cavalier petunias to DMSO, B-995, and B-Nine applied on four occasions from April 22 to May 4, 1965.

Treatment	DMSO concentration <sup>1</sup>						Water
	1:20	1:40	1:80	1:100	1:120	1:160	
DMSO	* <sup>2</sup>	*	*	*	*	+ <sup>3</sup>	---
DMSO - Dreft	*	*	*	*	*	+	---
DMSO - Dreft - B-995	*	*	*	*	*	+	---
DMSO - B-Nine	*	*	*	*	*	+	---
Check	---	---	---	---	---	---	+

1. Refers to one part by volume DMSO in 20, 40, 80, 100, 120, and 160 parts of water.
2. \* indicates damage caused by high concentrations of DMSO.
3. + indicates no damage occurred, plants were normal.

Damage occurred as scattered necrotic areas on the leaves. During bright weather, damage was first evident 2 days after application. In cloudy weather, up to 2 weeks were required before damage symptoms became evident. Nature and extent of damage were similar in all treatments and concentrations from 1:20 to 1:120 parts DMSO. Therefore, the 1:160 concentration of DMSO was selected for use in Study 2.

### Study 2.

Five treatments were applied on three different dates to the four varieties.

Plants in Trial 1 were treated May 4, 1965. At this time, they were  $1\frac{1}{2}$  inches in diameter and had not begun to elongate. Table 2 lists the treatments and results for Trial 1.

In general, plants treated with DMSO were taller than the check plants. Application of B-Nine decreased the internode length of some varieties. Plants of Comanche Improved showed the greatest response.

As the concentration of B-Nine was increased, plant height decreased. There were no consistent differences between plants treated with 2,500 ppm B-Nine with DMSO and those without DMSO. All plants flowered equally and had equal size flowers. In general, the plants in Trial 1 were taller than the plants in the other two trials. This finding might indicate that the plants were too small to absorb appreciable quantities of B-Nine, so they outgrew the effects of the treatment and resumed normal growth sooner than did plants treated at a later stage.

Plants in Trial 2 were treated on May 11, 1965. At this time, the plants were beginning to elongate. Treatments were the same as in Trial 1. Treatments and results are shown in Table 3.

All DMSO-treated plants were as tall or taller than the check plants. Applications of B-Nine decreased internode length, especially with Comanche Improved and White Cascade varieties. As the concentration of B-Nine was increased, plant height decreased. Plants treated with 2,500 ppm B-Nine plus DMSO were slightly shorter than plants treated with 2,500 ppm B-Nine only.

Much more basal branching was noted on plants treated with B-Nine and B-Nine plus DMSO than on plants that received no B-Nine. Flowering and flower size were similar in all treatments. The plants in Trial 2 were shorter in general and more desirable than those in Trials 1 and 3.

Coral Magic, Comanche Improved, and Cavalier, the three varieties included in Trial 3, were treated May 20, 1965. At this time, the plants were elongating rapidly. Treatments were the same as in Trials 1 and 2. Treatments and results are shown in Table 4.

Table 2. Trial 1--Response of four petunia varieties treated with DMSO and B-Nine on May 4, 1965, 37 days after seeding.<sup>1</sup>

Treatment	Varieties							
	Coral Magic		White Cascade		Cavalier		Comanche Improved	
	Height	Internode length <sup>2</sup>	Height	Internode length <sup>2</sup>	Height	Internode length <sup>2</sup>	Height	Internode length <sup>2</sup>
	-----inches-----							
Check untreated	9.5	1.0	12.0	1.5	10.0	1.5	9.0	1.75
1:160 DMSO plus 500 ppm B-Nine	9.5	1.0	11.5	1.5	11.5	1.5	8.0	1.5
1:160 DMSO plus 1500 ppm B-Nine	9.5	1.0	11.0	1.0	11.5	1.5	8.0	1.0
1:160 DMSO plus 2500 ppm B-Nine	8.5	0.75	9.0	0.75	11.0	1.0	7.0	0.75
1:160 DMSO	10.0	1.0	12.0	1.5	11.5	1.5	10.0	2.5
2500 ppm B-Nine	8.5	0.75	10.0	1.25	10.0	1.0	7.0	0.75

<sup>1</sup>Plants were  $1\frac{1}{2}$  inches in diameter and had not begun to elongate. Measurements were made on June 6, 1965.

<sup>2</sup>Measurements made halfway up the stem.

Table 3. Trial 2--Response of four petunia varieties treated with DMSO and B-Nine on May 11, 1965, 44 days after seeding.<sup>1</sup>

Treatment	Varieties							
	Coral Magic		White Cascade		Cavalier		Comanche Improved	
	Height	Internode length <sup>2</sup>	Height	Internode length <sup>2</sup>	Height	Internode length <sup>2</sup>	Height	Internode length <sup>2</sup>
	-----inches-----							
Untreated check	9.0	1.0	10.0	1.75	10.0	1.0	10.0	0.75
1:160 DMSO plus 500 ppm B-Nine	10.0	1.0	10.0	0.75	11.5	1.0	8.0	0.5
1:160 DMSO plus 1500 ppm B-Nine	8.5	0.75	8.5	0.5	11.0	0.75	7.0	0.5
1:160 DMSO plus 2500 ppm B-Nine	8.5	0.75	8.0	0.5	9.0	0.5	6.0	0.25
1:160 DMSO	9.5	1.0	9.5	0.75	11.5	1.25	10.0	0.75
2500 ppm B-Nine	9.0	0.75	7.5	0.5	10.0	1.0	7.0	0.5

<sup>1</sup>Plants were beginning to elongate. Measurements were made on June 6, 1965.

<sup>2</sup>Measurements were made halfway up the stem.

Table 4. Trial 3--Response of three petunia varieties treated with DMSO and B-Nine on May 20, 1965, 53 days after seeding.<sup>1</sup>

Treatment	Varieties					
	Coral Magic		Cavalier		Comanche Improved	
	Height	Internode length <sup>2</sup>	Height	Internode length <sup>2</sup>	Height	Internode length <sup>3</sup>
	-----inches-----					
Untreated check	9.0	1.0	11.0	1.0	8.5	---
1:160 DMSO plus 500 ppm B-Nine	8.5	1.0	10.0	0.75	7.0	---
1:160 DMSO plus 1500 ppm B-Nine	8.0	0.5	9.0	0.5	6.5	---
1:160 DMSO plus 2500 ppm B-Nine	8.0	0.5	8.0	0.5	5.5	---
1:160 DMSO	9.0	1.0	10.0	1.0	9.0	---
2500 ppm B-Nine	8.5	0.5	9.0	0.5	6.0	---

<sup>1</sup>Plants were 4 inches high and elongating rapidly. Measurements were made on June 6, 1965

<sup>2</sup>Measurements were made halfway up the stem.

<sup>3</sup>Data misplaced.

DMSO-treated plants averaged as tall as plants in other treatments. Long internodes were noted on the lower portion of plants. A decided decrease in internode length was noted in the mid and upper portions of plants following application of B-Nine.

Once again, as the concentration of B-Nine was increased, plant height decreased. There was a slight decrease in plant height when DMSO was applied with B-Nine at the rate of 2,500 ppm as compared to B-Nine alone. Nearly all the plants were too tall and were not equivalent in quality to the plants in Trials 1 and 2.

All plants from Trials 1 and 2 were planted in the field on June 14, 1965 to determine whether DMSO increased the effective life of B-Nine. Because the plants were quite tall at this time, they were cut back to approximately one-fourth their height.

The plants reached their flowering peak in early August. They were rated for plant size, habit, and flowering on August 4, 1965. No pattern was evident from the observations, so it was concluded that either (a) the chemicals were no longer effective at the time of the field planting or (b) pruning removed a large portion of the plants and the growth retardant.

DMSO at the rate of 1:160 did not significantly increase the effectiveness of B-Nine. Mussell (5) indicated that concentrations of 25 to 40 percent were needed to get outstanding results from DMSO in connection with plant growth. The use of a more concentrated DMSO spray on petunias may have increased the effectiveness of B-Nine, but accompanying damage to petunia foliage would have rendered the plants unsalable.

#### Summary

1. DMSO at the rate of 1 part by volume in 160 parts of water, with and without B-Nine, was not injurious to four varieties of petunias.
2. DMSO did not significantly increase the effectiveness of B-Nine and occasionally encouraged greater plant stretch.
3. To be most effective, B-Nine must be applied when plants are just beginning to elongate.
4. Varietal response application to B-Nine from greatest to least was: Comanche Improved, White Cascade, Coral Magic, and Cavalier. The response by Cavalier was negligible.
5. DMSO did not prolong the effectiveness of B-Nine under the conditions of this study.
6. The most effective concentration of B-Nine used in this study was 2,500 ppm.

Literature Cited

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