

Phytotoxicity and Efficacy of Fascination  
(6-Benzyl Adenine + Gibberellic Acid)  
for Enhanced Branching of  
Catnip (*Nepeta cataria*)

By

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Linda Dodge  
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Project: Interregional Research Project #4  
Project Number 23207A – 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  
Department of Environmental Horticulture  
University of California  
One Shields Ave.  
Davis, CA 95616  
<http://envhort.ucdavis.edu/ir4>

PR.NO.:	23207A
TRIAL:	1
DATE:	10/28/04

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

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

Dr. Heiner Lieth  
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 One Shields Ave.  
 Davis, CA 95616  
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LOCATION OF TRIAL:

TRIAL TYPE:(check one)  FIELD  CONTAINER  GREENHOUSE  INTERIORESCAPE

2. PESTICIDE:

COMMON NAME: 6-Benzyl Adenine + Gibberellic Acid A<sub>4</sub> A<sub>7</sub> 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>Catnip</u>	<u><i>Nepeta cataria</i></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 *Nepeta cataria* (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 77°F/63°F (25°C/17°C) for the first 4 weeks (Figure 1). For the last 2 weeks, the plants were grown in a greenhouse under natural day length with day/night temperatures of 80°F/64°F (27°C/17.5°C) (Figure 2). 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  $H*W_1*W_2$  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 for *Nepeta cataria* were generally low throughout the experiment. Plants treated with Fascination had significantly greater phytotoxicity index values than control plants only at week three (Figure 3, Table 2, Appendix B). Damage symptoms consisted of necrotic patches on scattered leaves throughout the plant canopies (Figure 4).

**Efficacy.** Over the course of the experiment, Catnip plants grew from a starting height of around 10 to 15 cm to 60 to 99 cm (Figures 3 and 5, Table 2, Appendix C). Plants exposed to Fascination always grew more in height than the control plants. Differences in width between the control and the Fascination treatments were less pronounced with the control plants being the widest at three weeks (Figures 3 and 5, Table 2, Appendix C). By week six there were no significant differences in width increases between the treatments. The volume index showed no differences between treatments (Figure 3, Table 2).

The branch counts increased by 33 to 35 for all plants during the 6-week experiment (Figure 3, Table 2, Appendix C). No significant differences in branch counts were noted between the various treatments.

## Discussion

Fascination did not have the desired effect on branching in Catnip. If anything it causes undesirable increases in growth. The phytotoxicity index was generally under a value of 3 so that at the proposed 1X rate, phytotoxicity of this product on Catnip is only a very minor problem and not likely to affect marketability.

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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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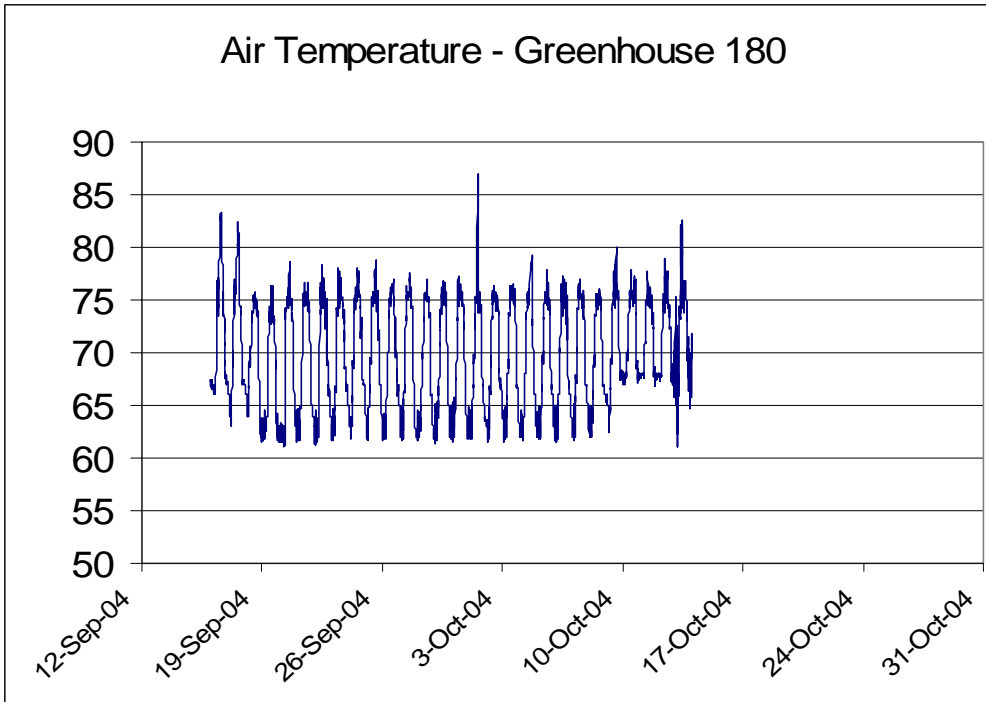


Figure 1. Greenhouse temperatures during the first four weeks of the experiment to evaluate the effects of Fascination on *Nepeta cataria*.

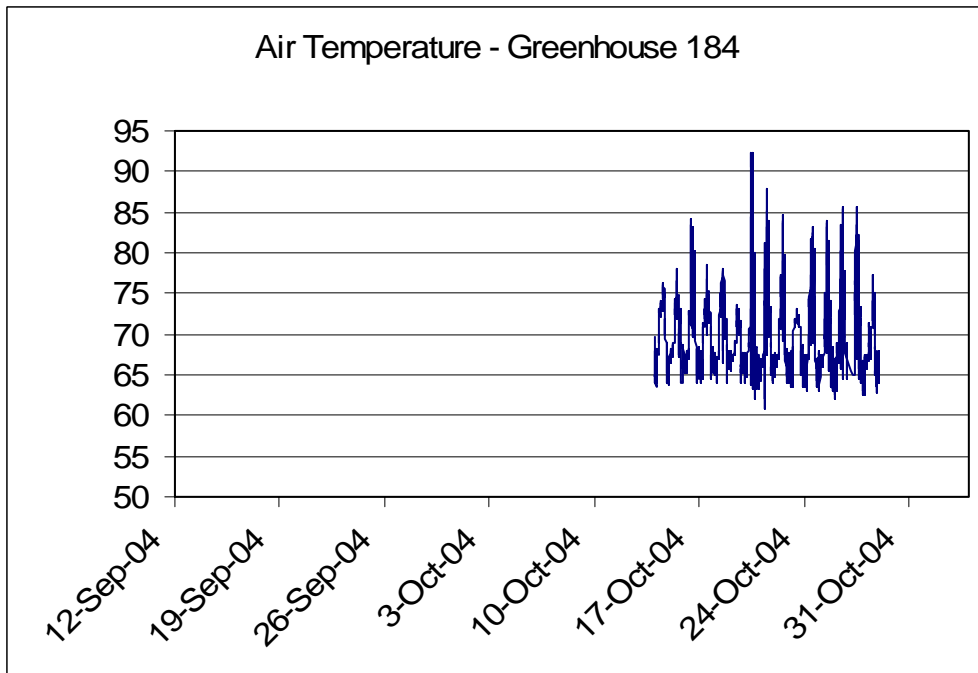


Figure 2. Greenhouse temperatures during the last two weeks of the experiment to evaluate the effects of Fascination on *Nepeta cataria*.

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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: Catnip -- Material: Fascination

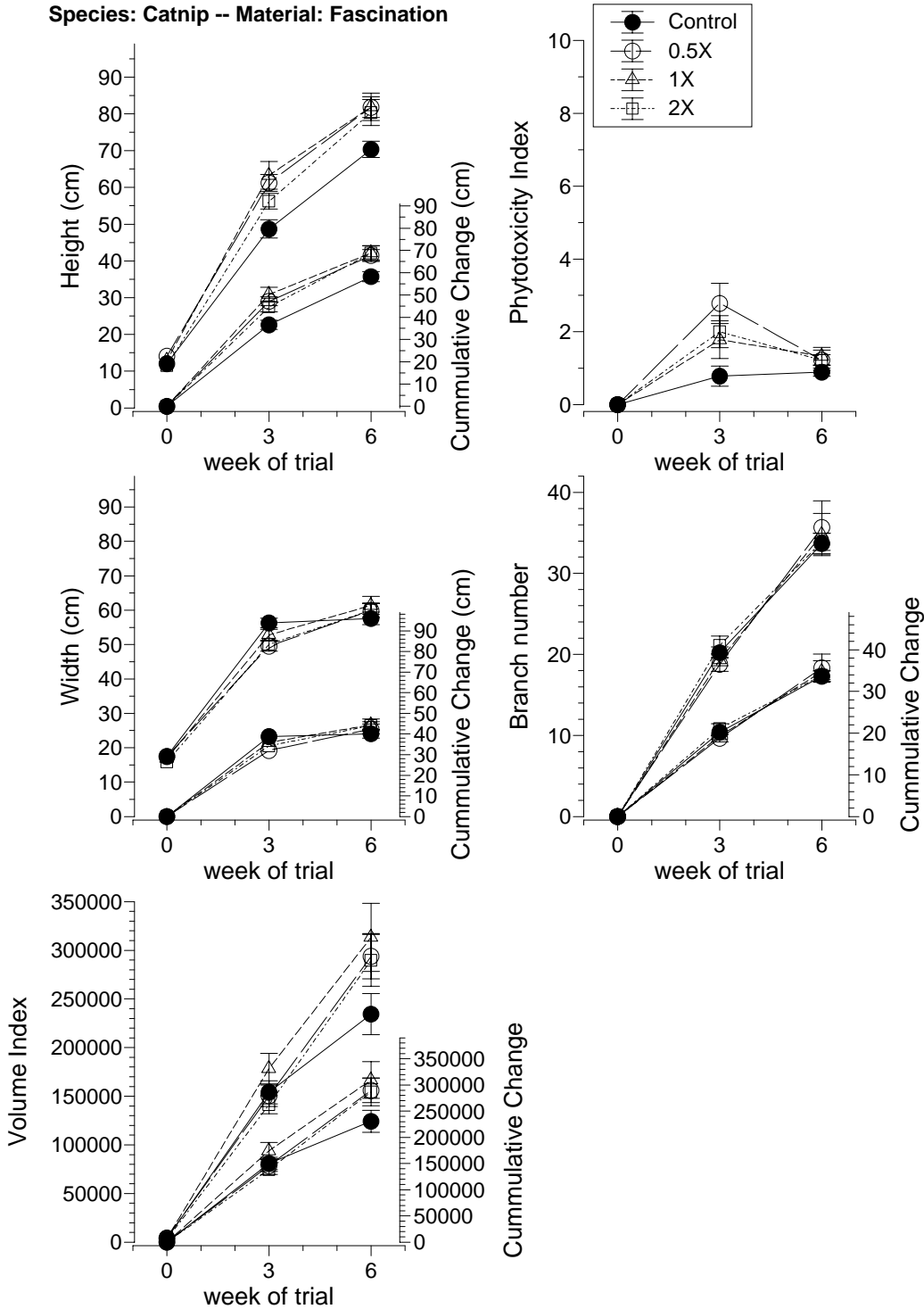


Figure 3. Summary of results for *Nepeta cataria* treated with 0, 125, 250 or 500 ppm Fascination. Both raw data and cumulative changes over time are plotted for phytotoxicity index, plant height, plant width, branch number and volume index. SE bars shown. n=9.

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Table 2. Summary of results for *Nepeta cataria* 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 Catnip		signif.		signif.
Phytotoxicity Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	0.78 $\pm$ 0.28	a	0.89 $\pm$ 0.11	a
125 ppm	2.78 $\pm$ 0.55	b	1.22 $\pm$ 0.28	a
250 ppm	1.78 $\pm$ 0.52	ab	1.33 $\pm$ 0.24	a
500 ppm	2.00 $\pm$ 0.44	ab	1.22 $\pm$ 0.15	a
Height Increase after:				
Treatment	3 weeks	yes	6 weeks	at 10%
0 ppm	36.61 $\pm$ 2.06	a	58.28 $\pm$ 2.28	a
125 ppm	47.17 $\pm$ 1.99	b	67.72 $\pm$ 2.64	b
250 ppm	50.28 $\pm$ 3.23	b	68.89 $\pm$ 3.19	b
500 ppm	44.67 $\pm$ 2.22	b	68.78 $\pm$ 3.44	b
Width Increase after:				
Treatment	3 weeks	yes	6 weeks	no
0 ppm	38.78 $\pm$ 1.08	a	40.11 $\pm$ 2.10	a
125 ppm	32.08 $\pm$ 1.58	b	42.42 $\pm$ 2.38	a
250 ppm	35.89 $\pm$ 1.51	ac	44.44 $\pm$ 2.87	a
500 ppm	34.22 $\pm$ 0.90	bc	44.11 $\pm$ 1.87	a
Relative Volume Index Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	150358 $\pm$ 11681.7	ab	230670 $\pm$ 21061.8	a
125 ppm	146131 $\pm$ 10965.5	ab	289640 $\pm$ 23380.0	a
250 ppm	174597 $\pm$ 15636.9	a	309614 $\pm$ 35033.9	a
500 ppm	138384 $\pm$ 9170.03	b	286774 $\pm$ 26561.7	a
Branch number Increase after:				
Treatment	3 weeks	no	6 weeks	no
0 ppm	20.22 $\pm$ 0.70	a	33.67 $\pm$ 1.25	a
125 ppm	18.78 $\pm$ 0.88	a	35.67 $\pm$ 3.28	a
250 ppm	19.33 $\pm$ 0.75	a	34.78 $\pm$ 2.61	a
500 ppm	21.11 $\pm$ 1.16	a	33.89 $\pm$ 1.06	a

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Figure 4. Damage symptoms seen on leaves of *Nepeta cataria* 3 weeks (left) and 6 weeks (right) after Fascination applications. Necrotic spots occurred on scattered leaves within the plant canopies.

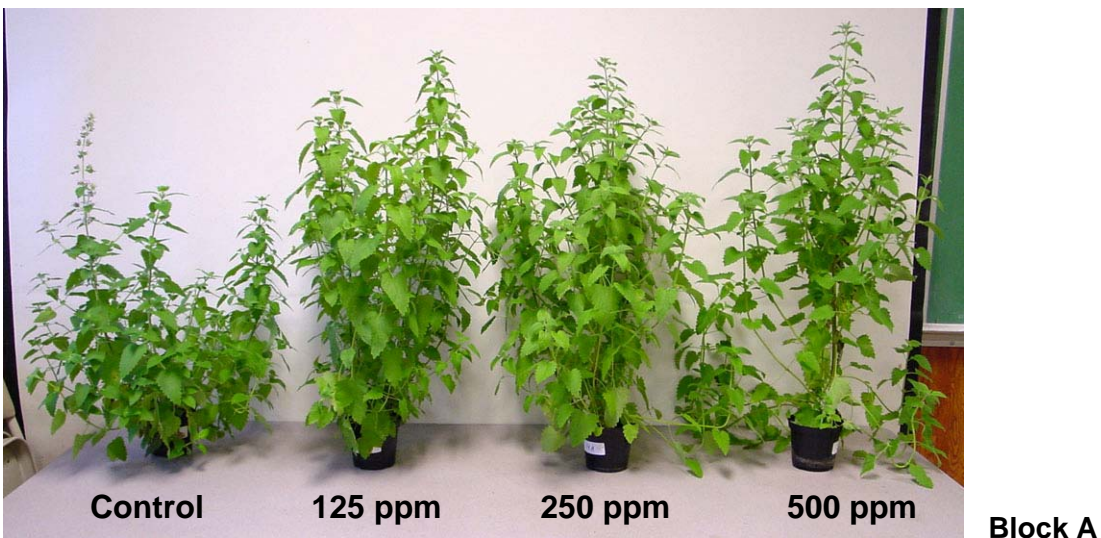


Figure 5. Representative plants of *Nepeta cataria* 6 weeks after 2 foliar applications of 0, 125, 250 or 500 ppm Fascination (Week 0 and Week 3).

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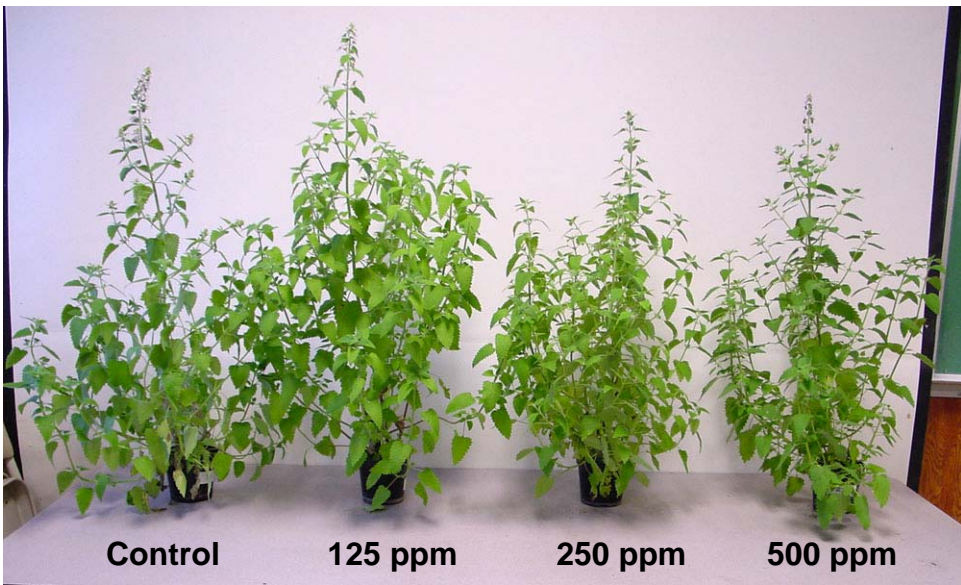
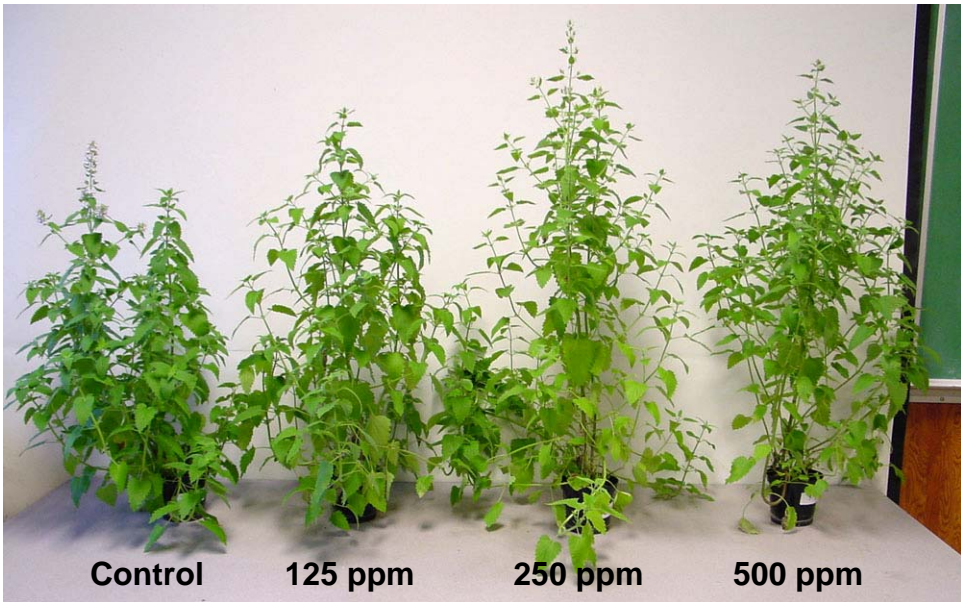


Figure 5. Representative plants of *Nepeta cataria* 6 weeks after 2 foliar applications of 0, 125, 250 or 500 ppm Fascination (Week 0 and Week 3).

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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](mailto: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 2<sup>nd</sup> 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

Catnip Data					
Fascination			Phyto	Phyto	Phyto
Treatment	Block	Rep	Rating	Rating	Rating
			9/15/2004	10/7/2004	10/28/2004
Control (0 ppm)	A	1	0	1	1
Control (0 ppm)	A	2	0	0	1
Control (0 ppm)	A	3	0	0	1
Control (0 ppm)	B	1	0	1	1
Control (0 ppm)	B	2	0	0	1
Control (0 ppm)	B	3	0	2	1
Control (0 ppm)	C	1	0	0	1
Control (0 ppm)	C	2	0	1	0
Control (0 ppm)	C	3	0	2	1
		Mean	0.00	0.78	0.89
		Std Dev	0.00	0.83	0.33
1/2X (125 ppm)	A	1	0	1	0
1/2X (125 ppm)	A	2	0	1	1
1/2X (125 ppm)	A	3	0	3	1
1/2X (125 ppm)	B	1	0	6	3
1/2X (125 ppm)	B	2	0	1	1
1/2X (125 ppm)	B	3	0	3	1
1/2X (125 ppm)	C	1	0	3	1
1/2X (125 ppm)	C	2	0	4	1
1/2X (125 ppm)	C	3	0	3	2
		Mean	0.00	2.78	1.22
		Std Dev	0.00	1.64	0.83
1X (250 ppm)	A	1	0	1	1
1X (250 ppm)	A	2	0	5	2
1X (250 ppm)	A	3	0	1	1
1X (250 ppm)	B	1	0	2	1
1X (250 ppm)	B	2	0	0	1
1X (250 ppm)	B	3	0	2	1
1X (250 ppm)	C	1	0	3	3
1X (250 ppm)	C	2	0	2	1
1X (250 ppm)	C	3	0	0	1
		Mean	0.00	1.78	1.33
		Std Dev	0.00	1.56	0.71
2X (250 ppm)	A	1	0	3	1
2X (250 ppm)	A	2	0	3	1
2X (250 ppm)	A	3	0	3	2
2X (250 ppm)	B	1	0	1	1
2X (250 ppm)	B	2	0	0	1
2X (250 ppm)	B	3	0	3	1
2X (250 ppm)	C	1	0	2	1
2X (250 ppm)	C	2	0	0	2
2X (250 ppm)	C	3	0	3	1
		Mean	0.00	2.00	1.22
		Std Dev	0.00	1.32	0.44

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**

Catnip Data											
			Plant	Plant	Plant	Plant	Plant	Plant			
Fascination	Block	Rep	Height (cm)	Height (cm)	Height (cm)	Width (cm)	Width (cm)	Width (cm)	# Branches	# Branches	# Branches
Treatment			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	11	44	60	18.25	52.5	51	0	20	38
Control (0 ppm)	A	2	11	47	74	18.5	59.5	50	0	22	32
Control (0 ppm)	A	3	14.5	51	72	18	55	57.5	0	20	35
Control (0 ppm)	B	1	11.5	49	64	16.25	56.5	59.5	0	20	28
Control (0 ppm)	B	2	14.5	50	65	16.5	54.5	60	0	20	38
Control (0 ppm)	B	3	14	61	81	17.75	52.5	67.5	0	16	28
Control (0 ppm)	C	1	12.5	53	70	20.25	64.5	57.5	0	24	34
Control (0 ppm)	C	2	10.5	50	70	17.75	59	54	0	20	36
Control (0 ppm)	C	3	9	33	77	14.25	52.5	61.5	0	20	34
Mean			12.06	48.67	70.33	17.50	56.28	57.61	0.00	20.22	33.67
Std Dev			1.94	7.50	6.61	1.68	4.08	5.44	0.00	2.11	3.74
1/2X (125 ppm)	A	1	11.5	51	74	19.25	47	54.5	0	16	28
1/2X (125 ppm)	A	2	12.5	55	75	17.5	51	60	0	20	36
1/2X (125 ppm)	A	3	16.5	70	84	16	56	62.5	0	16	50
1/2X (125 ppm)	B	1	13	65	83	16	46	72	0	18	26
1/2X (125 ppm)	B	2	14	53	71	17.75	54.5	55.5	0	20	36
1/2X (125 ppm)	B	3	16.5	63	87	17	51	54.5	0	22	28
1/2X (125 ppm)	C	1	14.5	60	85	17.5	44.5	54.5	0	22	50
1/2X (125 ppm)	C	2	14	66	99	18.25	52	57	0	20	42
1/2X (125 ppm)	C	3	14	68	78	18	44	68.5	0	15	25
Mean			14.06	61.22	81.78	17.47	49.56	59.89	0.00	18.78	35.67
Std Dev			1.67	6.85	8.50	1.04	4.35	6.54	0.00	2.64	9.85
1X (250 ppm)	A	1	12.5	59	74	18	57	62.5	0	20	32
1X (250 ppm)	A	2	14.5	83	97	15.5	55	74	0	16	54
1X (250 ppm)	A	3	14.5	70	90	17.5	56.5	59.5	0	18	40
1X (250 ppm)	B	1	13.5	64.5	88	17	53	71.5	0	20	30
1X (250 ppm)	B	2	13	65	83	19.5	49.5	53.5	0	16	32
1X (250 ppm)	B	3	16.5	72	91	16.25	46.5	51	0	20	32
1X (250 ppm)	C	1	11	50	71	16	47	56	0	20	33
1X (250 ppm)	C	2	10.5	46	62	15	51	66.5	0	22	30
1X (250 ppm)	C	3	11	60	81	17.75	60	58	0	22	30
Mean			13.00	63.28	81.89	16.94	52.83	61.39	0.00	19.33	34.78
Std Dev			1.98	11.28	11.14	1.41	4.68	7.93	0.00	2.24	7.84
2X (250 ppm)	A	1	11	65	92	17.75	51.5	66	0	22	34
2X (250 ppm)	A	2	11	56	70	15.5	54.5	63.5	0	20	34
2X (250 ppm)	A	3	18	56	84	14.75	50	59	0	18	33
2X (250 ppm)	B	1	10	54	90	13	46.5	57.5	0	22	32
2X (250 ppm)	B	2	10.5	59	80	16.5	50.5	54.5	0	16	32
2X (250 ppm)	B	3	11	59	81	17	49	60.5	0	24	38
2X (250 ppm)	C	1	11	63	91	16.25	54	70	0	20	30
2X (250 ppm)	C	2	8.5	44	60	15.75	47.5	57.5	0	20	40
2X (250 ppm)	C	3	13	50	75	16.5	47.5	51.5	0	28	32
Mean			11.56	56.22	80.33	15.89	50.11	60.00	0.00	21.11	33.89
Std Dev			2.69	6.44	10.64	1.39	2.84	5.75	0.00	3.48	3.18