

Phytotoxicity and Efficacy of Fascination
(6-Benzyl Adenine + Gibberellic Acid)
for Enhanced Branching of
Periwinkle (*Vinca* 'Tall Rosea Mix')

By

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Project: Interregional Research Project #4
Project Number 23189A – October 28, 2004

Donors/Supporters:
CDFA Minor Crops Research Grant, Project 2: Enhancement of the Western
Region IR-4 Program to Address California Needs

UC Davis Environmental Horticulture IR4 Center
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One Shields Ave.
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<http://envhort.ucdavis.edu/ir4>

PR.NO.:	23189A
TRIAL:	1
DATE:	10/28/04

IR-4 ORNAMENTAL DATA REPORTING FORM
(Please type or print)

1. INVESTIGATOR (Name, Address, Phone#):

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LOCATION OF TRIAL:

TRIAL TYPE:(check one) FIELD CONTAINER GREENHOUSE INTERIORSCAPE

2. PESTICIDE:

COMMON NAME: 6-Benzyl Adenine + Gibberellic Acid A₄ A₇ FORMULATION: 1.8% + 1.8% (w/w)

BATCH NO.: _____ PRODUCT: Fascination
 EPA REG. NO. 27135 MFG: Valent

3. USE INFORMATION:

COMMON NAME	SCIENTIFIC NAME
PLANT: <u>Periwinkle</u>	<u>Vinca 'Tall Rosea Mix'</u>

REASON: enhanced branching of potted crops

SOIL TYPE OR TYPE OF POTTING MIX: UC Mix

% SAND 35 % SILT _____ % CLAY _____ % OM 65 % pH 6.5

SEEDING DATE 7/23/04 EMERGENCE DATE _____ TRANSPLANTING DATE 9/9/04

PLANT OR POT SPACING 6" ROW SPACING 6" POT SIZE 4-inch

PLOT SIZE 50 sq. ft. EXPERIMENTAL DESIGN randomized complete block NO.OF REPS 9
(3 blocks)

4. APPLICATION PARAMETERS:

TYPE OF APPLICATION: foliar

NO. OF APPLICATIONS 2 APPLICATION TYPE manual spray bottle

NOZZLE TYPE/SIZE _____ NOZZLE PRESSURE _____ DELIVERY RATE _____
 CALIBRATION DATE(S) _____

5. APPLICATION SUMMARY:

APPL.DATE	RATES (ppm)*	GROWTH STAGE
9/16/04	0, 125 (0.5X), 250 (1X), 500 (2X)	1 week post-transplant
10/7/04	0, 125 (0.5X), 250 (1X), 500 (2X)	4 weeks post-transplant

*Be sure to provide units

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6. RAINFALL/IRRIGATION RECORDS:

INCLUDE RAINFALL/IRRIGATION INFORMATION (printouts, IR-4 forms, etc.)

Plants were watered as needed (at least once daily) with half-strength Hoagland's solution

7. OTHER PESTICIDES, FERTILIZER, LIME AND ADJUVANTS USED:

PRODUCT	<u>Flagship</u>	AMOUNT	<u>6 oz./acre</u>	DATE	<u>10/13/04</u>
PRODUCT	<u>Avid</u>	AMOUNT	<u>0.08 oz./gal</u>	DATE	<u>10/13/04</u>
PRODUCT	<u>Tame</u>	AMOUNT	<u>0.16 oz./gal</u>	DATE	<u>10/26/04</u>
PRODUCT	<u>Pedestal</u>	AMOUNT	<u>0.08 oz./gal</u>	DATE	<u>10/26/04</u>
PRODUCT	<u>Azatin</u>	AMOUNT	<u>5 oz./acre</u>	DATE	<u>10/26/04</u>

8. NARRATIVE SUMMARY OF METHODS AND RESULTS: (Use more pages if needed)

Materials and Methods

Plant Material and Culture. Seeds of *Vinca* 'Tall Rosea Mix' (Lake Valley Seed Co.) were planted in a seedling tray containing a medium of 50% peat and 50% vermiculite on July 23, 2004. The seedlings were allowed to germinate for four weeks in a mist bench with bottom heat of 75°F. The seedlings were transplanted to 4-inch pots containing UC Mix on September 9, 2004 and maintained in a greenhouse under natural day length for one week until the experiment began on September 16, 2004. For the experiment, the plants were grown in a greenhouse under natural day length with day/night temperatures of 78°F/65°F (26°C/18°C) (Figure 1). The plants were watered as needed (at least once daily) during the 6-week experiment with half-strength Hoagland's solution. Applications of pesticides as part of a normal pest management program were made as needed (see No. 7 above).

Experimental Procedure. Thirty-six plants were randomly chosen and individually tagged for treatment with 0, 125 ppm (0.5X), 250 ppm (1X) or 500 ppm (2X) Fascination with 9 replicates per treatment. These dosages were prescribed in an IR4 Fascination protocol dated 6/04 (Appendix A). The plants received the first of two foliar spray applications of the designated treatments on September 16, 2004 using manual spray bottles to spray leaves to runoff. The second application was made 21 days later on October 7, 2004. The plants were arranged in a randomized complete block design with 3 blocks and 3 treatment replicates per block. Phytotoxicity and efficacy measurements were taken at day 0 (September 16, 2004), day 21 (October 7, 2004) and day 42 (October 28, 2004). Phytotoxicity evaluations were based on a numerical rating scale of 0 (no injury) to 10 (complete kill) (Table 1). Efficacy measurements consisted of overall plant height (cm) measured from the surface of the container medium to the top of the canopy and width (cm) reported as the average of two horizontal canopy measurements taken perpendicular to each other. In addition, the numbers of branches per plant were counted and, on the last day of the experiment, the numbers of flowering branches were counted.

For each observation a canopy volume index was calculated so as to be able to determine if canopy volume was affected by the application of Fascination. The calculation was made as $H*W_1*W_2$ for observations where two width measurements were available and as $H*W*W$ where only one width measurement was available. The usefulness of this index is based on the fact that many of the models for such a volume calculation are of the form $a*H*W_1*W_2$, where H is the height, W_1 and W_2 are two width measurements. The constant "a" depends on the assumption of the shape of the canopy. Since analyses of variance are scale-independent, the conclusion will thus be for the volume of the plant canopy.

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Statistical Analysis. The data were analyzed using Proc GLM of the Statistical Analysis System (SAS). The phytotoxicity and change in mean value for all variables were analyzed for significant differences using t-tests.

Results

Phytotoxicity Index. Phytotoxicity index values were low throughout the experiment for all *Vinca* plants in all treatments (Figure 2, Table 2, Appendix B).

Efficacy. *Vinca* plants grew from about 7 cm to 40 to 50 cm over the 6 weeks of the experiment (Figures 2 and 3, Table 2, Appendix C). By week 6, the plants treated with Fascination were taller than the control. There were no significant differences in heights between the 0.5X, 1X and 2X treatments.

No significant differences in width were observed at week 3 and week 6 (Figures 2 and 3, Table 2, Appendix C). The calculated relative volume index also showed no differences in the change from week 0 to either week 3 or 6 (Figure 2, Table 2).

Branching data showed a lot of variability so that the changes in the means of the various treatments were not found to be significantly different (Figures 2 and 3, Table 2, Appendix C). It is interesting to note that the average number of branches on the Fascination treated *Vinca* plants was typically a greater value, but due to the variability no conclusion can be drawn.

Flower counts taken at week 6 showed no significant differences (Table 2, Appendix C).

Discussion.

Phytotoxicity. Fascination caused no phytotoxicity on *Vinca* plants at any of the rates tested.

Efficacy. Our study was not able to conclusively find any significant benefits of treating *Vinca* plants with Fascination. Thus for *Vinca*, the product requires further testing preferably with a larger sample size.

Fascination had no effect on flowering of *Vinca*.

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9. GOOD RESEARCH PRACTICE STATEMENT:

I acknowledge that I have read and followed the IR-4 Research protocol and completed this trial following good agricultural practice, or reported any deviations (note any changes from authorized protocol in narrative).

SIGNATURE _____ DATE
PRINCIPAL INVESTIGATOR

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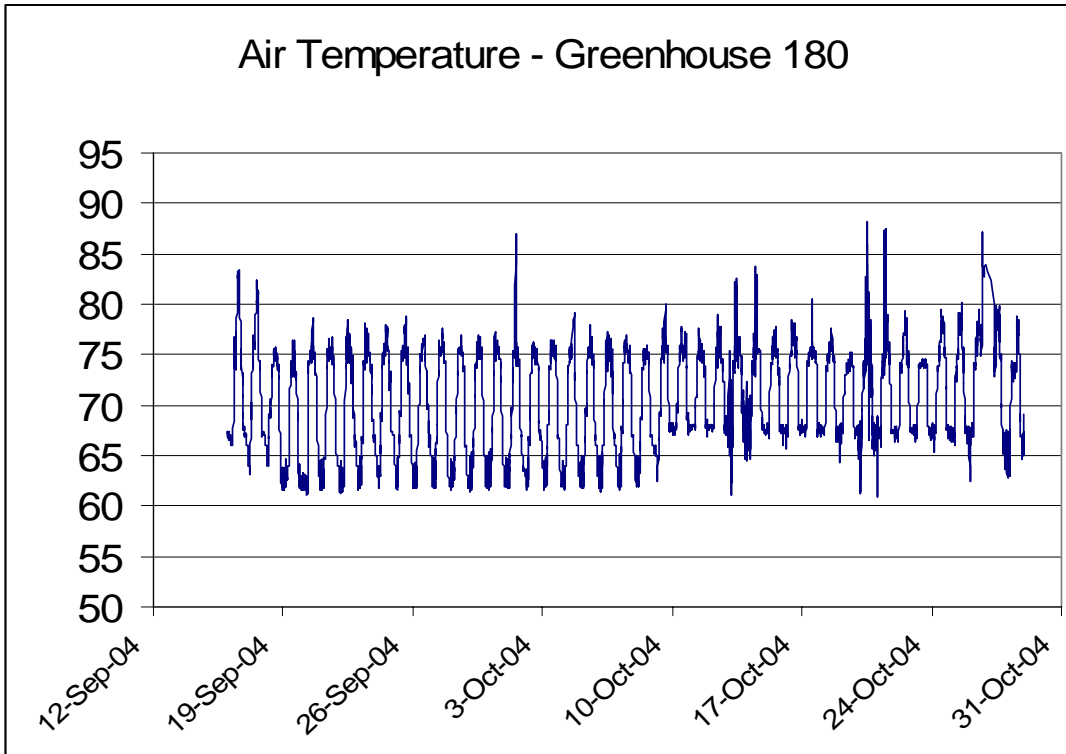


Figure 1. Greenhouse temperatures during the the experiment to evaluate the effects of Fascination on *Vinca* 'Tall Rosea Mix'.

Table 1. Numerical plant damage rating scale used for phytotoxicity determinations.

Rating	Description of plant damage
0	No damage
1	No visible damage but unintended (non-permanent) impact
2	Slight leaf/tissue damage (curling leaves, necrosis, etc.)
3	Marginal chlorosis on some leaves (damage on up to 10% of plant)
4	10% – 20% of plant damaged
5	Significant damage to much of plant (30% - 40%)
6	40% – 60% of plant damaged
7	Chlorosis or necrosis on most of plant (60% - 70%)
8	Abscised leaves, branch dieback
9	Tissue severely damaged (80% - 100% of plant)
10	Complete kill

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Species: Vinca -- Material: Fascination

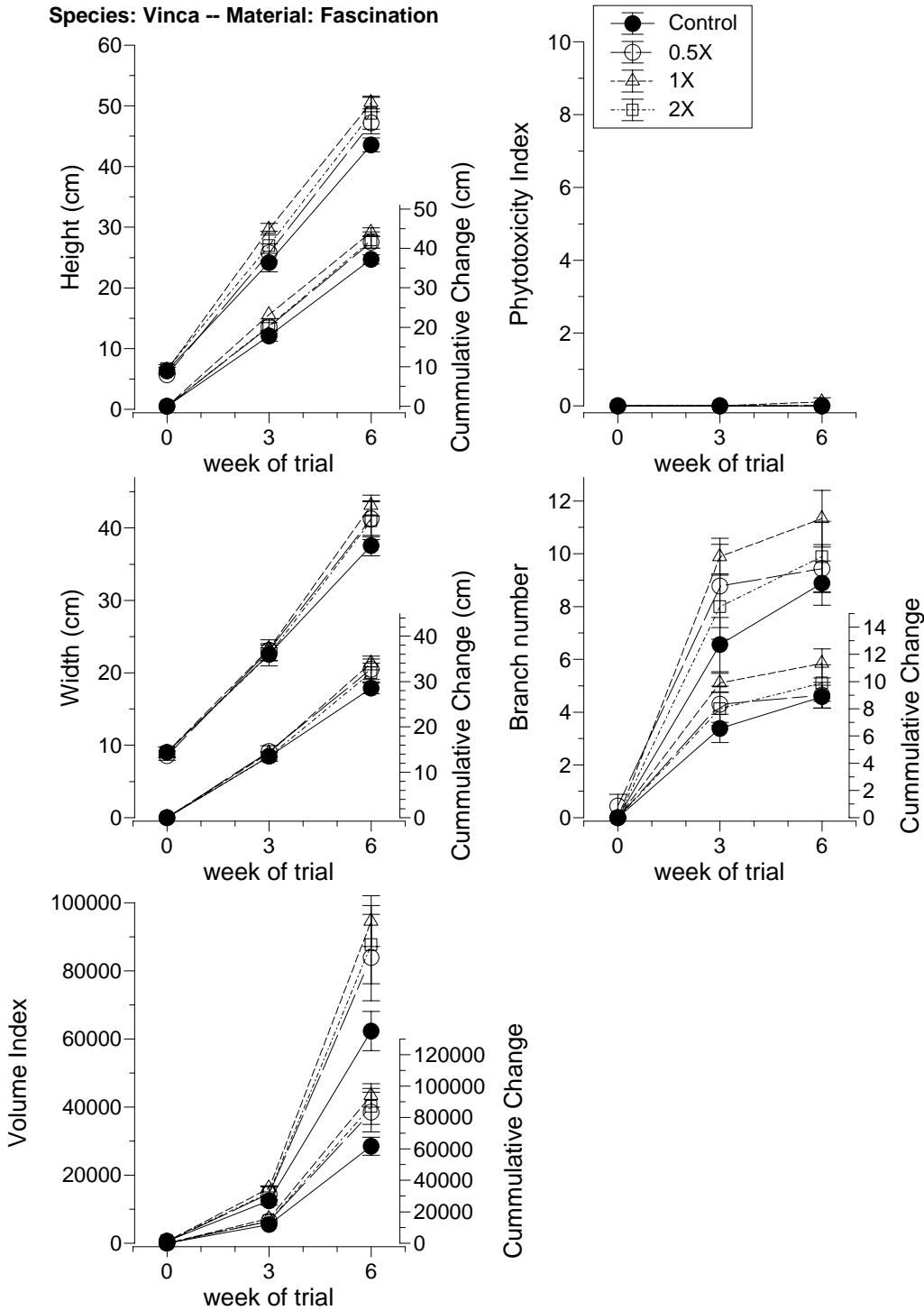


Figure 2. Summary of results for *Vinca* 'Tall Rosea Mix' treated with 0, 125, 250 or 500 ppm Fascination. Both raw data and cumulative changes over time are plotted for phytotoxicity index, plant height, plant width, branch number and volume index. SE bars shown. n=9.

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Table 2. Summary of results for *Vinca* 'Tall Rosea Mix' treated with 0, 125, 250 or 500 ppm Fascination. Cumulative changes over time are reported for phytotoxicity index, plant height, plant width, branch number, flowering branch number and volume index. Different letters within a column indicate significant differences between treatments ($P < 0.05$). "Yes"/"No" refer to significant treatment effects at the 5% level. Means \pm SE ($n=9$).

Fascination on <i>Vinca</i>				
Phytotoxicity Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	0.00 \pm 0.00	a	0.00 \pm 0.00	a
125 ppm	0.00 \pm 0.00	a	0.00 \pm 0.00	a
250 ppm	0.00 \pm 0.00	a	0.11 \pm 0.11	a
500 ppm	0.00 \pm 0.00	a	0.00 \pm 0.00	a
Height Increase after:				
Treatment	3 weeks	no	6 weeks	yes
0 ppm	17.83 \pm 1.34	a	37.22 \pm 1.17	a
125 ppm	20.11 \pm 1.10	ab	41.56 \pm 1.47	b
250 ppm	23.22 \pm 0.76	b	44.11 \pm 1.08	b
500 ppm	20.33 \pm 1.78	ab	42.11 \pm 2.06	b
Width Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	13.53 \pm 0.85	a	28.53 \pm 1.17	a
125 ppm	14.58 \pm 1.31	a	32.72 \pm 2.26	ab
250 ppm	14.28 \pm 0.61	a	34.08 \pm 1.50	b
500 ppm	13.47 \pm 1.06	a	31.97 \pm 2.04	ab
Relative Volume Index Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	11862.7 \pm 1261.69	a	61716.1 \pm 5751.37	a
125 ppm	14041.0 \pm 1997.28	a	83459.3 \pm 12622.4	ab
250 ppm	15629.1 \pm 935.82	a	94051.7 \pm 7472.34	ab
500 ppm	14222.5 \pm 1879.09	a	87066.3 \pm 11387.7	b
Branch number Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	6.56 \pm 1.03	a	8.89 \pm 0.84	a
125 ppm	8.33 \pm 1.33	ab	9.00 \pm 0.93	a
250 ppm	9.89 \pm 0.70	b	11.33 \pm 1.07	a
500 ppm	8.00 \pm 1.24	ab	9.89 \pm 1.34	a
Flowering Branch number at:				
Treatment			6 weeks	no
0 ppm			3.56 \pm 0.56	a
125 ppm			3.22 \pm 0.52	a
250 ppm			4.33 \pm 0.58	a
500 ppm			4.56 \pm 0.80	a

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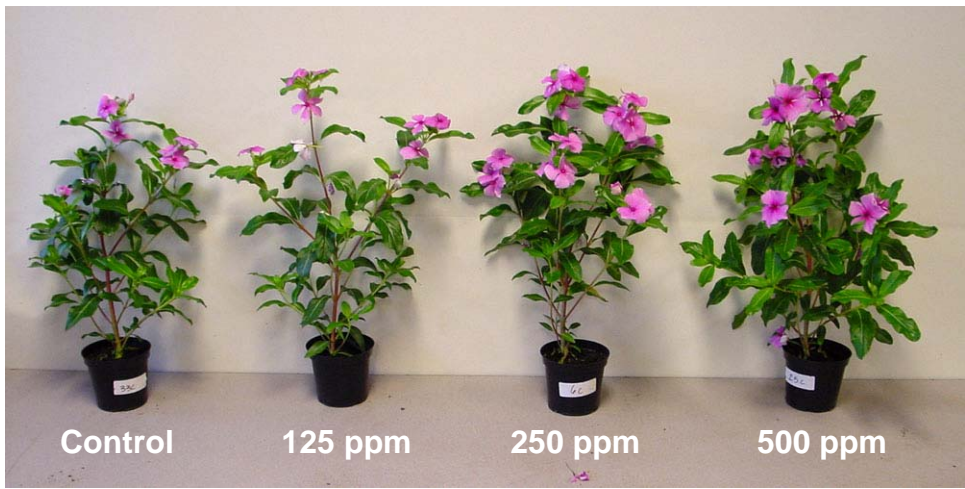
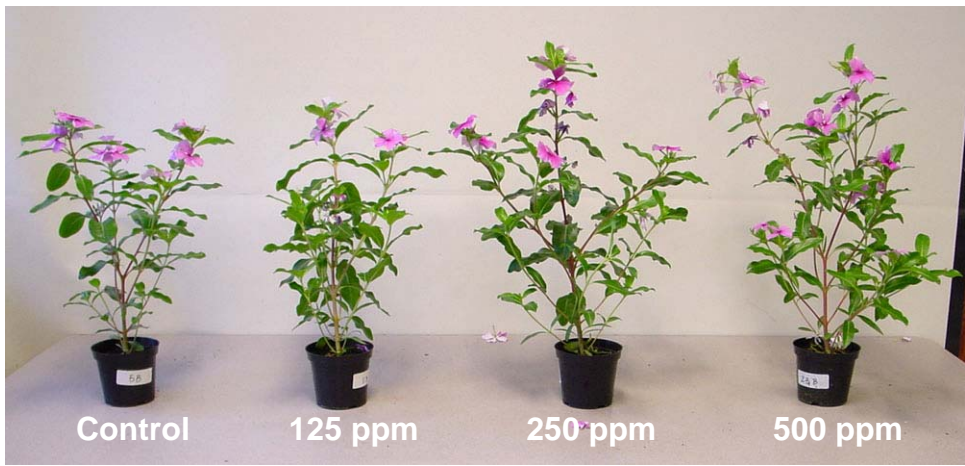
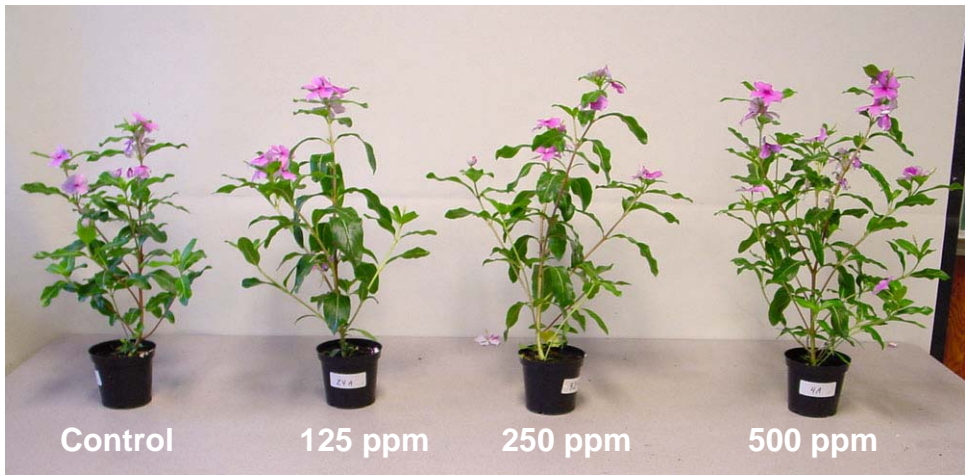


Figure 3. Representative plants of *Vinca* 'Tall Rosea Mix' 6 weeks after 2 foliar applications of 0, 125, 250 or 500 ppm Fascination (Week 0 and Week 3).

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Appendix A:

GROWTH ENHANCEMENT OF ORNAMENTAL PLANTS WITH FOLIAR APPLICATIONS OF 6-BENZYL ADENINE + GIBBERELIC ACID (FASCINATION)

Date: 6/04

Ornamental Protocol Number: 670

General label directions: Refer to product label or Technical Bulletin.

Research program:

Pest(s)/Plants – Plants other than labeled species.

Pesticide (common name and trade name): Refer to treatment list shown below.

For label, material & if needed, spray surfactant contact:

Valent USA, Joe Chamberlin, 770-985-0303, icham@valent.com

Plot size (must be adequate to reflect actual use condition)

Replicates Minimum of 4 Treatment Units

Controls (untreated controls to be included in all experiments)

Application: **FASCINATION**

Dosages - 1/2x 125 ppm or 0.125 pt/5 gal.

1x 250 ppm or 0.25 pt/5 gal.

2x 500 ppm or 0.5 pt/5 gal.

Active Ingredient: 6-benzyl adenine + gibberellic acid (FASCINATION).

Volume - Minimum of 100 gal/A.

Timing - 2 Applications, 21 day spray interval. Record number of branches and length, then increased branching, increased extension and crop safety at 7, 14, 21 (then 2nd appl.), 28 and 42 DAT.

Reports:

Method of application: Treatments should be applied according to product label instructions. application equipment consistent with conventional commercial equipment. Report completely on experimental design and method of application. Report plant size height x width before treatment and throughout the experiment.

Weather – Maintain temperature and precipitation (including irrigation) data.

Soil type – Identify soil type used in experimental area.

Product – When submitting data, include EPA registration number of product used.

Efficacy – Data should include percent control as well as an indication that infestation was light, heavy, etc.

Record all application and evaluation dates.

Phytotoxicity – Record phytotoxicity data at all rates. Use a 0-10 scale. 0 = No Phytotoxicity 10 = complete kill.

Please direct questions to: Dr. Robert M. Herrick, IR-4 Project, 681 US Highway #1 South, North Brunswick, NJ Phone: (732) 932-9575, Ext. 629.

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Appendix B: PHYTOTOXICITY REPORT FORM

Vinca Data			Phyto	Phyto	Phyto
			Rating	Rating	Rating
Treatment	Block	Rep	9/15/2004	10/7/2004	10/28/2004
Control (0 ppm)	A	1	0	0	0
Control (0 ppm)	A	2	0	0	0
Control (0 ppm)	A	3	0	0	0
Control (0 ppm)	B	1	0	0	0
Control (0 ppm)	B	2	0	0	0
Control (0 ppm)	B	3	0	0	0
Control (0 ppm)	C	1	0	0	0
Control (0 ppm)	C	2	0	0	0
Control (0 ppm)	C	3	0	0	0
		Mean	0.00	0.00	0.00
		Std. Dev.	0.00	0.00	0.00
1/2 X (125 ppm)	A	1	0	0	0
1/2 X (125 ppm)	A	2	0	0	0
1/2 X (125 ppm)	A	3	0	0	0
1/2 X (125 ppm)	B	1	0	0	0
1/2 X (125 ppm)	B	2	0	0	0
1/2 X (125 ppm)	B	3	0	0	0
1/2 X (125 ppm)	C	1	0	0	0
1/2 X (125 ppm)	C	2	0	0	0
1/2 X (125 ppm)	C	3	0	0	0
		Mean	0.00	0.00	0.00
		Std. Dev.	0.00	0.00	0.00
1X (250 ppm)	A	1	0	0	0
1X (250 ppm)	A	2	0	0	0
1X (250 ppm)	A	3	0	0	0
1X (250 ppm)	B	1	0	0	0
1X (250 ppm)	B	2	0	0	0
1X (250 ppm)	B	3	0	0	0
1X (250 ppm)	C	1	0	0	0
1X (250 ppm)	C	2	0	0	1
1X (250 ppm)	C	3	0	0	0
		Mean	0.00	0.00	0.11
		Std. Dev.	0.00	0.00	0.33
2X (500 ppm)	A	1	0	0	0
2X (500 ppm)	A	2	0	0	0
2X (500 ppm)	A	3	0	0	0
2X (500 ppm)	B	1	0	0	0
2X (500 ppm)	B	2	0	0	0
2X (500 ppm)	B	3	0	0	0
2X (500 ppm)	C	1	0	0	0
2X (500 ppm)	C	2	0	0	0
2X (500 ppm)	C	3	0	0	0
		Mean	0.00	0.00	0.00
		Std. Dev.	0.00	0.00	0.00

NOTE: DEFINE MEASUREMENT OF PHYTOTOXICITY, OR INDEX OF INJURY (0=NO INJURY, 10=COMPLETE KILL) (See Table 1)

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Appendix C: EFFICACY REPORT FORM

Vinca Data												
			Plant	Plant	Plant	Plant	Plant	Plant				#
			Height	Height	Height	Width	Width	Width	#	#	#	#
Treatment	Block	Rep	9/15/04	10/7/04	10/28/04	9/15/04	10/7/04	10/28/04	9/15/04	10/7/04	10/28/04	10/28/04
			(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	branches	branches	branches	branches
Control (0 ppm)	A	1	7	30	50	10.5	25.5	44.5	0	8	13	6
Control (0 ppm)	A	2	6	24	42	8.75	22	39	0	7	9	4
Control (0 ppm)	A	3	4	19	45	5.5	23.5	36.5	0	1	9	1
Control (0 ppm)	B	1	5.5	26	45	7.5	19.5	36.5	0	7	8	4
Control (0 ppm)	B	2	3.5	19	38	6.75	17.5	32	0	3	4	2
Control (0 ppm)	B	3	7.5	23	44	8.5	24.5	31	0	11	11	3
Control (0 ppm)	C	1	8.5	29.5	40	11.5	21.5	40.5	0	5	7	3
Control (0 ppm)	C	2	6.5	28	44	10.25	24.5	40.5	0	8	10	6
Control (0 ppm)	C	3	8.5	19	44	12	24.5	37.5	0	9	9	3
Mean			6.33	24.17	43.56	9.03	22.56	37.56	0.00	6.56	8.89	3.56
Std Dev			1.79	4.50	3.40	2.21	2.67	4.24	0.00	3.09	2.52	1.67
1/2 X (125 ppm)	A	1	7.5	32	51	10.5	26.5	47.5	0	12	12	6
1/2 X (125 ppm)	A	2	3.5	18	42	4.75	16.25	27.5	0	0	6	1
1/2 X (125 ppm)	A	3	6	27	49	9.5	23.5	41	0	5	5	3
1/2 X (125 ppm)	B	1	5	26	48	8.5	23.25	38	0	8	10	3
1/2 X (125 ppm)	B	2	5.5	22.5	42	7.75	23.25	39.5	0	9	12	2
1/2 X (125 ppm)	B	3	8.5	32	58	9.5	25	53.5	0	11	12	5
1/2 X (125 ppm)	C	1	6	23.5	41	8.25	31	44	4	17	11	4
1/2 X (125 ppm)	C	2	5	24.5	49	11.25	19.5	35.5	0	10	10	3
1/2 X (125 ppm)	C	3	4	26.5	45	7	20	45	0	7	7	2
Mean			5.67	25.78	47.22	8.56	23.14	41.28	0.44	8.78	9.44	3.22
Std. Dev.			1.58	4.44	5.43	1.95	4.29	7.47	1.33	4.74	2.74	1.56
1X (250 ppm)	A	1	4.5	26	51	8.25	23	45	0	11	14	3
1X (250 ppm)	A	2	7	27.5	50	9	22.75	36	0	10	13	3
1X (250 ppm)	A	3	6	29	51	8.5	20	44.5	0	6	6	4
1X (250 ppm)	B	1	6.5	33	53	10	23.5	42	0	10	10	5
1X (250 ppm)	B	2	8.5	33	53	10.25	24.75	47.5	0	12	16	7
1X (250 ppm)	B	3	6.5	31	51	10	23.5	44.5	0	10	12	6
1X (250 ppm)	C	1	6	25.5	44	7.75	23.5	38.5	0	12	12	2
1X (250 ppm)	C	2	7.5	32	48	10	23.25	40.5	0	7	7	6
1X (250 ppm)	C	3	5.5	30	54	7.5	25.5	49.5	0	11	12	3
Mean			6.44	29.67	50.56	9.03	23.31	43.11	0.00	9.89	11.33	4.33
Std. Dev.			1.16	2.86	3.05	1.07	1.51	4.29	0.00	2.09	3.20	1.73
2X (500 ppm)	A	1	5.5	26	48	8	24.5	46	0	8	9	3
2X (500 ppm)	A	2	4.5	22	40	9.25	23.5	37	0	5	8	3
2X (500 ppm)	A	3	7.5	33	55	10.75	24	45.5	0	12	13	7
2X (500 ppm)	B	1	3.5	13	34	4.5	10.5	22.5	0	0	2	0
2X (500 ppm)	B	2	8	34	55	10.5	22.5	45	0	9	11	6
2X (500 ppm)	B	3	8	26.5	57	10.75	25.5	44.5	0	12	16	8
2X (500 ppm)	C	1	9.5	32	50	10	26	47.5	0	10	12	5
2X (500 ppm)	C	2	8.5	34	55	10.5	23.5	43.5	0	8	11	5
2X (500 ppm)	C	3	5	22.5	45	7	22.5	37.5	0	8	7	4
Mean			6.67	27.00	48.78	9.03	22.50	41.00	0.00	8.00	9.89	4.56
Std. Dev.			2.08	7.08	7.87	2.15	4.66	7.85	0.00	3.71	4.01	2.40