

Phytotoxicity and Efficacy of Fascination
(6-Benzyl Adenine + Gibberellic Acid)
for Enhanced Branching of
Annual Baby's Breath (*Gypsophila elegans* 'Covent Garden')

By

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Project: Interregional Research Project #4
Project Number 23215A – October 28, 2004

Donors/Supporters:

CDFR 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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Davis, CA 95616
<http://envhort.ucdavis.edu/ir4>

PR.NO.:	23215A
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 INTERIORESCAPE

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: Annual Baby's Breath *Gypsophila elegans* 'Covent Garden'

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 Flagship AMOUNT 6 oz./acre DATE 10/13/04

PRODUCT Avid AMOUNT 0.08 oz./gal DATE 10/13/04

PRODUCT Tame AMOUNT 0.16 oz./gal DATE 10/26/04

PRODUCT Pedestal AMOUNT 0.08 oz./gal DATE 10/26/04

PRODUCT Azatin AMOUNT 5 oz./acre DATE 10/26/04

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

Materials and Methods

Plant Material and Culture. Seeds of *Gypsophila elegans* 'Covent Garden' (NK Lawn and Garden) 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.

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 $H \cdot W_1 \cdot W_2$ for observations where two width measurements were available and as $H \cdot W \cdot W$ 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 $a \cdot H \cdot W_1 \cdot W_2$, 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.

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.

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Results

Phytotoxicity Index. Phytotoxicity index values were always less than 2 (Figure 2, Table 3, Appendix B). Changes in phytotoxicity index to both weeks 3 and 6 were not significant.

Efficacy. The height of gypsophila increased from around 10 cm to between 23 and 43 cm (Figures 2 and 3, Table 2, Appendix C). There was substantial variability in the plant heights so that no conclusive differences could be identified. Curiously the plants in the 1X treatment were the smallest, with plants in the control and 2X treatment substantially taller at week 3. A treatment effect was found to be significant at week 3 at the 10% level but not at the 5% level. At week 6 no significant differences were seen. No differences in the increases in width or calculated volume index were noted between treatments (Figures 2 and 3, Table 2, Appendix C).

Branch counts showed some differences between the control and the 2X treatment (Figure 2, Table 2, Appendix C). By week 6 no differences were noted between treatments.

Discussion

It should be noted that there are several species of gypsophila. “Baby’s Breath” (mentioned in the Project Clearance Request) is usually *G. paniculata*, while *G. elegans* (specified in the Project Clearance Request) is “Annual Baby’s Breath” (see Armitage, A.M., 2001. *Armitage’s Manual of Annuals, Biennials and Half-Hardy Perennials*, pp. 234-235). In this study, we used *G. elegans* as required.

It should also be noted that gypsophila produces inflorescences of profusely branched panicles. Early in the growth period it is impossible to distinguish vegetative branching from inflorescence branching. This explains the variable branch counts at week 3.

There was no phytotoxicity of Fascination on *Gypsophila elegans* at any tested dosages. Any increases in branching noted at week 3 had disappeared by week 6 so that we found no efficacy.

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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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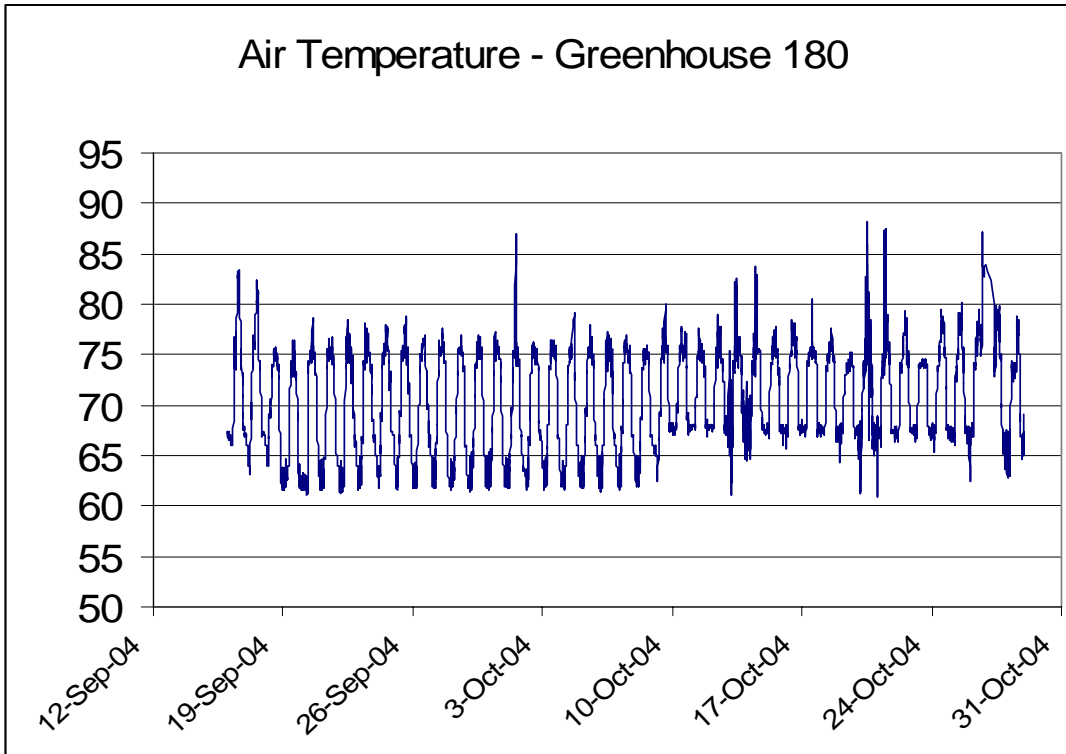


Figure 1. Greenhouse temperatures during the experiment to evaluate the effects of Fascination on *Gypsophila elegans* 'Covent Garden'.

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: *Gypsophila* -- Material: Fascination

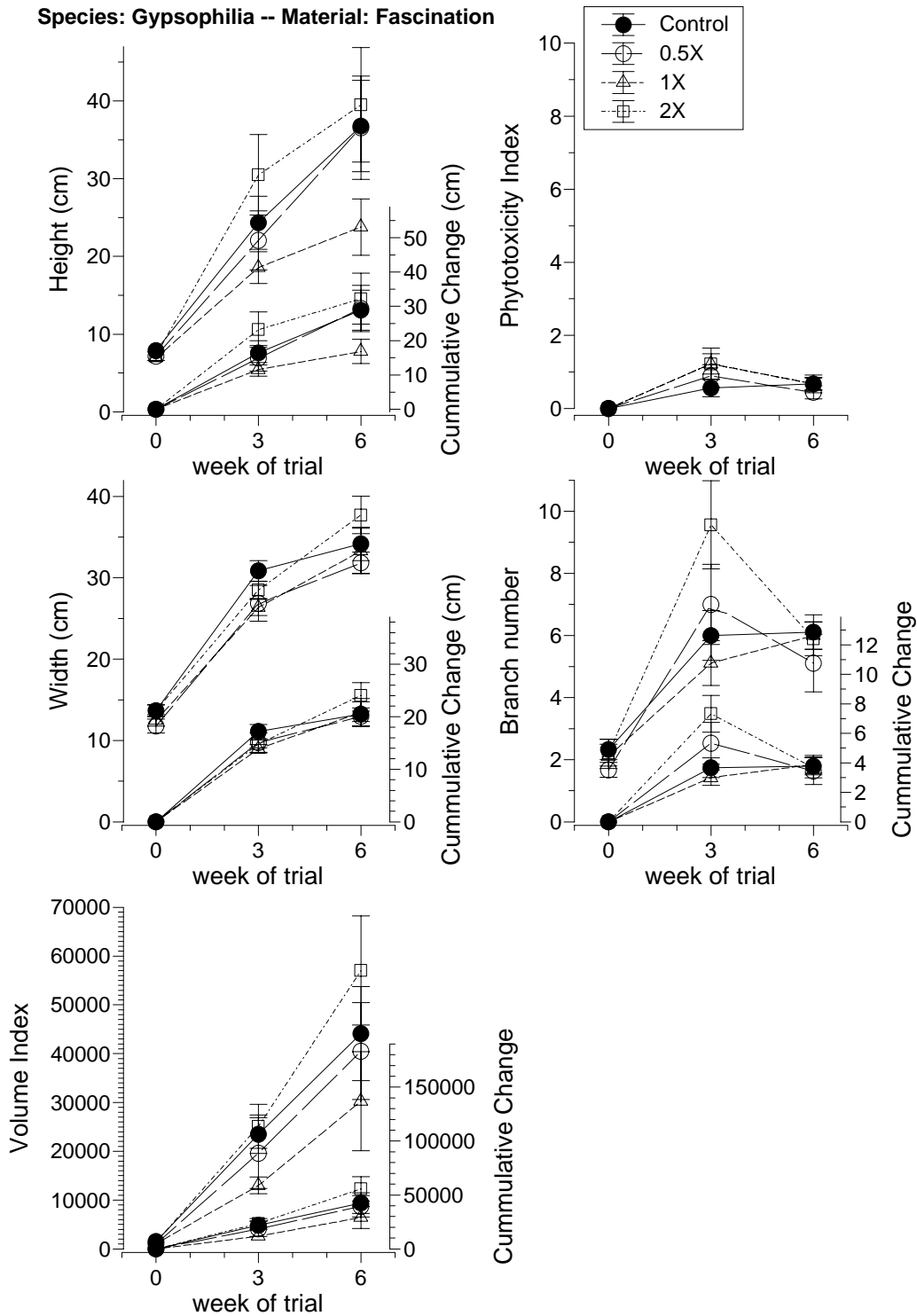


Figure 2. Summary of results for *Gypsophila elegans* 'Covent Garden' treated with 0, 125, 250 or 500 ppm Fascination. Both raw data and cumulative changes over time are plotted for phytotoxicity index, plant height, plant width, branch number and volume index. SE bars shown. n=9.

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Table 2. Summary of results for *Gypsophila elegans* 'Covent Garden' treated with 0, 125, 250 or 500 ppm Fascination. Cumulative changes over time are reported for phytotoxicity index, plant height, plant width, 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>Gypsophila</i>				
Phytotoxicity Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	0.56 \pm 0.24	a	0.67 \pm 0.17	a
125 ppm	0.89 \pm 0.31	a	0.44 \pm 0.18	a
250 ppm	1.22 \pm 0.28	a	0.67 \pm 0.24	a
500 ppm	1.22 \pm 0.43	a	0.67 \pm 0.17	a
Height Increase after:				
Treatment	3 weeks	at 10%	6 weeks	no
0 ppm	16.44 \pm 3.54	ab	28.89 \pm 5.85	a
125 ppm	14.89 \pm 3.73	ab	29.39 \pm 6.72	a
250 ppm	11.61 \pm 1.99	a	16.83 \pm 3.55	a
500 ppm	23.22 \pm 5.20	b	32.22 \pm 7.43	a
Width Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	17.19 \pm 1.34	a	20.50 \pm 2.35	a
125 ppm	15.08 \pm 1.85	a	20.06 \pm 1.00	a
250 ppm	13.89 \pm 0.82	a	20.83 \pm 2.60	a
500 ppm	14.83 \pm 0.74	a	24.06 \pm 2.41	a
Relative Volume Index Increase after:				
Treatment	3 weeks	at 10%	6 weeks	no
0 ppm	21970.3 \pm 4007.07	a	42592.1 \pm 9652.16	a
125 ppm	18588.6 \pm 7115.10	a	39475.2 \pm 9816.64	a
250 ppm	11907.7 \pm 1642.55	a	29168.8 \pm 10099.9	a
500 ppm	23722.5 \pm 4514.70	a	55644.6 \pm 11246.5	a
Branch number Increase after:				
Treatment	3 weeks	at 10%	6 weeks	no
0 ppm	3.67 \pm 0.67	a	3.78 \pm 0.60	a
125 ppm	5.33 \pm 1.42	ab	3.44 \pm 0.91	a
250 ppm	3.00 \pm 0.53	a	3.89 \pm 0.61	a
500 ppm	7.33 \pm 1.25	b	3.67 \pm 0.69	a

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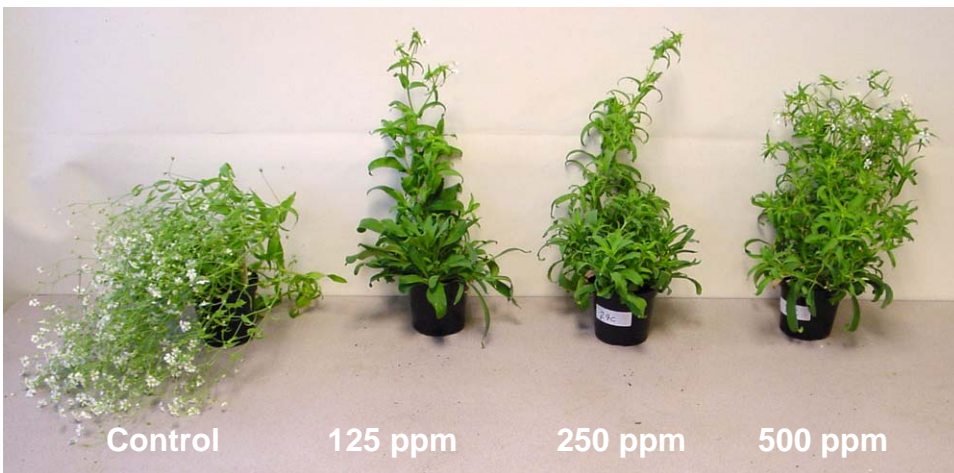
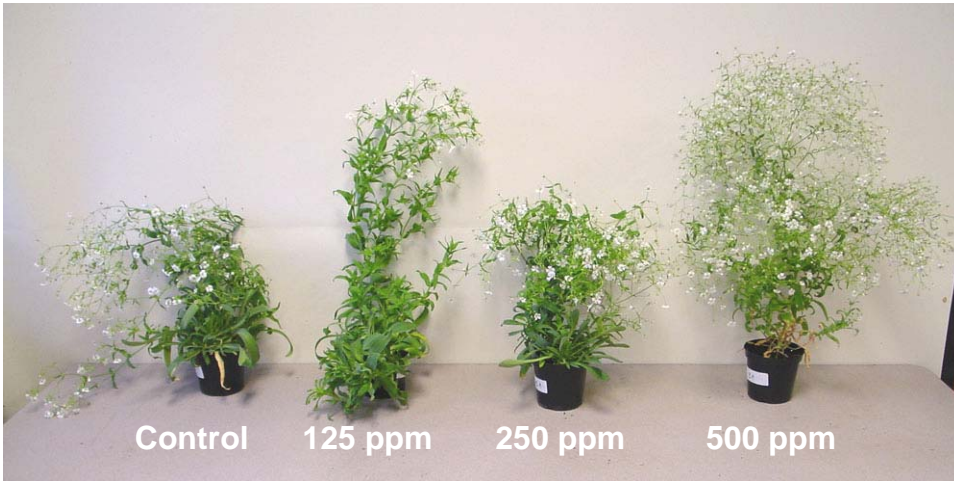


Figure 3. Representative plants of *Gypsophila elegans* 'Covent Garden' 6 weeks after 2 foliar applications of 0, 125, 250 or 500 ppm Fascination (Week 0 and Week 3).

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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

Gypsophilia 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	1	1
Control (0 ppm)	A	2	0	1	1
Control (0 ppm)	A	3	0	0	1
Control (0 ppm)	B	1	0	0	0
Control (0 ppm)	B	2	0	2	1
Control (0 ppm)	B	3	0	0	1
Control (0 ppm)	C	1	0	1	1
Control (0 ppm)	C	2	0	0	0
Control (0 ppm)	C	3	0	0	0
		Mean	0.00	0.56	0.67
		Std Dev	0.00	0.73	0.50
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	2	1
1/2 X (125 ppm)	B	1	0	2	1
1/2 X (125 ppm)	B	2	0	0	0
1/2 X (125 ppm)	B	3	0	1	0
1/2 X (125 ppm)	C	1	0	0	0
1/2 X (125 ppm)	C	2	0	2	1
1/2 X (125 ppm)	C	3	0	1	1
		Mean	0.00	0.89	0.44
		Std Dev	0.00	0.93	0.53
1X (250 ppm)	A	1	0	1	0
1X (250 ppm)	A	2	0	0	0
1X (250 ppm)	A	3	0	0	0
1X (250 ppm)	B	1	0	1	0
1X (250 ppm)	B	2	0	2	1
1X (250 ppm)	B	3	0	1	1
1X (250 ppm)	C	1	0	2	1
1X (250 ppm)	C	2	0	2	1
1X (250 ppm)	C	3	0	2	2
		Mean	0.00	1.22	0.67
		Std Dev	0.00	0.83	0.71
2X (500 ppm)	A	1	0	0	1
2X (500 ppm)	A	2	0	0	0
2X (500 ppm)	A	3	0	2	1
2X (500 ppm)	B	1	0	0	0
2X (500 ppm)	B	2	0	1	0
2X (500 ppm)	B	3	0	1	1
2X (500 ppm)	C	1	0	4	1
2X (500 ppm)	C	2	0	2	1
2X (500 ppm)	C	3	0	1	1
		Mean	0.00	1.22	0.67
		Std Dev	0.00	1.30	0.50

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

Gypsophilia Data			Plant	Plant	Plant	Plant	Plant	Plant			
			Height (cm)	Height (cm)	Height (cm)	Width (cm)	Width (cm)	Width (cm)	# branches	# branches	# branches
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
Control (0 ppm)	A	1	8	32	54	15.75	35	35.5	3	6	4
Control (0 ppm)	A	2	8	18	28	15.5	32.5	34	2	5	5
Control (0 ppm)	A	3	8	16	40	14.25	31	26.5	3	5	10
Control (0 ppm)	B	1	7.5	30	15	13	37.5	41.5	2	7	7
Control (0 ppm)	B	2	8	29	61	13.75	32	29	4	8	6
Control (0 ppm)	B	3	6.5	16	15	12	28.5	29	2	3	6
Control (0 ppm)	C	1	10	16	34	16	26.25	40.5	1	5	6
Control (0 ppm)	C	2	8	17	26	14	27	29	1	4	5
Control (0 ppm)	C	3	7	45	58	8.75	28	42.5	3	11	6
Mean			7.89	24.33	36.78	13.67	30.86	34.17	2.33	6.00	6.11
Std Dev			0.96	10.26	17.65	2.26	3.79	6.16	1.00	2.40	1.69
1/2X (125 ppm)	A	1	8	16	18	11	23.25	30.5	2	7	3
1/2X (125 ppm)	A	2	4.5	18	39	13.75	28.5	31.5	2	3	6
1/2X (125 ppm)	A	3	6.5	16	56	10.5	26	31.5	3	4	5
1/2X (125 ppm)	B	1	6.5	43	66	15.75	27	39	1	11	4
1/2X (125 ppm)	B	2	8	15	11	11.25	19	24.5	1	6	1
1/2X (125 ppm)	B	3	9	41	56	14.5	42.5	35	2	8	4
1/2X (125 ppm)	C	1	8	18	16	9.25	24.5	30.5	1	15	5
1/2X (125 ppm)	C	2	9	17	41	12.25	28.5	34	2	5	11
1/2X (125 ppm)	C	3	5	14.5	26	7.75	22.5	30	1	4	7
Mean			7.17	22.06	36.56	11.78	26.86	31.83	1.67	7.00	5.11
Std Dev			1.64	11.38	19.94	2.56	6.62	3.98	0.71	3.87	2.80
1X (250 ppm)	A	1	7	17	15	16	30	30.5	1	4	7
1X (250 ppm)	A	2	7.5	34	36	14.25	27	55	3	8	7
1X (250 ppm)	A	3	7.5	16	14	11.5	27.75	28.75	1	5	5
1X (250 ppm)	B	1	6.5	19	20	9.75	22.5	31.5	3	6	4
1X (250 ppm)	B	2	8	17	32	10	27	30.5	1	4	8
1X (250 ppm)	B	3	7	16	14	13.75	30.5	34	3	3	7
1X (250 ppm)	C	1	7	19	44	13.75	25	30	4	9	6
1X (250 ppm)	C	2	6.5	12	20	11.5	21.5	30.5	1	3	5
1X (250 ppm)	C	3	5.5	17	19	11.75	26	29	2	4	5
Mean			6.94	18.56	23.78	12.47	26.36	33.31	2.11	5.11	6.00
Std Dev			0.73	6.15	10.87	2.09	3.03	8.28	1.17	2.15	1.32
2X (500 ppm)	A	1	9	52	63	13.75	29.5	42.5	1	12	5
2X (500 ppm)	A	2	6	35	62	13	28.5	37.5	2	10	5
2X (500 ppm)	A	3	7.5	16	11.5	16.75	30	30	2	4	8
2X (500 ppm)	B	1	7.5	50	62	12.75	29.5	31.5	5	15	6
2X (500 ppm)	B	2	5	28	30	12.25	30	46.5	2	10	8
2X (500 ppm)	B	3	6.5	45	60	13.25	26.5	33	3	16	3
2X (500 ppm)	C	1	8	19	14	10.5	23.5	31.5	1	5	6
2X (500 ppm)	C	2	7.5	12.5	32	13.75	25	48.5	1	8	5
2X (500 ppm)	C	3	8.5	17	21	17	34	38.5	3	6	7
Mean			7.28	30.50	39.50	13.67	28.50	37.72	2.22	9.56	5.89
Std Dev			1.25	15.52	22.10	2.07	3.12	6.86	1.30	4.25	1.62