Chemical Growth Retardants For Bedding Plants

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Chemical growth retardants placed on the market within the past few years have made it possible for bedding plant growers to reduce or eliminate excessive stem elongation, thereby producing a more compact and sturdier plant requiring less frequent pruning. The chemical 1, 1 dimethylamino succinamic acid (B-Nine, Alar) is one of the most promising and useful of the new growth retardants because it can be applied to the foliage of most species without causing injury. Some of the chemicals also appear to initiate precocious flowering, suggesting a treatment that may be of value in slow-maturing species where flowering and fruiting are prized. Many plants treated with the growth retardants also appear to be better able to resist stress conditions such as drought, salinity, frost or chilling, and air pollution.

BECAUSE OF ITS quick germination and fast growth, *Zinnia elegans* was chosen as the candidate species for these tests with growth retardants. To determine any possible preference in varieties, a preliminary experiment was run testing four widely different varieties of zinnia. Alar was applied at the rate of 2,500 ppm 17 days after seeding on the following four varieties: Elegans pumila, Old Mexico, Dahlia-flowered "Golden Dawn," and Thumbelina. Seven days after treatment, each of the ten replications of the four varieties were measured from the soil surface to the apex to determine stem elongation, with the following results:

EFFECT OF ALAR ON STEM ELONGATION IN ZINNIA

Variety	Check	Treated
	Average height (10 reps.)	
Elegans pumila	12.08 mm	6.56 mm
Old Mexico	7.4 mm	5.4 mm
Thumbelina	4.1 mm	2.93 mm
Dahlia-flowered	9.15 mm	6.6 mm

Alar at 2,500 ppm was effective in reducing linear growth by approximately 50% in all zinnia varieties tested except Old Mexico. Because of its growth habit and availability of seed, the Dahlia-flowered variety was chosen for further testing.

Further investigations involved the effects of several wetting agents on Alar-induced inhibition of stem elongation. Two-week-old seedlings were transplanted to 3-inch pots. Approximately one week later, when the seedlings were 20 to 40 mm tall, with one to two pairs of true leaves, they were ready for testing. Eight replicates per treatment, randomly placed on raised benches, were used. They were measured at the time of treatment and final data were taken one week later. Stem elongation is the difference between the initial and final heights of the seedlings. The plants were grown in evaporatively cooled greenhouses for the duration of the experiment.

The wetting agents tested were all of the non-ionic type and fall into two broad categories: (1) acyl, aryl polyoxyethylene derivates, and (2) sucrose-fatty-acid ester derivates. The latter group are of particular interest because they appear to be more readily biodegradable. Many of the substances may not be available commercially for some time, however.

The main conclusion from the two experiments, was that the wetting agents tested did not enhance Alar-induced inhibition of stem elongation (see table). However, one of the surfactants, X-77, inhibited stem elongation when applied alone—probably resulting from phytotoxic side effects (which became quite evident when the X-77 concentration was increased to 2%). Also, one wetting agent, TMN–10, apparently blocked the action of Alar—Alar plus TMN–10, in fact, promoted elongation, whereas TMN–10 alone showed no effects.

Alar-induced inhibition was greater in the first experiment than in the second, as indicated in the table. Although no climatic data were recorded, the average temperature in the greenhouse during the first experiment was considerably higher than during the second experiment. We have observed a similarly reduced sensitivity to Alar in chrysanthemum pot plants during periods when greenhouse temperatures were warmer than usual. Thus, it may be advisable to increase the rates or frequency of Alar application during abnormally warm periods.

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EFFECT OF SURFACTANTS ON ALAR-INDUCED INHIBITION OF STEM ELONGATION IN ZINNIA*

Treatment	Experiment 1 Elongation	Control
	(mm)	%
1. Alar+H_2O	39	37
2. Alar+SET	27	26
3. Alar+20–115	35	34
4. Alar+30–13	40	39
5. Alar+30–145	42	40
6. Alar+40–13	43	41
7. Alar+SP	36	35
8. Alar+SS	58	56
9. Alar+SL	45	43
10. SET	103	100
11. 20–115	95	91
12. 30–145	112	108
13. SS	96	92
14. S6	102	99
15. Control	104	..
$LSD_{0.05}$	19	18

Treatment	Experiment 2 Elongation	Control
	(mm)	%
1. Alar+H_2O	63	61
2. Alar+1100–9	62	60
3. Alar+209	63	61
4. Alar+P–342	127	122
5. Alar+1100–50	65	63
6. Alar+P–11	68	65
7. Alar+X–77	53	51
8. 1100–9	95	91
9. 209	97	93
10. P–342	103	100
11. 1100–50	117	112
12. P–11	99	95
13. X–77	51	..
14. Control	104	..
$LSD_{0.05}$	21	20

* Surfactants were used at 0.5% in each case. Chemical composition of surfactants used is available upon request from the Department of Landscape Horticulture, U. C. Davis.