SECTION 9
WEED CONTROL

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Hairy Bittercress *(Cardamine hirsuta)* Seed Production and Dispersal in the Propagation of Landscape Plants

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Nature of Work: Weeds are one of the biggest pest problems at commercial nurseries. The most common weed species found in North Carolina nurseries were oxalis, eclipta, prostrate and spotted spurge, hairy bittercress, purple and yellow nutsedge, bermudagrass and crabgrass (Cross and Skroch, 1992). Cloutier et al., 1991 reported bittercress, though a lesser known weed species in Quebec displayed great potential for rapid increase within nursery crop production.

Weeds in container-grown landscape plants can cause growth reductions and reduce marketability. The growth of Heller Japanese hollies in containers was reduced with only one redroot pigweed or large crabgrass plant present in the container (Fretz, 1972). Berchielli-Robertson et al. (1990) determined that lowgrowing species such as eclipta and prostrate spurge reduced dry shoot weight of 'Fashion' and Gumpo White Sport azaleas and 'Crimson Pigmy' barberry. Research has shown that bittercress does not affect the dry shoot weight of plants in containers, however, in poly propagation houses bittercress quickly grows taller than the cuttings in the propagation trays. The faster growing bittercress interferes with the cuttings receiving sunlight and could prevent the cuttings from achieving maximum root and shoot growth. This may be the most vulnerable time for weed competition.

Plastic propagation containers are commonly reused and media residue from previous crops may cling to the sides of the containers. The residue in used containers could contain some of these seeds to germinate during the next crop cycle. Wind and precipitation deposit weed seeds in media stored outdoors and also be a source of seed.

The objectives of this study were to (1) investigate seed number and dispersal from bittercress and (2) determine if residue in used containers is a source of weed seed and/or if weed seed contamination is from the media used during propagation.

Eight hairy bittercress plants were selected from a population occurring in a greenhouse at Clemson, SC. After five weeks, data were collected concerning silique development and dispersal. The total number of siliques were counted for each plant. The average number of seeds per silique was determined by averaging the number of seeds from ten siliques per plant. Seed was sown on the surface of growing medium. Dates of and percent emergence were recorded and expressed as inherent seed viability. Seed dispersal distance was determined by placing the plants in the middle of an eight foot by eight foot black plastic sheet. Black plastic was used to facilitate visibility of the seed. Siliques were manually triggered and dispersal distance of the seeds from the plant was measured.

The second phase was conducted at Carolina Nurseries, Moncks Corner, SC. Two inch containers with media residue were collected. These containers had a heavy hairy bittercress population during the previous propagation cycle. Half of the containers were rinsed with a pressure nozzle (clean) and the other hag the residue were not rinsed (dirty). Propagation media, 50% peat moss and 50% perlite, was sampled at the outdoor storage area from the top and bottom of the pile. The containers were placed into 18" square trays holding 64 containers. There were 16 replicates of each container media combination per tray. The trays were placed in the center of 4'x 4' square blocks on the gravel floor. The trays were placed in a randomized complete block design with six replications. Weed seed emergence was monitored for four weeks.

Results and Discussion: Though the bittercress plants were selected for uniformity, there were differences in the number of siliques produced by each plant. Afler five weeks, the average number of siliques per plant was 68 (Table 1); however, the number of siliques per plant ranged from 27 to 182. The average number of seeds per silique was 29 (Table 1). The total number of seeds ranged from 675 to 4980 per plant. This reflects the non-uniformity of weed seed production.

Bittercress seeds are dispersed by a spring-like action of the locule with the seed thrown to each side of the silique. The average seed dispersal distance was 19.7 in with a maximum distance of 42 in (Table 1). Germination of bittercress seeds was 90% after 13 days (Figure 1). Germination began after five days with no new germination after 13 days. Greatest germination rates occurred between 6 and 8 days after sowing. Presumably the other 10% of seeds were either not viable or more likely have a dormancy mechanism for later germination.

Emergence of bittercress from unwashed containers at Carolina Nurseries correlated with previous results. Bittercress began emerging within 7 days and all seedlings were within 1 cm of the edge of the container. This indicates the seed was in the media residue clinging to the container. There was no new bittercress emergence after 14 days. There was a difference between the number of weed seedlings emerging from the dirty compared to clean (rinsed) containers (Table 2). There were six times more bittercress seedlings in the unwashed containers compared to the washed containers. Use of new or cleaned containers is one method that could potentially reduce a large portion of bittercress emergence. There were no difference in weed seedlings from the media from different locations indicating that the media is not a significant source of bittercress seed. Cross and Skroch (1992) determined that sterilization of container media did not affect the number of weed seedlings found.

Bittercress has the potential to quickly become a problem in a nursery. Data from this study suggest that if one plant is allowed to produce seed, seed that has up to 90% viability, the potential for the emergence of over 2000 seedlings exists. Since bittercress can disperse seed up to 42 in, a few widely scattered plants could infest a large area in a matter of just a few weeks.

Hairy bittercress is a prolific seed producer and dispenses them efficiently in the propagation areas of nurseries. In trying to control the bittercress, the cycle of seed production must be interrupted. Once this is accomplished a program of bittercress prevention could be followed.

Significance to the Industry: Hairy bittercress is a nuisance weed which can produce great numbers of seed. To be able to control this weed, the cycle of seed production must be interrupted. By identifying the sources of weed seed in a propagation area, sanitation and management strategies can be designed for the control of hairy bittercress.

Literature Cited

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Table 1. Silique number per plant, seeds per silique and dispersal distance (in) for greenhouse grown hairy bittercress *(Cardamine hirsuta).*

	Mean	Standard Error
Silique	68.3	1 8.8
Seed/Silique	29	1.1
Dispersal Distance	19.7	4.6

Table 2. Hairy bittercress *(Cardamine hirsuta)* emergence by container and media treatment.

	Container Treatment		Media Treatment	
	Washed	Dirty	Top	Bottom
Seed Emergence	14	83	48	49

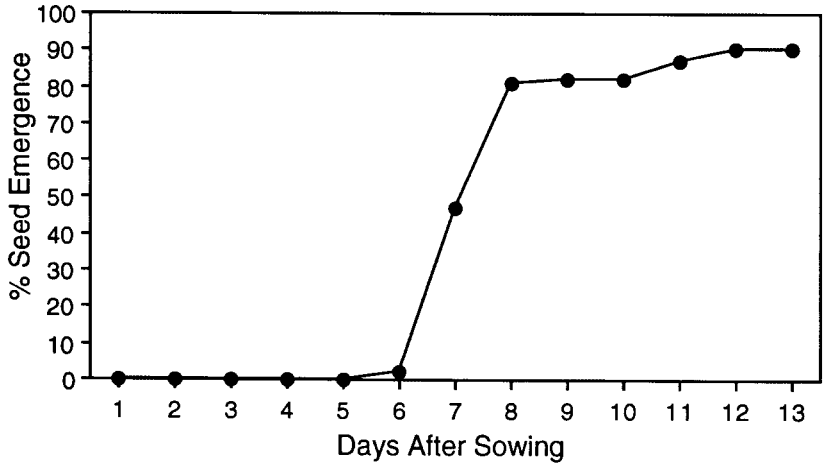

Figure 1. Emergence percentages of hairy bittercress (*Cardamine hirsuta*) seed 13 days after sowing.

Tolerance of Groundcovers to Preemergence Herbicides

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Nature of work: Weed control is an important management concern for producers of groundcovers. Herbicide use is one option for weed control in container nursery production. Limited information is available on the tolerance of groundcovers to herbicides. Ronstar did not affect growth of four groundcovers, while Barricade reduced root dry weight of common periwinkle (2). Ronstar injured liriope, and injury increased as herbicide rate increased (1). Gallery plus Surflan controlled a broad spectrum of weeds with excellent safety on most nursery crops tested (3)

A study was estabished to evaluate the tolerance of English ivy (Hedera helix), bronze ajuga (Ajuga reptans), green liriope (Liriope muscari), and periwinkle (Vinca minor) to selected preemergence herbicides. Plants were grown in one gallon containers using a 4:1 pine bark:sand medium and fertilized with a slow-release fertilizer (Osmocote 17-6-12 3-4 month plus minors). The granular products tested were: Snapshot 2.5TG, Stakeout 1G, Derby 5G, and Ronstar 2G. The sprayable formulations evaluated were: Snapshot 80DF, Surflan 4L, Gallery 75DF, Pendulum 60 WDG, Barricade 65 WG, and Predict 80DF. Both Snapshot formulations, Gallery, Surflan, Derby, and Stakeout were applied at their maximum use rate (or anticipated maximum use rate) and twice the maximum use rate. Other herbicides were applied at their maximum use rate. Sprayable herbicides were applied overtop nursery plants using a CO_2-pressurized backpack sprayer delivering 25 gallons per acre. Granular fromulations were applied using a shaker jar. Pots were treated on May 21, 1993 under sunny skies and 66 F air temperature. All treatments were reapplied on August 13, 1993 under cloudy skies and 91 F air temperature. Pots were irrigated one hour after both sets of herbicide applications. Groundcovers were evaluated visually during the course of the study. Stem blight in periwinkle may have affected the observed results. Groundcover shoot fresh weight was recorded October 5, 1993, which was approximately 2 months after the second herbicide application.

Results and Discussion: Ajuga was the most sensitive species to the herbicides tested. Both Snapshot formulations, Gallery, and the high rate of Derby visually injured ajuga. The 2X rate of Snapshot 80DF, Surflan, and Gallery visually injured the other three groundcovers. Pendulum, Stakeout, Barricade, and Ronstar caused little to no visible injury to the 4 groundcovers.

Snapshot 80DF, Surflan, Gallery, and the high rate of Stakeout reduced shoot fresh weight of English ivy, compared to untreated plants (Table 1). No other treatment reduced shoot weight in this species. Ronstar and Predict were the only treatments that did not reduce shoot weight of ajuga. Disease development in periwinkle limited the conclusions that can be drawn from this species, although a few treatments did appear to reduce growth of this plant. The 2X rate of Snapshot 80DF and Surflan were the only

treatments to reduce shoot weight in liriope. Lower application rates could increase the tolerance of these groundcovers to the treatments causing injury, while still maintaining effective weed control.

Significance to the industry: Groundcover species responded differently to the herbicide treatments. Ajuga was the most sensitive species of the four groundcovers and was injured by Gallery and the combination herbicides that contain the active ingredient in Gallery (Snapshot 2.5TG, Snapshot 80DF). Nurserymen must choose their herbicides based on both crop tolerance and weed control effectiveness.

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Table 1. Groundcover shoot fresh weight approximately two months after the second herbicide application.

		Shoot fresh weight per plant grams)			
Treatment	Rate (lb ai/A)	English ivy	Ajuga	Vinca	Green liriope
Untreated	-	69	163	12	95
Snapshot 2.5TG	5.0	51	70	14	86
Snapshot 2.5TG	10.0	52	38	14	94
Snapshot 80DF	4.0	26	77	8	93
Snapshot 80DF	8.0	28	30	7	55
Surflan 4L	4.0	43	74	3	68
Surflan 4L	8.0	35	49	5	40
Gallery 75DF	1.0	44	112	17	94
Gallery 75DF	2.0	25	39	5	88
Pendulum 60WDG	4.0	64	144	4	89
Derby 5G	5.0	58	95	23	79
Derby 5G	10.0	58	38	11	114
Stakeout 1G	1.0	59	92	11	100
Stakeout 1G	2.0	45	123	11	104
Barricade 65WG	0.75	70	112	13	84
Predict 80DF	2.4	51	140	12	102
Ronstar 2G	4.0	57	161	18	92
LSD (.05)		25	33	7	21

Weed Management in Ferns

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Nature of Work: Ferns are becoming popular as landscape plants and fern production is increasing in the nursery industry. Weeds are a major production problem particularly in overwintering houses. However, there is little information on the tolerance of container-grown ferns to the herbicides used for nursery weed control. Two studies were conducted to evaluate tolerance of fern species to preemergence herbicides and preemergence herbicides mixed with postemergence herbicides Sharpshooter or Roundup.

Experiment 1. Twelve fern species were evaluated for tolerance to preemergence herbicides. Nine species were in 3.8L gallon containers and four species were liners in 4" round containers. Each species were infested with hairy bittercress and were handweeded prior to treatment with preemergence herbicides. Granular formulations of Snapshot 2.5TG (3.75 and 7.5 lb ai/A) and OH2 (3 and 6 lb ai/A) were applied using a handshaker. Gallery (0.75 and 1.5 lb ai/A) was applied using a CO2 sprayer equipped with 8004 nozzles at 25 psi and a volume of 25 gpa. All treatments were applied on 17 Dec 93. Environmental conditions were 45F and overcast. Visual phytotoxicity determinations were made 14, 60, and 139 days after treatment (DAT). Treatments were arranged in a RCBD with 3 replications.

Fern species evaluated were grown in 50/50 peat/perlite media. Liners were planted in 3.8L containers for a minimum of 8 weeks or in 4" containers for 2 weeks. Species included:

Polystichum tsus-sinense	*Dryopteris felix-mas*	*Polystichum setiferum*
Polystichum acrostichoides	*Polystichum polyblenphernum*	*Dryopteris atrata*
Selaginella pallescens	*Dryopteris marginalis*	*Dryopteris erthyrosora*
Athryium nipponicum 'Pictum'	*Osmunda cinnamonea*	*Blechnum spicant*

Experiment 2. Handweeding is an expensive and labor intensive method of controlling weeds. Two species of fern, *Polystichum polyblenphenrum* (evergreen) and *Athyrium nipponicum* 'Pictum ' (deciduous), were selected having a heavy hairy bittercress population in the containers. Sharpshooter (20%) or Roundup (0.5 lb ai/A) were applied alone or tankmixed with two rates of Gallery (0.75 and 1.5 lb ai/A) using a CO2 sprayer equipped with 8004 nozzles at 25 psi and 25 gpa. Treatments were applied 22 Feb 94. Weed control and fern injury ratings were made 2, 8, and 42 DAT. Treatments were arranged in a RCBD with 3 replications.

Result and Discussion: Experiment 1. All herbicide formulations and rates were effective in controlling hairy bittercress. Herbicide injury was not evident until 139 DAT. *Selaginella pallescens, Athryium nipponicum* 'Pictum', and *Dryopteris erthyrosora* were not injured by any of the preemergence herbicides evaluated (Table 1). Snapshot

2.5TG caused severe injury to *Dryopteris atrata, Dryopteris felix-mas* (4"), *Polystichum setiferum* (4") at both rates and *Polystichum tsus-sinense* and *Blechnum spicant* at the high rate only. OH2 injured *Dryopteris atrata, Dryopteris felix-mas, Dryopteris marginalis,* and *Osmunda cinnamonea* at both rates.

Experiment 2. All Sharpshooter treatments removed hairy bittercress after two days, but Roundup effectiveness on hairy bittercress was inconclusive. At 42 DAT, Roundup caused significant damage to the *Polystichum polyblenphernum* while no damage was associated with the *Athyrium nipponicum* 'Pictum' which was still dormant at the time of treatment. Sharpshooter with or without Gallery did not injure *Polystichum polyblenphernum*. *Athryium nipponicum* 'Pictum' emergence was delayed from all treatments with Gallery.

Significance to the Industry: Gallery was the safest preemergence herbicide for fern species evaluated, however the timing of Gallery application is important. December application did not delay emergence whereas a February application delayed emergence of a deciduous fern species. Granular preemergence herbicides, Snapshot and OH2 injured several species of ferns evaluated, particularly the Dryopteris species, perhaps due to the granules remaining on the fronds.

Table 1. Ratings of herbicide injury on container-grown ferns 139 DAT.

Herbicide	Rate lb ai/A	Polystichum tsus-sinense	Polystichum acrostichoides	Selaginella palbscens 'Pidum'	Athryium nipponicum	Dryolperis atrata	Blechnum spicant	Dryopteris erlhyrosora	Dryolperis felix mas	Polystichum polyblen phenum
		1 gallon containers								
Snapshot	3.75	10	3.3	0	0	23.3	6.7	0	13.3	43.3
Snapshot	7.5	26.7	10	0	0	33.3	33.3	0	3.3	36.7
OH2	3	6.7	10	0	0	16.7	6.7	0	0	20
OH2	6	3.3	30	0	0	20	3.3	0	0	13.3
Control		0	0	0	0	0	0	0	0	0
Gallery	0.75	6.7	10	0	0	0	6.7	0	0	10
Gallery	1.5	0	6.7	0	0	0	6.7	0	0	3.3
LSD (0.05)		17.9	15.8	ns	ns	17.5	19.4	ns	8.5	17.9

Table 1. Ratings of herbicide injury on container-grown ferns 139 DAT.

Dryoptens	Dryopteris	Osmunda elix mas	Polyslichum marginalis	cinnamonea	setiferum
			4" containers		
Snapshot		90	16.7	16.7	53.3
Snapshot		100	20	26.7	46.7
OH2		76.7	10	60	3.3
OH2		33.3	16.7	50	16.3
Control		0	0	0	0
Gallery		30	3.3	10	6.7
Gallery		0	0	33.3	10
LSD (0.05)		54.4	29.6	49.5	18.3

New Preemergence Herbicides and Herbicide Combinations for Use in Field-Grown Woody Ornamentals

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Nature of Work: Several promising preemergence herbicides are now under evaluation for use in agronomic and ornamental cropping systems. Sulfentrazone (FMC 6285) is a newly developed herbicide which selectively controls yellow nutsedge and morninglories as well as broadleaf and annual grass weeds. Sulfentrazone controls weeds through the process of membrane disruption by the inhibition of protoporphyrinogen oxidase in the chlorophyll biosynthetic pathway, leading to the build-up of toxic intermediates in susceptible species (FMC bulletin, 1994). Plants emerging from soils treated with sulfentrazone turn necrotic and die shortly after light exposure. Foliar contact with sulfentrazone also results in desiccation and necrosis of exposed plant tissues in susceptible species. FMC is exploring the possibility for product development of this herbicide in turf and ornamental

Norflurazon (Predict, Sandoz Inc.) is a preemergence herbicide labelled for use in field grown nursery stock and non-cropland areas as well as cotton. Predict controls many annual broadleaf weeds including ragweed, lambsquarters, purslane and plantain (Sandoz bulletin, 1994). Many species of annual and perennial grasses are also controlled. Predict is labelled for use only on established plantings in finer textured soils. Sandoz is investigating the use of Predict on other ornamental species at this time. Predict is an inhibitor of carotenoid biosynthesis in higher plant systems.

Research was conducted to evaluate the efficacy of sulfentrazone and norflurazone in combination with other labelled products for preemergence weed control in nursery crops. The evaluation was initiated in 1994 with herbicide application occurring annually in May. Herbicides evaluated (Table 1) included F6285 (sulfentrazone) in combination with Dimension, Goal, Snapshot, Gallery, Pennant and Predict. Predict (norflurazon) was evaluated by itself and in combination with Gallery and Barricade.

During April 1992, plots measuring 1800 sq. ft. were planted with ten tree and shrub species, using 3 plants of each species per plot. Each treatment was replicated three times. All treatments in the F6285 (sulfentrazone) experiment included the following plant materials: *Liriope muscari 'Variegata', Juniperus horizontalis* 'Bar Harbor', *Buxus sempirvirens, Taxus media* 'Hicksii', *Euonymus alata* 'Compacta', *Virbumum* 'Mohawk', *Ilex decidua, Malus* X 'Indian Summer', *Acer rubrum, Quercus muehlenbergii,* and *Cercidiphyllum japonicum.* Treatments in the Predict experiment included the following: *Malus* (several cultivars), *Quercus imbricaria, Quercus coccinea, Sorbus* 'Blackhawk', and *Prunus autumnalis.* Application was made with a CO_2 pressurized backpack sprayer calibrated to 26 gallons per acre using 8004 nozzles at 28 lbs. psi at the boom.

Results and DIscussion: Weed control ratings are reported for evaluations 4 and 8 weeks after herbicide treatment (WAT) for the F6285 herbicide combination experiment and 4 WAT for the Predict experiment. Weeds encountered in both experiments included ivyleaf and tall morningglory, honeyvine milkweed, yellow nutsedge, large crabgrass, johnsongrass, and Carolina horsenettle. Combinations of F6285 (0.33 lbs. aVA) with Gallery (0.5 lbs. ai/A), Pennant (3.0 lbs. ai/A) or Snapshot (2.0 lb. ai/A) provided superior (> 90%) control of morningglory, honeyvine milkweed, and yellow nutsedge at 4 WAT (Table 2.). Weed control provided by these treatments averaged 85% or greater at 8 WAT (Table 3). The combination of F6285 plus Dimension provided poorest overall control (41.7%), with less than 20% control of morningglory and honeyvine milkweed at 8 WAT. It was difficult to determine if herbicide antagonism was occurring in this treatment. F6285 plus Predict or Goal gave moderate control overall, with poor (40-78%) control of honeyvine milkweed and yellow nutsedge in both treatments (Tables 2 and 3). Limited phytotoxicity in ornamentals was observed 4 WAT with F6285 combinations(data not presented). Slight necrosis was noted in viburnum and deciduous holly, with injury greatest in the F6285 plus Pennant combination. Injury was not evident 8 WAT. Significant chlorosis in burning bush treated with F6285 plus Dimension was noted 4 WAT. Chlorosis was minimal after 8 weeks. No injury was observed in other ornamental species evaluated. Injury with F6285 may potentially be minimized by avoiding contact with newly emerged foliage of sensitive trees and shrubs. Weed control provided by Predict at 2.4 or 4.8 lbs ai/acre or Predict plus Gallery or Barricade was limited, with poor control of morningglory species, honeyvine milkweed and johnsongrass observed (Table *2).* Dry conditions following application may have minimized herbicide efficacy. No phytotoxicity to ornamentals was observed in any Predict treatments 4 WAT.

Significance to Industry: *F6285 is* a newly developed preemergence herbicide with potential for use in fieldgrown ornamentals and turf. The dry flowable formulation of *F6285* at 0.5 lbs. ai/A gave excellent season-long weed control in 1993 and effectively controlled yellow nutsedge, morningglory spp. and honeyvine milkweed. At lower use rates (0.33 lbs. ai/A) in combination with other preemergence herbicides, the combinations of *F6285* plus Pennant or Gallery provided superior season-long weed control in 1994. Predict is also newly labelled in ornamentals and when used alone or in combination with Barricade, provides moderate control of annual broadleafs and grasses and limited control of morningglory spp., honeyvine milkweed and seedling johnsongrass.

Table 1: Herbicide Applications and Manufactures

TREATMENTS	CHEMICAL	RATE (lbs/A)	MANUFACTURERS
1. F6285 75DF + Dimension 1EC	sulfentrazone dithiopyr	0.33 0.33	FMC Monsanto
2. F6285 75DF + Goal 1.6E	sulfentrazone oxyfluorfen	0.33 0.50	FMC Rohm and Haas Co.
3. F6285 75DF + Snapshot 80DF	sulfentrazone isoxaben 20%, oryzalin 60%	0.33 2.00	FMC Dow-Elanco Co.
4. F6285 75DF + Gallery 75WG	sulfentrazone isoxaben	0.33 0.50	FMC Dow-Elanco Co.
5. F6285 75DF + Pennant 7.8L	sulfentrazone metolachlor	0.33 3.00	FMC Ciba-Geigy Coop.
6. F6285 75DF + Predict 80WG	sulfentrazone norflurazon	0.33 2.40	FMC Sandoz Agro, Inc.
7. Predict 80WG	norflurazon	2.40	Sandoz Agro, Inc.
8. Predict 80 WG	norflurazon	4.80	Sandoz Agro, Inc.
9. Predict 80 WG + Gallery 75DF	norflurazon isoxaben	2.40 0.75	Sandoz Agro, Inc. Dow-Elanco Co.
10. Predict 80WG + Barricade 65WG	norflurazon prodiamine	2.00 2.00	Sandoz Agro, Inc. Sandoz Agro, Inc.
11. Untreated Check		0	

Table 2: Herbicide Treatments and Weed Control Ratings, 30 Days After Treatment

TREATMENTS	RATE (lbs/A)	MORNINGGLORY	CAROLINA HORSENETTLE	GRASSES	HONEYVINE MILKWEED	YELLOW NUTSEDGE	OVERALL
1. F6285 75DF + Dimension 1EC	0.33 0.33	86.7 b	-----	13.3 a	0 c	86.7 ab	79.7 b
2. F6285 75DF + Goal 1.6E	0.33 0.50	98.3 a	-----	63.3 a	6.7 c	70.0 bc	84.0 b
3. F6285 75DF + Snapshot 80DF	0.33 2.00	100.0 a	-----	60.0 a	41.7 abc	85.0 ab	90.7 a
4. F6285 75DF + Gallery 75WG	0.33 0.50	100.0 a	-----	40.0 a	69.3 ab	83.3 ab	92.3 a
5. F6285 75DF + Pennant 7.8L	0.33 3.00	100.0 a	-----	63.3 a	78.3 a	100.0 a	95.7 a
6. F6285 75DF + Predict 80WG	0.33 2.40	100.0 a	-----	26.7 a	16.7 bc	60.0 c	82.3 b
7. *F6285DF	0.05	99.3	-----	98.3	100.0	99.0	89.0
Significance		NS	-----	NS	*	*	<.001
LSD 0.05		11.14	-----	60.49	52.96	21.97	5.66
8. Predict 80WG	2.40	23.3 a	65.0 a	70.0 a	63.3 a	-----	71.7 a
9. Predict 80WG	4.80	26.7 a	73.3 a	57.7 a	63.3 a	-----	66.7 a
10. Predict 80WG + Gallery 75DF	2.40 0.75	16.7 a	83.3 a	65.0 a	53.3 a	-----	70.0 a
11. Predict 80WG + Barricade 67WG	2.00 2.00	20.0 a	80.0 a	40.0 ab	76.7 a	-----	70.0 a
12. Untreated Check	0	0 b	0 b	0 b	0 b	-----	0 b
Significance		NS	**	*	*	-----	<.001
LSD 0.05		31.13	29.84	45.32	37.38	----	8.15

*This data was collected from a previous experiment conducted in 1993 and was included for comparative purposes only.

Table 3: Herbicide Treatments and Weed Control Ratings, 60 Days After Treatment

TREATMENTS	RATE (lbs/A)	MORNINGGLORY	CAROLINA HORSENETTLE	GRASSES	HONEYVINE MILKWEED	YELLOW NUTSEDGE	OVERALL
1. F6285 75DF + Dimension 1EC	0.33 0.33	10.0 b	76.7 a	87.7 b	16.7 c	70.0 a	41.7 b
2. F6285 75DF + Goal 1.6E	0.33 0.50	90.7 a	91.7 a	95.0 a	50.0 bc	78.3 a	84.3 ab
3. F6285 75DF + Snapshot 80DF	0.33 2.00	93.0 a	88.3 a	96.0 a	68.3 ab	97.7 a	85.0 ab
4. F6285 75DF + Gallery 75WG	0.33 0.50	96.3 a	93.3 a	98.3 a	91.7 a	88.3 a	93.0 a
5. F6285 75DF + Pennant 7.8L	0.33 3.00	94.7 a	85.0 a	97.7 a	78.3 ab	96.0 a	89.7 a
6. F6285 75DF + Predict 80WG	0.33 2.40	87.7 a	86.7 a	97.3 a	40.0 bc	68.3 a	72.7 b
7. *F6285DF	0.05	79.0	96.7	91.0	69.3	96.7	87.0
Significance		<.001	NS	<.001	*	NS	<.001
LSD 0.05		14.14	22.26	3.56	40.60	32.7	13.08

*This data was collected from a previous experiment conducted in 1993 and was included for comparative purposes only.

Phytotoxicity of Prism® on four container grown woody ornamentals

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Mississippi

Nature of Work: A study was conducted to determine the phytotoxicity potential of the postemergence grass herbicide Prism® to four ornamentals growing in containers. The study consisted of a completely randomized design with three replications. The study was conducted at Barton's Nursery, Lucedale, MS. The following herbicides and rates were used: Prism® applied at .125 #ai/A and .250 #ai/A, and Fusilade 2000® applied at .370 #ai/A. Each herbicide application included a .25 %v/v of Ortho X-77® Spreader Sticker. Prism® (clethodim) was developed by Valent U.S.A. Corporation for postemergence control of grassy weeds. Fusilade 2000® (fluazifop-P-butyl) manufactured by Zeneca is registered for use over-the-top of many woody and herbaceous ornamentals for postemergence control of grassy weeds. The following four plant species were treated October 1, 1993 at Barton's Nursery with a CO_2, plot sprayer: dwarf burford holly (Ilex cornuta 'Burfordii nana'), dwarf yaupon (Ilex vomltoria 'Nana'), wintergreen boxwood (Buxus microphvlla 'Winter Green'), and dwarf mondo (Ophiopogen japonicus 'Nana'). The plants were transplanted into trade gallon containers approximately one year before treatment. Injury and weed control ratings were taken at 7 DAT, 14 DAT, 21 DAT, and 28 DAT.

Results and Discussion: None of the herbicide treatments resulted in phytotoxicity to any of the ornamentals. Since there was no grass present in the containers percent grassy weed control could not be measured.

Weed control is a primary concern to most nurserymen. Chemical weed control in containers offer a special challenge because of the small volume of soil coupled with the high concentration of crop roots. Environmental concerns continue to be a primary concern to all producers. Worker safety seems to be the number one issue of the '90's with federal and state regulatory agencies publicizing their regulatory intent.

Significance to Industry: As ecological changes and resistant to various herbicides occur, the search of different chemistry must be sought. Screening for crop safety should be the first step of every grower before introducing a new pesticide into his program. Search should continue to develop and release environmentally friendly pesticides.

White Clover Control in Wildflower Meadows

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Nature of Work: Encroachment of weeds into established wildflower beds continues to be the major nemesis of wildflower plantings for low maintenance landscapes. Managing the natural succession of plant taxa in ornamental plantings can extend and enhance the desired aesthetics of wildflower beds which contain perennial and/or reseeding annual flower species. Recent research (1, 2, 3) has indicated that several herbicides exhibit differential activity across plant species. Since many wildflower plantings are comprised of several species which combine to give extended bloom periods, weed control by herbicides which exhibit selectivity toward families of dicots can be effective in weed management strategies.

During the winter of 1991-1992, encroachment of white clover, *Trifolium repent* began to seriously dominate wildflower beds previously seeded with a typical southeastern mix. This site was used to test the effectiveness of two herbicides for reclamation of desired wildflower species. In late winter, two rates of Drive (Quinclorac, BASI;) and Campaign (glyphosate + 2,4-D. Monsanto) were applied to test plots. Data on wildflower species performance and white clover suppression were taken in April and June.

Results and Discussion: Campaign failed to control white clover and caused temporary phytotoxicity on all perennial wildflower species. Drive at 1/2X rate temporarily suppressed clover and resulted in the best wildflower color displays. At X rate (1 lb./ac.) Drive controlled white clover with temporary phytotoxicity on lanceleaf coreopsis, California poppy, and gaillardia. White Barrow, cornflower and blackeye Susan were not affected visually by either rate of Drive.

Significance to Industry: Selective use of herbicides can be an effective management tool for weed control in wildflowers. Control of broadleaf weeds may be accomplished in part by choosing an herbicide with high activity on weed taxa while showing little activity on desired wildflower species. Using this weed management option, renovation of weed infested wildflower beds can often be delayed by several years.

Literature Cited

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