

Potential for Phytotoxicity of Snapshot 2.5TG
(Isoxaben + Trifluralin) on
Sea Pink (*Armeria maritima* 'Dusseldorf')

By

Heiner Lieth, Director
Linda Dodge
Ron Lane
Dylan Hodgkiss

Project: Interregional Research Project #4
Project Number 24774A – September 30, 2005

Donors/Supporters:
High Ranch Nursery, Loomis, CA

UC Davis Environmental Horticulture IR4 Center
Department of Plant Sciences
University of California
One Shields Ave.
Davis, CA 95616
<http://envhort.ucdavis.edu/ir4>

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

| | |
|---|--|
| Investigator (Name, Address, Phone#, e-mail, etc) | Dr. Heiner Lieth Department of Plant Sciences University of California One Shields Ave. Davis, CA 95616 Ph 530-752-7198 FAX 530-752-1819 Email: jhlieth@ucdavis.edu |
| Location of Trial | University of California, Davis CA |
| TRIAL TYPE: (field, container, greenhouse, etc) | Field Container |
| Chemical - Common Name | Isoxaben + Trifluralin |
| - Formulation | 2.5TG |
| - Batch Number | |
| - Product | Snapshot 2.5TG |
| - EPA Registration Number | 62719-175 |
| - Manufacture | Dow AgroSciences |
| USE INFORMATION | |
| - Plant Common Name | Sea Pink, Thrift |
| - Plant Scientific Name | <i>Armeria maritima</i> 'Dusseldorf' |
| - Pest (s) | Weeds |
| Soil Type or Type of Potting Mix: Grower's Mix | a)%Sand: b)%Silt: c)%Clay: d)%OM: e)%pH: |
| Enter each DATE for: | Seedling: Emergence: Transplanting: |
| Enter each SPACING for: | Plant or Pot: 6 inches Row: 6 inches |
| Enter each SIZE for: | Pot: 1-gallon (15 cm) Plot: 50 sq ft |
| Experimental Design: | Completely randomized design |
| Number of Reps: | 4 replicates per treatment |

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

APPLICATION PARAMETERS¹

| | |
|---|-------------------------|
| Type of Application: (aerial, ground, foliar, drench, ppi, chemigation, broadcast, directed, etc) | Broadcast over the top |
| Number of Applications: | 2, 30 days apart |
| Application Type: | manual shaker container |
| Nozzle Type/Size: | |
| Nozzle Pressure: | |
| Delivery Rate: | |
| Calibration Date(s): | |

APPLICATION SUMMARY

| APPLICATION DATE | RATES (a.i./A) (Be sure to provide units) | Brief Description of Growth Stage (Dormant, New Growth Present, Bud, etc) |
|-------------------------|---|---|
| August 5, 2005 | 0, 2.5, 5, 10 lb. a.i./A | Vegetative/flowering, actively growing |
| September 2, 2005 | 0, 2.5, 5, 10 lb. a.i./A | Vegetative/flowering, actively growing |

¹ **RAINFALL/IRRIGATION RECORDS:** INCLUDE RAINFALL/IRRIGATION INFORMATION (printouts, IR-4 forms, etc.)

See Table 1 for environmental conditions. The plants were watered daily with tap water using a drip irrigation system delivering 1 gallon per hour.

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

OTHER PESTICIDES, FERTILIZER, LIME AND ADJUVANTS USED:

| PRODUCT | AMOUNT | DATE |
|-------------|---------------|-----------|
| Pounce | 0.16 oz/2 gal | 8/26/2005 |
| Marathon II | 2.4 oz/2 gal | 8/26/2005 |

NARRATIVE SUMMARY OF METHODS AND RESULTS:

Materials and Methods

Plant Material and Culture. One-gallon plants of *Armeria maritima* 'Dusseldorf' were received from High Ranch Nursery on July 19, 2005. The plants remained in the 1-gallon pots containing the grower's mix and controlled release fertilizer. The 8-week experiment took place in an outdoor nursery and began on August 5, 2005. Environmental conditions during the experiment are summarized in Table 1. The plants were watered daily during the 8-week experiment with tap water using a drip irrigation system delivering 1 gallon per hour. Applications of pesticides as part of a normal pest management program were made as needed (see above).

Experimental Procedure. Sixteen plants were randomly chosen and individually tagged for treatment with 0 (Control), 2.5 (1X), 5 (2X), or 10 (4X) lb. ai/A Snapshot 2.5TG with 4 replicates per treatment. These dosages were prescribed in IR4 Ornamental Protocol 05-001 dated 1/05 (Appendix A). The plants received the first foliar spray application on August 5, 2005 and the second application 4 weeks later on September 2, 2005. The plants were arranged in a completely randomized design with 4 replicates per treatment (Figure 1). Phytotoxicity ratings and plant height and width measurements were taken at day 0, 3, 7, 14, 28, 31, 35, 42 and 56. Visual phytotoxicity evaluations were based on a numerical rating scale ranging from 0 (no injury) to 10 (complete kill) (Table 2). Plant height (cm) was measured from the container soil surface to the top of the leaf canopy (excluding flower scapes).

Plant width (cm) was measured twice along perpendicular lines at the widest part of the plant, resulting in W_1 and W_2 . 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 Snapshot 2.5TG. The calculation was made as $H*W_1*W_2$, where H is the height and W_1 and W_2 are two width measurements. The usefulness of this index is based on the fact that many of the models for such a volume calculation are of the form $a*H*W_1*W_2$. 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 from the starting plant height, width and volume index were analyzed for significant differences using t-tests.

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

Results

Significant effects were found in phytotoxicity index at week 1, 4, 5, 6, and 8 (Table 3, Figure 2, Appendix B). However, the average phytotoxicity index values of all treatments on all observation dates were below 1.0 and all increases in phytotoxicity index over the initial level were less than 1.25 at any time during the trial in all of the treatments.

The *Armeria* plants increased in height between 2.0 and 2.4 cm in all treatments and these mean height increases were not significantly different from each other (Table 4, Figures 2 and 3, Appendix B). The width increased by 5.0 to 6.9 cm in the control, 1X and 2X treatments and these width increases were also not significantly different from each other. Although the statistical analysis did not result in showing a significant treatment effect on width, it is likely that the small sample size is responsible for a mean width increase of only 3.7 that was not significantly different from the width increase of 6.9 cm for the control.

The average volume index increases ranged from 2657 to 3905 and were not significantly different from each other. Again, the range in mean is somewhat large and the lack of resolution is probably due to small sample size.

Discussion

Snapshot caused no phytotoxicity on *Armeria* at any of the rates. Snapshot also caused no growth suppression at the 1X or 2X rates. At 4X the growth suppression data are somewhat inconclusive, but it is certain that growers should be advised to not apply Snapshot on *Armeria* at this excessive rate.

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 (PRINCIPAL INVESTIGATOR) _____

Date Completed:

If submitted, using e-mail, please provide e-mail address and send confirming receipt.

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

Table 1. Environmental conditions during the experiment to evaluate the phytotoxicity of Snapshot 2.5TG on *Armeria maritima* 'Dusseldorf'.

| Date | Sol Rad (Ly/day) | Max Air Temp (°F) | Min Air Temp (°F) | Avg Air Temp (°F) | Avg Vap (mBars) | Avg wSpd (MPH) | Precip (in) | CIMIS ETo (in) | Avg Rel Hum (%) | Dew Pt (°F) |
|-----------|------------------|-------------------|-------------------|-------------------|-----------------|----------------|-------------|----------------|-----------------|-------------|
| 8/5/2005 | 658 | 100.1 | 58.8 | 78.2 | 14.1 | 3.6 | 0 | 0.26 | 43 | 53.7 |
| 8/6/2005 | 647 | 102.6 | 57 | 77.7 | 13.8 | 4.2 | 0 | 0.27 | 42 | 53.1 |
| 8/7/2005 | 636 | 101.3 | 59.8 | 78.8 | 14.2 | 4 | 0 | 0.27 | 42 | 53.9 |
| 8/8/2005 | 573 | 92.2 | 59.6 | 73.8 | 14.9 | 4.8 | 0 | 0.23 | 52 | 55.2 |
| 8/9/2005 | 641 | 99 | 57.6 | 75.5 | 14.8 | 4.4 | 0 | 0.26 | 49 | 55.1 |
| 8/10/2005 | 650 | 94.6 | 55.8 | 74.5 | 14 | 4.2 | 0 | 0.26 | 48 | 53.6 |
| 8/11/2005 | 640 | 97.7 | 53.2 | 76 | 13 | 3.6 | 0 | 0.26 | 43 | 51.6 |
| 8/12/2005 | 640 | 97.6 | 57.4 | 75.5 | 13.8 | 4.8 | 0 | 0.27 | 46 | 53.1 |
| 8/13/2005 | 552 | 81.6 | 53.7 | 66.6 | 13.5 | 5.7 | 0 | 0.2 | 61 | 52.6 |
| 8/14/2005 | 613 | 84.7 | 54.3 | 67.1 | 14.2 | 5.9 | 0 | 0.23 | 62 | 53.8 |
| 8/15/2005 | 546 | 81.1 | 56.4 | 69 | 13.9 | 6.6 | 0 | 0.23 | 57 | 53.3 |
| 8/16/2005 | 579 | 94 | 62.3 | 76.1 | 14.7 | 4.8 | 0 | 0.25 | 48 | 54.9 |
| 8/17/2005 | 608 | 89.8 | 55.7 | 70.6 | 13.7 | 5.8 | 0 | 0.25 | 54 | 53 |
| 8/18/2005 | 611 | 79.8 | 54.4 | 65.1 | 14.1 | 8.9 | 0 | 0.23 | 67 | 53.7 |
| 8/19/2005 | 609 | 83.1 | 52.7 | 65.9 | 13.6 | 5.9 | 0 | 0.22 | 63 | 52.8 |
| 8/20/2005 | 608 | 88.8 | 51.3 | 69.7 | 13.1 | 3.9 | 0 | 0.22 | 53 | 51.8 |
| 8/21/2005 | 613 | 91.9 | 53.5 | 71.2 | 13.5 | 4.2 | 0 | 0.24 | 52 | 52.6 |
| 8/22/2005 | 609 | 95.3 | 50.1 | 73.3 | 13.6 | 4 | 0 | 0.24 | 48 | 52.7 |
| 8/23/2005 | 609 | 95.1 | 54.7 | 72.3 | 13 | 5.6 | 0 | 0.25 | 48 | 51.6 |
| 8/24/2005 | 607 | 89.2 | 52.9 | 70.7 | 12.4 | 6.9 | 0 | 0.26 | 48 | 50.2 |
| 8/25/2005 | 601 | 90.2 | 53.1 | 70.8 | 10.1 | 4.5 | 0 | 0.24 | 39 | 44.8 |
| 8/26/2005 | 605 | 95.2 | 52.2 | 73.3 | 9.6 | 4.4 | 0 | 0.25 | 34 | 43.5 |
| 8/27/2005 | 585 | 97.8 | 54.5 | 76.4 | 11.2 | 4 | 0 | 0.25 | 36 | 47.5 |
| 8/28/2005 | 601 | 98.4 | 56.8 | 77 | 11.2 | 4.6 | 0 | 0.26 | 35 | 47.6 |
| 8/29/2005 | 588 | 90.6 | 55.5 | 72.8 | 11.4 | 4.2 | 0 | 0.23 | 41 | 47.9 |
| 8/30/2005 | 587 | 92.9 | 65.4 | 78.3 | 7.6 | 11.9 | 0 | 0.36 | -- | -- |
| 8/31/2005 | 580 | 98.2 | 59.2 | 77.1 | 8.7 | 4.9 | 0 | 0.26 | 27 | 40.9 |
| 9/1/2005 | 568 | 91.7 | 52.8 | 71.2 | 12.4 | 4.6 | 0 | 0.23 | 47 | 50.2 |
| 9/2/2005 | 574 | 87.5 | 51.9 | 67.6 | 12.9 | 4.8 | 0 | 0.21 | 56 | 51.4 |
| 9/3/2005 | 568 | 87.5 | 50.8 | 67.2 | 12.8 | 5.7 | 0 | 0.22 | 56 | 51.1 |
| 9/4/2005 | 552 | 82.5 | 52 | 66.2 | 12.8 | 5 | 0 | 0.19 | 58 | 51 |
| 9/5/2005 | 554 | 87.4 | 50.2 | 68.8 | 11.8 | 3.5 | 0 | 0.2 | 49 | 49 |
| 9/6/2005 | 551 | 86.4 | 51.4 | 66.7 | 11.9 | 4.9 | 0 | 0.21 | 53 | 49.2 |
| 9/7/2005 | 544 | 84.2 | 48.4 | 64.6 | 12.3 | 4.8 | 0 | 0.19 | 59 | 50 |
| 9/8/2005 | 536 | 77.5 | 50.3 | 64 | 12.4 | 7 | 0 | 0.2 | 61 | 50.3 |
| 9/9/2005 | 524 | 73.7 | 53.5 | 62.1 | 12.9 | 9.6 | 0 | 0.19 | 68 | 51.2 |
| 9/10/2005 | 481 | 76.4 | 49.9 | 62 | 11.7 | 5.6 | 0 | 0.17 | 62 | 48.8 |
| 9/11/2005 | 531 | 76.2 | 45.3 | 61.4 | 11.1 | 4.1 | 0 | 0.17 | 60 | 47.3 |
| 9/12/2005 | 520 | 78.2 | 44 | 61.3 | 10.7 | 2.3 | 0 | 0.16 | 58 | 46.3 |
| 9/13/2005 | 521 | 78.5 | 42.8 | 60.6 | 10.7 | 4 | 0 | 0.17 | 59 | 46.4 |
| 9/14/2005 | 505 | 76.3 | 46.7 | 60.6 | 11.9 | 4.5 | 0 | 0.16 | 66 | 49.1 |
| 9/15/2005 | 506 | 81.1 | 46.3 | 62.6 | 11.8 | 3.5 | 0 | 0.16 | 61 | 48.9 |
| 9/16/2005 | 491 | 79.9 | 52.2 | 63.6 | 12.2 | 6.9 | 0 | 0.18 | 61 | 49.7 |
| 9/17/2005 | 486 | 78.1 | 48.7 | 63.4 | 11.9 | 4.4 | 0 | 0.17 | 60 | 49.1 |
| 9/18/2005 | 491 | 83.8 | 46.2 | 65.7 | 9.5 | 3.7 | 0 | 0.18 | 44 | 43.3 |
| 9/19/2005 | 495 | 89.7 | 46.9 | 68.1 | 9.3 | 3.5 | 0 | 0.19 | 39 | 42.5 |
| 9/20/2005 | 458 | 89.6 | 51.4 | 70.3 | 10.5 | 6.2 | 0 | 0.2 | 42 | 45.8 |
| 9/21/2005 | 464 | 86.5 | 54.6 | 67.8 | 12.4 | 4.3 | 0 | 0.17 | 54 | 50.3 |
| 9/22/2005 | 492 | 87.1 | 48.2 | 66.1 | 10.8 | 4 | 0 | 0.18 | 49 | 46.5 |
| 9/23/2005 | 480 | 80.1 | 53.1 | 65.7 | 9.8 | 9.1 | 0 | 0.23 | 45 | 44.1 |
| 9/24/2005 | 479 | 78.5 | 56.2 | 66.6 | 5.9 | 10.1 | 0 | 0.26 | 27 | 31.3 |
| 9/25/2005 | 460 | 82.3 | 52.3 | 66.2 | 6.5 | 5.9 | 0 | 0.2 | 29 | 33.4 |
| 9/26/2005 | 400 | 86.6 | 55.3 | 70 | 9.8 | 4.7 | 0 | 0.18 | 39 | 43.9 |
| 9/27/2005 | 441 | 84.8 | 52.1 | 68.5 | 11.7 | 2.7 | 0 | 0.16 | 49 | 48.7 |
| 9/28/2005 | 463 | 94.1 | 58.6 | 74.6 | 9.1 | 6.4 | 0 | 0.23 | 31 | 42 |
| 9/29/2005 | 451 | 92.4 | 49.6 | 70.8 | 10 | 2.9 | 0 | 0.17 | 39 | 44.5 |
| 9/30/2005 | 438 | 92.2 | 52.8 | 71 | 10.5 | 3.4 | 0 | 0.17 | 40 | 45.8 |

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

Table 2. 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 |

Table 3. Phytotoxicity ratings over 8 weeks for *Armeria maritima* ‘Dusseldorf’ treated with 0 (Control), 2.5 (1X), 5 (2X), or 10 (4X) lb. ai/A Snapshot 2.5TG, applied at weeks 0 and 4. 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 ± SE (n = 4)

| Phytotoxicity Effect of Snapshot on Armeria | | | | | | | | |
|---|-------------|----|--------------|------------|--------------|-----|--------------|-----|
| Phytotoxicity Index Increase from beginning of trial until: | | | | | | | | |
| Treatment | Day 3 | no | 1 week | yes | 2 weeks | no | 4 weeks | yes |
| 0X | 0.00 ± 0.00 | a | 0.00 ± 0.00 | b | 0.25 ± 0.25 | a | 0.50 ± 0.29 | a |
| 1X | 0.00 ± 0.00 | a | 0.00 ± 0.00 | b | 1.25 ± 0.63 | a | -0.75 ± 0.25 | c |
| 2X | 0.25 ± 0.25 | a | 0.50 ± 0.29 | ab | 0.75 ± 0.48 | a | -0.25 ± 0.25 | bc |
| 4X | 0.50 ± 0.29 | a | 0.75 ± 0.25 | a | 1.25 ± 0.48 | a | 0.00 ± 0.00 | ab |
| Phytotoxicity Index increase from beginning of trial until: | | | | | | | | |
| Treatment | | | 5 week | yes at 10% | 6 weeks | yes | 8 weeks | yes |
| 0X | | | 0.00 ± 0.41 | ab | -0.25 ± 0.25 | b | -0.50 ± 0.29 | b |
| 1X | | | -0.75 ± 0.25 | b | -0.75 ± 0.25 | b | -0.75 ± 0.25 | b |
| 2X | | | -0.25 ± 0.25 | ab | -0.25 ± 0.25 | b | -0.25 ± 0.25 | ab |
| 4X | | | 0.50 ± 0.29 | a | 0.75 ± 0.48 | a | 0.50 ± 0.29 | a |

Table 4. Plant height, width and volume changes over 8 weeks for *Armeria maritima* ‘Dusseldorf’ treated with 0 (Control), 2.5 (1X), 5 (2X), or 10 (4X) lb. ai/A Snapshot 2.5TG, applied at weeks 0 and 4. 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 ± SE (n = 4)

| Growth Effect of Snapshot on Armeria | | | | | | |
|--------------------------------------|-------------|----|--------------------|----|------------------|----|
| Increase by week 8 of: | | | | | | |
| Treatment | Height (cm) | no | Average Width (cm) | no | Volume Index | no |
| 0X | 2.38 ± 0.38 | a | 6.94 ± 1.29 | a | 3719.00 ± 357.55 | a |
| 1X | 2.13 ± 0.47 | a | 5.81 ± 0.57 | ab | 3905.13 ± 368.61 | a |
| 2X | 2.00 ± 1.21 | a | 5.00 ± 1.22 | ab | 3150.00 ± 696.00 | a |
| 4X | 2.38 ± 0.38 | a | 3.69 ± 0.77 | b | 2657.75 ± 241.53 | a |

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM



Figure 1. *Armeria maritima* 'Dusseldorf' plants were arranged in a completely randomized design with 4 replicates per treatment for the experiment to evaluate the phytotoxicity of Snapshot 2.5TG.

| | |
|--------|---------|
| PR.NO. | 24774 |
| : | |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

Species: *Armeria* -- Material: Snapshot

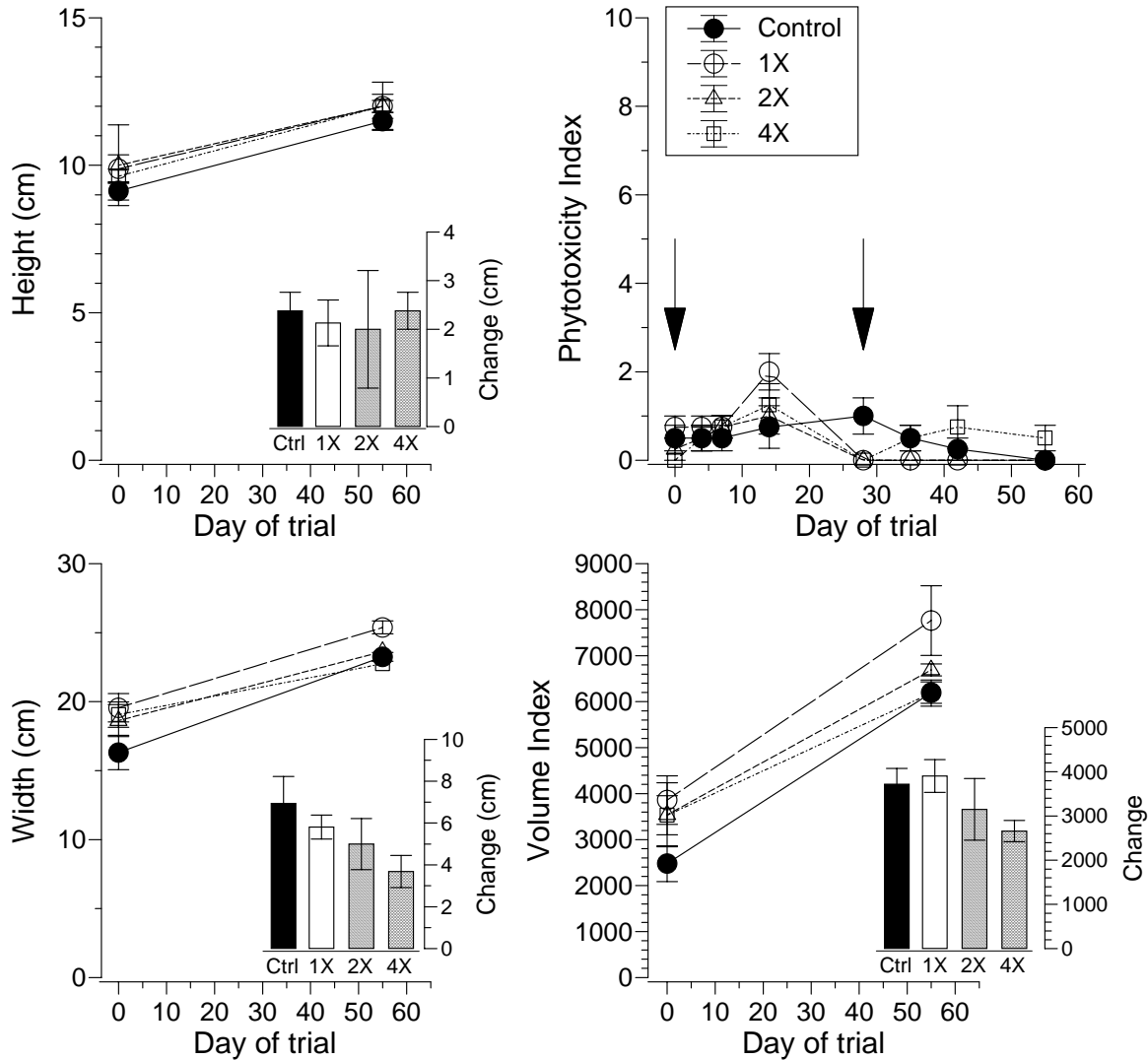


Figure 2. Summary of results for *Armeria maritima* 'Dusseldorf' treated with 0 (Control), 2.5 (1X), 5 (2X), or 10 (4X) lb. ai/A Snapshot 2.5TG, applied at weeks 0 and 4 (arrows). Both means and cumulative changes over time are plotted for phytotoxicity index, plant height, plant width and plant volume index. Histograms show changes over the 8-week trial period. SE bars shown. (n = 4)

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM



CONTROL

1X

2X

4X

Figure 3. *Armeria maritima* 'Dusseldorf' plants 8 weeks after treatment with 0 (Control), 2.5 (1X), 5 (2X), or 10 (4X) lb. ai/A Snapshot 2.5TG, applied at weeks 0 and 4.

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

Appendix A

Phytotoxicity to herbaceous perennial plants with pre-emergent applications of Pendulum, Pennant Magnum, and Snapshot

Ornamental Protocol Number: 05-001

Objective: Determine phytotoxicity of Pendulum, Pennant Magnum, and Snapshot to unlabelled perennial plants commonly grown in nurseries.

Experimental Design:

Plot Size: Must be adequate to reflect actual use conditions.

Replicates: Minimum of 3 replications (preferably 4) with 3 pots per replicate

Application Instructions: Two applications made approximately 4 weeks apart with the first application within 7 days of potting. Plant materials must have broken dormancy prior to first application. For liquid applications, use a minimum of 20 gal per acre. Applications should be made over the top of the plants using application equipment consistent with conventional commercial equipment. Please see table below for instructions for post-application irrigation.

Plant Materials: See attached list of plant materials. Plants grown in field containers are preferred to in-ground.

Evaluations: Record phytotoxicity on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill) at 3, 7, 14, and 28 days after each application. If phytotoxicity is observed in treated plants, take pictures comparing treated and untreated plant material.

Recordkeeping: Keep detailed records of weather conditions including temperature and precipitation, soil-type or soil-less media, application equipment, application volume per acre, irrigation, liner size, plant height & width, and plant growth stage at application and data collection dates.

Treatments:

| Product | Rate | Post-Application Irrigation Instructions |
|---------------------------------------|--------------|---|
| Snapshot 2.5TG (pendimethalin) | 2.0 lb ai/A | Follow with sufficient overhead irrigation to wash Pendulum from the foliage to reduce the chance of injury |
| | 4.0 lb ai/A | |
| | 8.0 lb ai/A | |
| Pennant MAGNUM 7.62EC (s-metalochlor) | 2.5 lb ai/A | Follow with sufficient overhead irrigation to wash Pennant Magnum from the foliage to reduce the chance of injury |
| | 5.0 lb ai/A | |
| | 10.0 lb ai/A | |
| Snapshot 2.5TG (isoxaben+trifluralin) | 2.5 lb ai/A | Follow with sufficient overhead irrigation to wash Snapshot from the foliage to reduce the chance of injury |
| | 5.0 lb ai/A | |
| | 10.0 lb ai/A | |
| Untreated | -- | -- |

For labels, materials, and any required adjuvants contact:

Pendulum - BASF, Kathie Kalmowitz, 919-785-9659, email: kalmowk@basf-corp.com

Pennant Magnum - Syngenta, Dave Ross, 336-632-6411, david.ross@syngenta.com

Snapshot - Dow AgroSciences, Mike Melichar, 317-337-4982, mwmelichar@dow.com

Reports:

Report must include a brief summary paragraph of results, a summary table with appropriate statistical analyses, a section on experimental design and materials and methods, with raw data and recordkeeping information as listed above included as appendices. If pictures were taken, please include them.

An electronic report is preferred but not required. If the report is provided electronically, the basic report can be sent in MS Word or WordPerfect, the recordkeeping information as pdf or other electronic documents, and the raw data in MS Excel or other suitable program such as ARM.

Please direct questions to: Cristi Palmer, IR-4 HQ, Rutgers University, 681 US Hwy 1 S, North Brunswick, NJ 08902-3390, Phone 732-932-9575 x629, palmer@aesop.rutgers.edu OR Ely Vea, 308 Aston Forest Lane, Crownsville, MD 21032, Phone & FAX#: 410-923-488, E-mail: evvea@comcast.net.

| | |
|-------------|---------|
| PR.NO. : | 24774 |
| TRIAL: | |
| DATE: | 9/30/05 |

IR-4 ORNAMENTAL DATA REPORTING FORM

Appendix B

| Phytotoxicity Report Form for Snapshot on Armeria | | | | | | | | | | | | | | | | | | |
|---|-------|-----|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|----------------------|----------------|-----------------|----------------------|----------------|-----------------|------|
| Treatment | Block | Rep | Phytotoxicity at week | | | | | | | | | Plant Size at week 0 | | | Plant Size at week 8 | | | |
| | | | day | | | | day | | | | | Height (cm) | Width1 (cm) | Width 2 (cm) | Height (cm) | Width1 (cm) | Width 2 (cm) | |
| | | | 0 | 3 | 1 | 2 | 4 | 3 | 5 | 6 | 8 | | | | | | | |
| Control | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 19 | 17 | 12 | 26 | 22 |
| Control | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 9 | 12 | 13.5 | 11 | 24 | 23 |
| Control | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 9 | 19 | 17 | 11 | 25 | 21 |
| Control | 0 | 4 | 1 | 1 | 1 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 8.5 | 17 | 16 | 12 | 23 | 22 |
| Mean | | | 0.5 | 0.5 | 0.5 | 0.8 | 1.0 | 0.0 | 0.5 | 0.3 | 0.0 | 0.0 | 9.1 | 16.8 | 15.9 | 11.5 | 24.5 | 22.0 |
| 1X | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 8.5 | 17 | 16 | 10 | 25 | 23 |
| 1X | 0 | 2 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 10.5 | 20.5 | 20.5 | 14 | 28 | 24 |
| 1X | 0 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10.5 | 20.5 | 21.5 | 12 | 27 | 25 |
| 1X | 0 | 4 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 21.5 | 19 | 12 | 26 | 25 |
| Mean | | | 0.8 | 0.8 | 0.8 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.9 | 19.9 | 19.3 | 12.0 | 26.5 | 24.3 |
| 2X | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 16 | 17 | 12 | 24 | 23 |
| 2X | 0 | 2 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 8.5 | 22 | 21 | 11.5 | 24 | 23 |
| 2X | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.5 | 18 | 16 | 12 | 24 | 24 |
| 2X | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 19 | 20 | 12.5 | 25 | 22 |
| Mean | | | 0.3 | 0.5 | 0.8 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 18.8 | 18.5 | 12.0 | 24.3 | 23.0 |
| 4X | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 9.5 | 18 | 17 | 11 | 25 | 20 |
| 4X | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 10 | 21 | 21 | 13 | 24 | 22 |
| 4X | 0 | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 1 | 1 | 9 | 20 | 15 | 12 | 24 | 21 |
| 4X | 0 | 4 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 20.5 | 20 | 12 | 24 | 22 |
| Mean | | | 0.0 | 0.5 | 0.8 | 1.3 | 0.0 | 0.0 | 0.5 | 0.8 | 0.5 | 0.5 | 9.6 | 19.9 | 18.3 | 12.0 | 24.3 | 21.3 |