SECTION 9
WEED CONTROL

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Phytotoxicity of Container Applied Herbicides

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Nature of Work: Weed control is a continuous problem with woody ornamental production. Weed control in containers offer a unique challenge regarding organic matter content of the growing media and the amount of water applied throughout the growing season. The objective of this study was to evaluate the effects of selected herbicides and/or combinations thereof for possible plant phytotoxicity and weed control effectiveness in two container grown plants.

Materials and Methods: Liners of *Ilex crenata* 'Compacta' (Dwarf Japanese Holly) and *Juniperus horizontalis* 'Plumosa' (Andorra Creeping Juniper) were planted in 4 quart containers on June 15, 1995. The growing medium consisted of 4 parts pine bark, and one part sand (v/v) amended with 12 pounds of 17-7-12, 1 pound each of Micromax and 0-20-0 and 4 pounds of dolomitic limestone per cubic yard. Treatments I - VI were made July 27, 1995 using a modified kitchen spice shaker to distribute the herbicides over the treated area. After herbicide application, the plants were watered to move the herbicide into the growing media. Treatments VII - XII were made September 6. 1995 at recommended label rates in various combinations to determine possible plant phytotoxicity and weed control effectiveness. Treatments I - VI were evaluated for possible plant phytotoxicity and weed control effectiveness September 6, 1995. Weeds in each container were identified and number per pot recorded (data not included). A completely randomized design with 6 replications was used in this experiment.

Results and Discussion: Plant phytotoxicity ratings were made September 6, 1995 of the six treatments made July 27, 1995 using a scale of 0 - 10, 0 being no phytotoxicity symptoms observed and 10 indicating death). There were no phytotoxicity symptoms noted on either *Ilex crenata* Compacta' (Dwarf Japanese Holly) or *Juniperus horizontalis* Plumosa' (Andorra Creeping Juniper) with only two weeds infesting one container in treatment VI (check). Various herbicide combinations were applied (treatments VII- XII) at label rates (Table 1) on September 6, 1995. The combination herbicide treatments were rated for plant phytotoxicity on a scale of 0-10, 0 being no symptoms of plant phytotoxicity and 10 being dead) and weed control effectiveness on November 15, 1995 and December 5, 1995. Weeds infesting the containers were counted and identified. There were no plant phytotoxicity symptoms noted by any herbicide combination at either date. However, winter weeds were noted in several treatments.

Significance to Industry: Winter and spring weeds continue to present a problem for many growers. Herbicide combinations may prove to be an effective means in controlling a broader range of weeds infesting container nursery stock. Before using various herbicides combinations, growers should evaluate any combination on a small number of plants. Nurserymen should select herbicides for winter and spring weed control based on crops being grown, persistent weeds, and timing of application.

Literature Cited

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Table 1. Phytotoxicity of Container applied Herbicides on Ilex crenata Compacta' (Dwarf Japanese Holly) and Juniperus horizontalis Plumosa' (Andorra Creeping Juniper)

TREATMENT	HERBICIDE	RATE OF APPLICATION	PLANT PHYTOTOXICITY
I	Ornamental Herbicide II (OH2)	2.3 pounds /1000' sq.	0
II	Snapshot 2.5 TG	4.6 pounds/1000' sq.	0
III	Ronstar 2G	4.5 pounds/ 1000' sq.	0
IV	Scotts Southern Weedgrass Control	2.5 pounds/ 1000' sq.	0
V	Lasso 15G	9.8 ounces/1000' sq.	0
VI	Check		
VII	Ronstar 2G + Lasso 15 G	4.5 pounds/ 1000' sq. 9.8 ounces/ 1000' sq.	0
VIII	Ronstar 2G + Scotts Southern Weedgrass Control	4.5 pounds/ 1000' sq. 2.5 pounds/ 1000' sq.	0
IX	Snapshot 2.5 TG + Ronstar 2G	4.6 pounds/ 1000' sq. 4.5 pounds/ 1000' sq.	0
X	Ornamental Herbicide II + Ronstar 2G	2.3 pounds/ 1000' sq. 4.5 pounds/ 1000' sq.	0
XI	Snapshot 2.5 TG + Ornamental Herbicide II	4.6 pounds/ 1000' sq. 2.3 pounds/ 1000' sq.	0
XII	Scotts Southern Weedgrass Control + Ornamental Herbicide II (OH2)	2.5 pounds/ 1000' sq 2.3 pounds/ 1000' sq.	0

Winter Annual Weed Suppression by Spring Applied Preemergence Herbicide Carryover

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Nature of Work: An evaluation of the extended effect of preemergence herbicide activity associated with trees and shrubs in nursery production. Specific winter annuals were controlled depending on chemical and rate when preemergence herbicide application was made during the spring.

Seventeen preemergence herbicide treatments were applied to ten tree and shrub species on June 6, 1995 (Figure 1). Trees and shrubs, which were established in 1992, included: *Platanus acerifolia, Zelkova serrate, Prunus cerasifera* 'Newport', *Crataegus crus-galli* 'Inermis', *Amelanchier* 'Princess Diana', *Magnolia virginiana, Pseudotsuga menziesii, Buxus microphylla, Ilex crenata* 'Noble's Upright', and *Taxus cuspidata* 'Thayerae'. Each treatment plot was 18 feet by 100 feet and contained three plants of each species. Plots were set up in a randomized block design with three replications.

The granular herbicides were applied using a calibrated rotary spreader. The other materials were applied using a CO_2 pressurized backpack sprayer calibrated at 26 GPA using 8004 nozzles with 28 psi.

Ratings were made May 10, 1996 for the control of henbit, chickweed, shepherdspurse, and violet.

Results and Discussion: The trees were large enough that shade was provided which did not occur around the shrubs. The area around the trees appeared to remain moist during the winter and spring compared to the shrub rows. Weed control varied depending on whether shade was provided to the plot or not (Figure 1.). The high rate of Predict and Predict + Factor both gave excellent control of chickweed eleven months after treatment. All materials controlled shepherdspurse except the low rates of Predict and Derby. Violet was less predictable in its control. Excellent control of henbit occurred using any combination including Factor or with Dimension.

Significance to Industry: New preemergence herbicides appear to have persistence which will allow for winter annual weed control from the previous spring application.

Table 1. Preemergence herbicides for winter annual weed control in woody nursery plants 1995-1996

TREATMENT	RATE (lb ai/A)	HB shade	HB sun	CW shade	CW sun	SP shade	SP sun	VIO shade	VIO sun
1. Predict 80WG	2.4	S6.67 abc	33.33 bcd	38.33 cafe	8.33 efg	100.00 a	45.00 bc	3.33 c	8.33 cafe
2. Predict 80WG	4.8	20.00 cd	0.00 d	91.00 ab	62.67 abed	100.00 a	99.33 a	98.33 a	71.67 ab
3. Predict 80WG	7.2	33.33 abc	33.33 bcd	95.67 a	89.67 a	100.00 a	100.00 a	75.00 ab	95.00 a
4. Predict 80WG + Princep 4L	2.4 2.0	33.33 abc	23.33 cd :	55.00 bcd	51.00 abcdef	100.00 a	99.67 a	76.67 ab	35.00 bcde
5. Predict 80WG + Factor 65WG	2.4 1.5	99.33 a	80.00 abc	99.33 a	89.67 a	100.00 a	100.00 a	96.67 a	63.33 ab
6. Predict 80WG + Gallery 75DF	2.4 0.75	83.33 ab	79.67 abc	80.00 ab	35.00 bcdefg	100.00 a	66.67 ab	66.67 ab	25.00 bcde
7. Factor 65WG + Gallery 75DF	1.5 0.75	100.00 a	86.67 abc	99.00 a	68.33 abc	100.00 a	100.00 a	43.33 abc	52.67 abed
8. Predict 80WG + Factor 65 WG	1.2 1.0	96.67 a	99.00 a	94.67 a	78.33 ab	100.00 a	100.00 a	46.67 abc	72.67 ab
9. Pennant 5G	2.0	70.00 abc	33.33 bcd	3.33 e	5.00 g	100.00 a	66.67 ab	33.33 bc	33.33 bcde
10. Pennant 5G	4.0	73.33 abc	76.67 abc	32.33 cafe	25.00 cdefg	100.00 a	100.00 a	1.67 c	33.33 bcde
11. Derby 5G	2.5	70.00 abc	33.33 bcd	23.33 de	9.00 efg	66.67 b	33 33 bc	55.00 abc	32.33 bcde
12. Derby 5G	5.0	45.00 abed	66.67 abc	66.67 abc	21.67 defy	100.00 a	100.00 a	66.67 ab	3.33 de
13. Factor 65WG	1.5	99.67 a	98.33 a	97.00 a	52.67 abcde	100.00 a	75.00 ab	73.33 ab	58.33 abc
14. Gallery 75DF	0.75	68.33 abc	65.00 abc	23.33 de	6.67 fg	100.00 a	100.00 a	66.67 ab	58.33 abc
15. Dimension IEC	1.0	100.00 a	96.67 abc	95.67 a	71.67 ab	100.00 a	100.00 a	68.33 ab	66.67 ab
16. Pennant 7.8L + Gallery 75DG	6.0 0.75	91.67 a	70.00 abc	35.00 cde	41.67 bcdefg	66.67 b	66.67 ab	53.33 abc	46.67
17. Untreated Check		0.00 d	0.00 d	0.00 e	0.00 g	0.00 c	0.00 c	0.00 c	0.00 e
Significance		*	*	<.001	<.001	<.001	* *	*	*
LSD 0.05	_	55.5	63.6	38.4	45.5	31.7	52.3	60.9	50.0

Preemergence Herbicides for Use in Annual Bedding Plants

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Nature of Work: There are many effective ornamental herbicides available for broadspectrum weed management. However, many products applied preemergence are not labeled for use on bedding plants. Researchers have evaluated efficacy for weed management over time, but phytotoxicity to annual bedding plants has not been extensively evaluated. Our past work has shown that certain herbicides offer promise for effective weed suppression, but phytotoxcity to sensitive bedding plants such as begonia *(Begonia x semperflorens-cultorum)* or impatiens *(Impatiens wallerana)* can be severe (Brown et al., 1995). Currently, metalochlor (Pennant) and oryzalin (Surflan) are labeled for use in bedding plants, but not for all commonly used species. Our objectives were to evaluate the efficacy of newly available and standard preemergence herbicides in numerous species of commonly available bedding plants.

On May 23, 1996 a variety of annual bedding plants were transplanted into the field by hand into beds. Species included:- *Begonia x semperflorens-cultorum* 'Vodka', 'Gin', *Petunia x hybrida* 'Saffrina Purple', 'Purple Sunset', '182 Sun Vale', *Portulaca grandiflora* 'Sundial Pink', *Tagetes erecta* 'Jamie Spry', *Impatiens wallerana* 'Peach Swirl', *Catharanthus roseus* 'Grape and Rose Cooler, *Pelargonium x hortorum* 'Picasso', and *Zinnia elegans* 'Mix'. Plots were irrigated after establishment and ammonium nitrate applied before planting (112 kg/ha). Plots were arranged in a randomized complete block design with 3 replications On May 24, herbicides were applied to the plots post-transplant and over the top. The granular materials (Derby 5G, metolachlor plus simazine; Snapshot 2.5G, isoxaben plus trifluralin; and Ronstar 5G; oxadiazon) were applied using a calibrated rotary spreader. Other materials were applied as liquids using a calibrated CO_2 pressurized backpack sprayer at 26 GPA using 8004 nozzles and 30 PSI at the boom.

Plots were rated visually for herbicide efficacy (0= no control, 100= complete control) and phytotoxicity (0= no injury, 5= completely dead). Weed control ratings were taken at 4 and 8 weeks after treatment and phytotoxicity ratings were taken at 2 and 4 weeks after treatment.

Results and Discussion: *Weed Control*. At 4 weeks after herbicide application, weed control provided by Derby (metolachlor plus simazine), Snapshot DF (isoxaben plus oryzalin), Dimension (dithiopyr), Pendulum (pendimethalin EC, G or WDG) and Ronstar (oxadiazon) was superior. Overall weed control provided by these treatments was above 75 %, while annual grass control was generally over 90% at this time. The highest level of overall weed suppression was observed in the Predict (norflurazon) treatment, with overall control of 93% obtained. All Pendulum formulations provided over 87% control. Gallery (isoxaben) provided good suppression of broadleaf weeds as expected, while Surflan (oryzalin) and Factor (prodiamine) controlled annual grasses effectively. At 8 weeks after herbicide application, weed suppression had declined in all

treatments. However, efficacy was still very acceptable in treatments containing Pendulum at all 3 formulations (G, EC, WDG) (68-77%). In addition, high levels of suppression were observed in the Predict (77%), Ronstar (61%) and Snapshot (77%) treatments. In general, control of annual grasses was acceptable (80% or greater) at 8 WAT, but yellow nutsedge control was reduced and broadleaf weed control was marginal with morningglory spp. and horsenettle predominating.

Phytotoxicity to annuals. Although weed control provided by Pendulum, Snapshot and Predict treatments was highly acceptable, injury to sensitive annual spp. was observed. In particular, vinca, impatiens and begonia were generally most sensitive to all herbicide applications. Significant injury to vinca, impatiens, begonia and geranium only was observed in Pendulum treatments, and begonia and vinca exhibited most injury which appeared as necrosis and yellowing. Zinnia and petunia spp. were least affected in all herbicide treatments. Injury to annuals was minimized when Pendulum was applied in granular formulation as opposed to WDG or EC formulations. Injury appeared as chlorosis followed by necrosis. Predict application resulted in injury to begonia, impatiens and vinca species and was severe. No injury was observed in portulaca or zinnia. Injury appeared as bleaching or chlorosis. Least phytotoxicity was observed in the Ronstar G, Factor and Surflan treatments. Ronstar application resulted in good weed suppression and limited annual injury, with begonia being the only species seriously affected by application.

Significance to Industry: Herbicide application resulted in good overall weed control with most treatments 4 weeks following application. At 8WAT, Pendulum, Predict, Ronstar and Snapshot provided reasonable weed suppression. Pendulum, Predict and Snapshot application resulted in herbicide injury to a variety of annual species, with zinnia and petunias least affected. Ronstar and Pendulum treatments provided best overall weed control and least injury to annual bedding plant species.

Literature Cited

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Table 1. Herbicide Rates & Manufacturers

Treatment	Rate	Manufacturers
1. Pennant 7.8L	3.0 pt/A	Ciba
2. Derby 5G	60 lb/A	Ciba
3. Snapshot 2.5G	150 lb/A	DowElanco
4. Gallery 75DF	1.0 lb/A	DowElanco
5. Dimension 1EC	0.5 lb/A	Rohm & Haas
6. Predict 80WG	3.0 lb/A	Sandoz Agro, Inc.
7. Surflan 7.8L	1.0 qt/A	DowElanco
8. Ronstar 5G	150 lb/A	Rhone-Poulenc
9. Factor 65 WG	1.0 lb/A	Sandoz Agro, Inc.
10. Snapshot 80DF	3.75 lb/A	DowElanco
11. Pendulum 2G	4.0 lb/A	American Cyanamid
12. Pendulum 3.3EC	4.0 lb/A	American Cyanamid
13. Pendulum 60WDG	4.0 lb/A	American Cyanamid
14. Untreated Check-	0.0 lb/A	

Flower species represented in each treatment:

(1) Petunia ‘Saffinia Purple’
(2) Begonia ‘Vodka’, ‘Gin’
(3) Marigold ‘Jamie Spry’
(4) Impatiens ‘Peach Swirl’
(5) Portulaca ‘Sundial Pink’
(6) Geranium ‘Picasso’
(8) Zinnia
(9) Petunia ‘Purple Sunset’, ‘182 Sun Vale’

Table 2. Weed Control Rating at 4 Weeks After Treatment

TREATMENT	AG[z]	MG	SD	SW	YNS	HN	RW	OVERALL
1. Pennant 7.8L	100.00 a	52.67 bcd	89.33 ab	65.67 abc	100.00 a	30.00 bc	33.33 ab	76.00 ab
2. Derby 5G	96.67 a	36.67 cde	90.00 ab	79.33 abc	100.00 a	88.33 ab	98.33 a	76.67 ab
3. Snapshot 2.5G	75.00 b	68.33 abc	72.67 ab	41.67 bcd	69.33 ab	99.33 a	98.33 a	74.33 abc
4. Gallery 75DF	76.67 b	57.67 abcd	60.67 b	54.00 abc	94.33 a	87.33 ab	100.00 a	71.67 bc
5. Dimension 1EC	93.00 a-	20.00 de	98.33 a	36.67 cd	94.67 a	49.00 abc	33.33 ab	55.00 c
6. Predict 80WG	100.00 a	91.67 a	100.00 a	92.33 a	99.33 a	95.00 ab	100.00 a	92.67 a
7. Surflan 7.8L	94.33 a	60.67 abc	80.67 ab	60.33 abc	41.67 bc	30.00 bc	32.67 ab	81.00 ab
8. Ronstar 5G	87.33 ab	87.33 ab	100.00 a	93.33 a	92.00 a	60.00 abc	65.00 ab	80.33 ab
9. Factor 65WG	87.00 ab	51.00 bcd	71.67 a	87.67 ab	69.97 ab	36.67 abc	65.00 ab	75.00 ab
10. Snapshot 80DF	94.33 a	86.67 ab	86.33 ab	88.00 ab	65.00 ab	56.67 abc	100.00 a	89.33 ab
11. Pendulum 2G	94.67 a	66.00 abc	100.00 a	96.67 a	61.67 ab	30.00 bc	33.33 ab	87.67 bc
12. Pendulum 3.3EC	97.67 a	88.33 ab	100.00 a	100.00 a	74.33 ab	58.33 abc	66.67 ab	92.33 a
13. Pendulum 60WDG	94.00 a	82.67 ab	100.00 a	99.67 a	89.00 a	63.33 abc	50.00 ab	90.00 ab
14. Untreated Check	0.00 c	0.00 e	0.00 c	0.00 d	0.00 c	0-0.00 c	0.00 b	0.00 d
Significance-	<.001	<.001	<.001	**	**	ns	ns	<.001
LSD 0.0513.80	38.98	34.43	49.80	44.64	66.36	68.51	19.50	

[z]AG=Annual Grass; MG=Morningglory; SD=Prickly Sida; SW=Smartweed; RW=Ragweed; HN=Horsenettle; YNS=Yellow Nutsedge.

Table 3. Weed Control Rating at 8 Weeks After Treatment

TREATMENT	AG[z]	MG	SD	SW	YNS	HN	RW	OVERALL
1. Pennant 7.8L	97.00 a	26.67 bc	50.00 abc	51.67 ab	100.00 a	5.00 cd	92.67 a	46.00 abcd
2. Derby 5G	92.00 ab	0.00 c	64.33 ab	55.00 ab	100.00 a	61.67 abcd	66.67 ab	33.33 bcde
3. Snapshot 2.5G	10.00 e	35.00 abc	53.33 ab	30.00 bc	65.00 ab	96.00 ab	95.33 a	39.00 abcd
4. Gallery 75DF	13.33 e	3.33 c	56.00 ab	58.33 ab	100.00 a	100.00 a	97.67 a	16.67 de
5. Dimension 1EC	71.67 abc	0.00 c	95.00 a	10.00 bc	95.00 a	63.33 abcd	87.67 a	26.67 cde
6. Predict 80WG	98.00 a	65.00 ab	100.00 a	25.00 bc	93.33 a	100.00 a	88.33 a	76.67 a
7. Surflan 7.8L	68.33 bcd	39.67 abc	60.00 ab	58.33 ab	33.33 bc	59.33 abcd	81.00 a	37.67 bcde
8. Ronstar 5G	58.33 cd	71.67 a	98.33 a	93.33 a	89.33 ab	36.67 abcd	65.00 ab	61.00 abc
9. Factor 65WG	43.33 d	0.00 c	56.67 ab	81.67 a	100.00 a	58.33 abcd	33.33 ab	25.00 cde
10. Snapshot 80DF	90.67 ab	62.67 ab	36.67 bc	95.00 a	66.67 ab	66.67 abc	61.00 ab	76.67 a
11. Pendulum 2G	80.00 abc	40.00 abc	100.00 a	96.67 a	61.67 ab	32.67 bcd	67.00 ab	68.00 ab
12. Pendulum 3.3EC	80.00 abc	51.67 abc	100.00 a	98.33 a	61.67 ab	46.00 abcd	62.67 ab	76.67 a
13. Pendulum 60WDG	75.00 abc	32.67 abc	100.00 a	91.67 a	93.33 a	48.33 abcd	64.33 ab	77.00 a
14. Untreated Check	0.00 e	0.00 c	0.00 c	0.00 c	0.00 c	0.00 d	0.00 b	0.00 e
Significance	<.001	**	**	**	*	ns	ns	**
LSD 0.0527.18	43.49	51.34	48.60	55.79	66.10	69.36	38.41	

[z]AG=Annual Grass; MG=Morningglory; SD=Prickly Sida; SW=Smartweed; RW=Ragweed; HN=Horsenettle; YNS=Yellow Nutsedge.

Tolerance of a Lavender *Phlox subulata* to Preemergent Herbicides

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Nature of Work: The commercial production of *Phlox subulata* is increasing in Middle Tennessee. Weed control is the most challenging cultural practice. Cultivation and hoeing is slow and can be damaging to the prostrate growing plant.

Currently, Pennant is the only labeled preemergent herbicide for the Phlox species. Pennant was registered in 1991. It provides adequate grass control. Broadleaf weed control is still a problem due to the lack of labeled preemergent herbicides for over-the-top use.

An evaluation of preemergent herbicides applied over-the-top of field grown creeping phlox was initiated on May 2, 1996. Plants treated had been transplanted March 28, 1996, from 4 inch pots into a field of Mountview Silt Loam soil. Ten herbicide treatments were applied with a Solo backpack sprayer at 44 gallons per acre (Table 1) in three replications with four plants in each experimental unit. Field conditions were optimal with no wind, overcast sky and low 70's F temperature. Visual ratings for phytotoxicity and growth response were made at 10, 30, 60 and 90 day intervals.

Results and Discussion: No phytotoxicity or stunting was observed on any herbicide treatment when compared to the control. A foliage curl was observed on small portions of 10-20 percent of the Pennant treatments 10 days after application. By 30 days after treatment, there were no discernible differences among treatments.

Significance to Industry: It appears that these herbicides may be applied over-the-top of phlox with minimal phytotoxic problems. The authors will repeat this project and continue to promote labeling of herbicide products.

Table 1. Herbicide treatments applied as over-the-top of creeping phlox.

Herbicide	Formulation/Acre	AI/Acre (lbs.)
Factor 65 WDG	1.0 lb.	0.65
Pendulum 60 WDG	3.3 lbs.	1.98
Pennant 7.8 E	2.5 pints	2.50
Surflan 4AS	2 quarts	2.0
Princep 4L	1 quart	1.0
Gallery 75 DF	0.5 lb.	0.375
Factor 65 WDG	1.0 lb.	0.65
Princep 4L	1.0 quart	1.0
Pendulum 60 WDG	3.3 lbs.	1.98
Princep 4L	1 quart	1.0
Pennant 7.8 E	2.5 pints	2.50
Princep 4L	1 quart	1.0
Surflan 4AS	2 quarts	2.0
Princep 4L	1 quart	1.0
Control	—	—

Effects of Preemergence-Applied Herbicides on Growth of Container-Grown Pampas Grass

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Nature of Work: Ornamental grasses are produced using various preemergence herbicides, several of which are labeled for use on pampas grass *(Cortaderia selloana).* The authors have observed reduced growth and lodging of pampas grass in nurseries where certain preemergence herbicides were applied. Hence, the objective of this study was to determine the sensitivity of pampas grass to various labeled and non-labeled preemergence-applied herbicides.

Uniform liners (72-cell packs) of two varieties of pampas grass (white and pink) were potted in trade gallon containers with a 6 pinebark:1 sand medium amended with 10 lbs Osmocote 17-7-12, 6 lbs dolomitic lime, 2 lbs gypsum, and 1.5 lbs Micromax/yd^3. Each of the two varieties was used independently in the evaluation of nine herbicides demonstrating a potential for use on pampas grass. The herbicides and their rate of application in lbs ai/A were Ornamental Weed Grass Control (3.0), Rout 3G (3.0), OH-2 3G (3.0), Regal O-O (3.0), Factor 65 WG (1.5), Surflan 4AS (3.0), Pendulum 60 WDG (3.0), Pendulum 2G (3.0), and Ronstar 2G (4.0). Following treatment, plants were lined-out and maintained on an irrigated container bed in Mobile, AL. The study consisted of 11 treatments: 9 herbicide treatments with 2 non-treated controls (one hand weeded and one unweeded). Each treatment was assigned 8 single-plant replications. Data were collected at 45 and 75 days after treatment (DAT). Plant height was recorded. Roots in the upper 2 inches and lower 4 inches of the container were rated separately on a scale of 1-5 where 1-5 = 0, 25, 50, 75, and 100% root coverage at the medium-container interface. Mortality and lodging were also recorded at 75 DAT. Treatment means were separated using Duncan's multiple range test ($P \leq 0.05$).

Results and Discussion: The white and pink varieties of pampas grass displayed similar trends in response to treatments, therefore results are given for pink pampas grass only (Table 1). Rout 3G, Factor 65 WG, Surflan 4AS, and Pendulum 60 WDG all had a detrimental effect on height development at 45 DAT and all of these but Pendulum 60 WDG continued to suppress height at 75 DAT. The same four herbicides all significantly decreased upper and lower root development at 45 and 75 DAT. At 75 DAT, 100% and 87.5% of plants treated with Factor 65 WG and Pendulum 60 WDG, respectively, had lodged. Both herbicides are labeled for use on pampas grass. At 75 DAT, 87.5% and 25% of plants treated with Surflan 4AS and Rout 3G, respectively, had died. OWGC, OH-2 3G, Regal O-O, and Pendulum 2G caused minor suppression of upper root development at 75 DAT when compared to the unweeded control. Ronstar 2G proved to be a completely safe herbicide for use on pampas grass.

Significance to Industry: Of the preemergence herbicides evaluated in this study, Rout 3G, Factor 65 WG, Surflan 4AS, and Pendulum 60 WDG were detrimental to plant growth and development. Plants treated with Ronstar 2G, OWGC, OH-2 3G, Regal O-O, or Pendulum 2G exhibited little or no adverse effects from herbicide application and were considered highly marketable.

Table 1. Effects of selected preemergence herbicides on pink pampas grass.

				Root rating[z]			
	Rate	Height (cm)		Upper 2 in.		Lower 4 in.	
Treatment	lb ai/A	45 DAT	75 DAT	45 DAT	75 DAT	45 DAT	75 DAT
OWGC	3.0	68.2a[y]	108.2a	1.6b	2.9e	4.1bc	4.9a
OH-2 3G	3.0	67.9a	107.8a	2.6a	3.8bcd	4.5abc	5.0a
Pendulum 2G	3.0	66.9a	109.9a	1.8a	3.3de	4.0c	5.0a
Pend 60 WDG	3.0	45.7b	91.1ab	1.0c	1.0f	2.4d	2.9b
Surflan 4AS	3.0	15.3d	9.0d	1.0c	1.0f	1.0f	1.0e
Rout 3G	3.0	27.8	80.4bc	1.0c	1.5f	1.6e	2.8c
Factor 65 WG	1.5	37.9b	70.7c	1.0c	1.0f	1.4ef	1.6d
Regal O-O	3.0	66.3a	107.8a	2.8a	3.5cd	4.5abc	4.9a
Ronstar 2G	4.0	61.7a	107.9a	2.5a	4.5a	4.3abc	5.0a
Ctrl (HW)	——	64.9a	104.4a	2.8a	4.0abc	4.6ab	5.0a
Ctrl (NW)	——	62.1a	107.6a	2.8a	4.1ab	4.8a	5.0a

[z] Mean separation using Duncan's multiple range test ($P \leq 0.05$).-

[y] 1-5 rating scale = 0, 25, 50, 75, and 100% root coverage at the container-medium interface.

Perennial Kyllinga Control in Ophiopogon Production

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Nature of the Work: Perennial weeds such as green Kyllinga (*Kyllinga brevifolia*) normally are not major problems in the production of container grown plants because the vegetative propagules (i.e. rhizomes) are not easily disseminated in nursery culture. However, some landscape species used as ground covers are propagated by division and when infested with a weedy species such as green Kyllinga, each plant division could also contain a Kyllinga rhizome.

Green Kyllinga (belonging to the sedge family - Cyperaceae) is a mat forming, seed producing perennial weed that can spread rapidly by rhizome buds and seed. Yelverton and McCarty (1996) reported that Kyllinga is spreading rapidly in turfgrass areas and that it was difficult to control. Manage (halosulfuron) and sulfentrazone (experimental herbicide) effectively suppressed Kyllinga in turfgrass (Yelverton and McCarty, 1996). There is limited information about the tolerance of landscape plants to Manage (Hurt and Vencil, 1993, Bachman and Whitwell, 1995) and sulfentrazone (Smith and Whitwell, 1996).

This study investigated the control of a nursery infestation of green Kyllinga (*Kyllinga brevifolia*) in *Ophiopogon japonicus* production with selective postemergence herbicides. Iris, daylily, and Ophiopogon injury ratings were also recorded.

Ophiopogon pots (4") with a uniform Kyllinga infestation were selected from Carolina Nurseries (Moncks Corner, SC) production beds and placed in Clemson University 's on-site research area in a 60% shade house. Ophiopogon pots without Kyllinga was also selected to use in herbicide injury evaluations. Uniform non-infested pots of *Iris lousiana* 'Charjoys Jan' and *Hemerocallis* sp 'Tiny Trumpeter' were evaluated for phytotoxicity.

Sulfentrazone at 0.25, 0.5, 0.75 lb. ai/A, Manage at 0.03, 0.06, 0.12 at lb. ai/A, Image at 0.5 lb ai /A, and Basagran at 1 lb/ai/A were applied to Kyllinga and landscape plants on August 29, 1995. A second application of the same treatments was made to the same pots on November 16, 1995. Treatments were applied using a CO_2 backpack sprayer calibrated to deliver 40 gpa with 0.5% surfactant (Kinetic) added v/v. A randomized block design with 10 single plant replications was used for the Kyllinga and Ophiopogon experiments. Five single plant replications were used for the Iris and Daylily experiments.

Visual ratings on a scale 0 to 100 with 0 = no control and 100 = complete kill were taken 3, 11, 14, and 41 weeks after the initial application date. Analysis of variance was used for rating data and means were compared using LSD at $P = 0.05$.

Results and Discussion: Sulfentrazone quickly desiccated the Kyllinga but it recovered by 11 WAIT (weeks after the initial treatment) (Table 1). All rates provided > 86% control by 11 weeks after the initial treatment but only the higher rates (0.5 and 0.75) gave acceptable control (> 87%) at 41 WAIT. The 41 WAIT rating was in June after the initiation of new growth.

Manage gave poor control initially (3 WAIT) but all rates suppressed Kyllinga by >90% at 11 and 15 WAIT. Excellent Kyllinga control (> 98%) was observed in June with the higher Manage rates which included the labeled rate in turfgrass (0.06 lb. ai/A). Poor Kyllinga control was realized from both Image and Basagran.

Sulfentrazone injured Ophiopogon by > 21% at 3 WAIT and injury was never greater than 24% during the study (Table 2.). Iris and daylily had unacceptable injury from the higher rates of sulfentrazone. Manage did not substantially injure Ophiopogon but killed Iris and daylily. Image and Basagran were the least injurious to the landscape plants.

Significance to Industry : Managing perennial weed populations such as Kyllinga is difficult in the production and maintenance of landscape plants. Manage, which is labeled for Kyllinga control in turfgrass, was effective in controlling Kyllinga in Ophiopogon production but killed Iris and daylily. Sulfentrazone was less effective for Kyllinga control and less injurious to the nursery crops. Image and Basagran were ineffective for Kyllinga control and less phytotoxic to the Ophiopogan, Iris and daylily.

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Table 1. Green Kyllinga control ratings with postemergence herbicides.

		% Control			
Treatment	Rate lb ai/A	3 WAIT [z]	11 WAIT	15 WAIT	41 WAIT
Sulfentrazone	0.25	83 ab [y]	18 bc	86 a	51 c
Sulfentrazone	0.5	86 ab	33 b	87 a	87 a
Sulfentrazone	0.75	94 a	32 b	90 a	96 a
Manage	0.03	66 c	90 a	90 a	80 ab
Manage	0.06	73 c	91 a	90 a	98 a
Manage	0.12	78 c	93 a	94 a	98 a
Image	0.5	46 d	31 b	34 c	79 ab
Basagran	1.0	17 e	2 c	48 b	57 bc

[z] WAIT = weeks after initial treatment. The first application was made on 8/29/95 and re treatments were applied 11/16/95.

[y] Control ratings were based on a scale of 0 to 100 with 0 = no control and 100 = complete shoot kill. Means followed by the same letter are not significantly different within columns according to LSD at P = 0.05.

Table 2. Ophiopogon, Iris, and Daylily injury from postemergence herbicides evaluated for Kyllinga control.

		% Injury					
		Ophiopogon		Iris		Daylily	
Treatment	Rate lb ai/A	3 WAIT[z]	41 WAIT	3 WAIT	41 WAIT	3 WAIT	41 WAIT
Sulfentrazone	0.25	24 a[y]	26 a	42 b	15 bc	89 a	12 d
Sulfentrazone	0.5	23 a	1 b	37 b	40 abc	91 a	34 c
Sulfentrazone	0.75	21 a	6 b	39 b	55 ab	95 a	65 b
Manage	0.03	7 c	8 b	45 b	65 a	41 c	100 a
Manage	0.06	6 c	9 b	37 b	55 ab	61 b	100 a
Manage	0.12	14 b	7 b	66 a	65 a	66 b	100 a
Image	0.5	5 c	5 b	6 c	0 c	12 d	7 d
Basagran	1.0	6 c	5 b	51 ab	15 bc	11 d	2 e

[z] Weeks after initial treatment. The first application was made on 8/29/95 and re treatments were applied 11/16/95.

[y] Control ratings were based on a scale of 0 to 100 with 0 = no control and 100 = complete foliage kill. Means followed by the same letter are not significantly different within columns according to LSD at P = 0.05.