Chapter 3. REDUCING BERMUDAGRASS CONTAMINATION IN TALL FESCUE TURFGRASS STANDS

Abstract: Field studies were conducted to evaluate the effects of fenoxaprop and fluazifop on turfgrass tolerance and for bermudagrass control in tall fescue. Test sites were constructed containing six different bermudagrass cultivars randomized within an established tall fescue stand, thereby allowing for comparisons between herbicides and bermudagrass cultivars. No herbicides are available for selective control of bermudagrass in tall fescue. In order to achieve the goal of bermudagrass removal, a non-selective herbicide must be used prior to complete renovation of the area. A premix of fenoxaprop plus fluazifop is currently under evaluation for selective control of bermudagrass in cool-season turfgrasses. Two years of field studies were conducted to determine bermudagrass and tall fescue susceptibility to fenoxaprop and fluazifop. Fenoxaprop and fluazifop when applied alone suppressed bermudagrass; however, regrowth via rhizomes occurred within 21 days after treatment (DAT). Lack of rhizome control and/or suppression was evident with control ratings of 87% in Tifgreen, 95% in Navy Blue and 88% in Midiron four weeks after the third application of 1.18 kg ai/ha fenoxaprop followed by ratings of only 20%, 23% and 13%, respectively, six weeks after the third application. The premix of fenoxaprop plus fluazifop proved more effective for control of bermudagrass and significantly suppressed rhizomes at lower rates than sequential applications of either herbicide alone. Control ratings of 78% in Tifgreen, 91% in Navy Blue and 86% in Midiron were observed six weeks after the third application of the premix at 0.20 kg ai/ha. These control levels were substantially greater than those observed for the 1.18 kg ai/ha rate of fenoxaprop, with only minimal tall fescue injury. Periods of drought stress appeared to decrease the efficacy of both fenoxaprop and fluazifop.

Nomenclature: Bermudagrass (*Cynodon dactylon* (L.) Pers. 'Tifway', 'Tifgreen I', 'Vamont', 'Brute', 'Navy Blue' and 'Midiron'; tall fescue *(Festuca arundinaceae* Schreb.'Confederate'); fenoxaprop [2-[4-(6-chloro-2-benzoxazobyl] oxy]phenoxy] propanoate]; fluazifop [2-[4-(5 trifluromethyl-2-pyridinyl)oxy] phenoxy]propionate]; chlorthalonil [tetrachloroisophthalonitrile]; brown patch (*Rhizoctonia solani* Kuhn); dollar spot *(Sclerotinia homeocarpa* F.T. Bennet);

3.1. INTRODUCTION

Bermudagrass (*Cynodon dactylon* (L.) *Pers.)* is considered to be one of the most difficult to control weeds in the world (10). It causes severe economic losses in both agronomic and horticultural crops (2, 3, 5, 6, 7, 9, 10, 11, 13, 14). Bermudagrass infestation and/or contamination are a significant problem due to the weed's vigorous growth habit and ability to survive in diverse conditions. When the desired turfgrass is injured or dormant, bermudagrass populations can increase enormously. Currently, no selective herbicides are commercially available for bermudagrass control in cool-season turfgrasses (3, 4, 7). If control can not be attained, bermudagrass suppression for extended periods without significantly injuring other turfgrasses would be desirable. In this scenario, the desirable turfgrass could grow into and compete with bermudagrass. Problems with cross contamination occur in transition zones where both warm- and cool-season turfgrasses are grown in close proximity. In addition, infestations of multiple cultivars of bermudagrass cause significant economic losses on sod farms and recreational turf areas throughout the U.S (2, 7, 13). Areas with contamination can generally not be harvested or used in high profile areas such as golf course putting greens.

A premix of fenoxaprop [2-[4-(6-chloro-2-benzoxazoxyl]oxy]phenoxy]propanoate] plus fluazifop [2-[4-(5 trifluromethyl-2-pyridinyl)oxy] phenoxy]propionate] is used to control perennial weeds such as dallisgrass and johnsongrass in both agronomic and horticultural crops. In preliminary studies with this premix, safety to tall fescue as well as excellent control of various bermudagrass cultivars was attained (1).

The objectives of this research were two fold. First, field tests were performed to determine the susceptibility of various bermudagrass cultivars to the premix formulation of fenoxaprop plus fluazifop. Second**,** field tests were conducted to determine tall fescue susceptibility to this formulation.

3.2. MATERIALS AND METHODS

Field studies were conducted in Blacksburg, VA in 1994 and 1995 to determine the effect of fenoxaprop and fluazifop applications on six bermudagrass cultivars and on tall fescue. Blacksburg, 640m above sea level, is well suited for growing cool-season turfgrasses. Difficulties were encountered in locating test sites containing all of the bermudagrass cultivars under similar climatic and edaphic conditions. For this reason, two test sites containing polystands of six different bermudagrass cultivars and tall fescue were constructed. The bermudagrass *Cynodon dactylon* (L.) *Pers*. cultivars were 'Tifgreen', 'Tifway', 'Vamont', 'Brute', 'Navy Blue', and 'Midiron'. 'Tifway', 'Tifgreen', 'Brute', 'Navy Blue', and 'Vamont' cultivars were harvested from Virginia Turf Farms in Baskerville, VA[1] in one square foot sections and the 'Midiron' was harvested from the Virginia Tech Turfgrass Research Center (VTTRC) in Blacksburg, VA. All were transplanted into the tall fescue sites. Prior to transplanting the bermudagrass a 20 cm diameter circle of tall fescue was killed with paraquat (1', 1'-dimethyl-4,4'-bipyridinium ion) to facilitate new lateral growth from bermudagrass until herbicide applications were initiated.

The first site was a highway rights-of-way along U.S. 460 West in Blacksburg which consisted of Kentucky 31 tall fescue. The other site was located at the VTTRC and consisted of Rebel Jr.and Rebel II turf type tall fescue.

Chemical treatments were applied to 3.6 m x 3.6 m plots with a CO_2 bicycle plot sprayer[2] using 8004 flat fan nozzle tips[3] and a pressure of 210 kPa to apply 280 L/ha. Herbicide rates were selected by reviewing previous research studies regarding fenoxaprop and fluazifop on tall fescue and bermudagrass and consisted of sequential applications of fenoxaprop at 0.40, 0.80, 1.18 kg ai/ha, fluazifop at 0.20 kg ai/ha and the mixtures of fenoxaprop and fluazifop at 0.025+0.075, 0.05+0.15, and 0.10+0.30 kg ai/ha,

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[1] Virginia Turf Farms Inc., Route 1 Box 140, Baskersville, VA 23915

[2] R & D Sprayers Inc., 790 E. Natchez Blve., Opelousas, LA 70570

[3] Spraying Systems Co., North Ave., Wheaton, IL 60187-7900

respectively. All chemical treatments were applied with 0.25% v/v nonionic surfactant[4].

The test located on the roadside was initially treated on July 20, 1994 with an additional application on August 17, 1994. The test located at the VTTRC was initially treated on June 17, 1995 with sequential applications on July 15 and August 12.

Seasonal rainfall is present in Tables 3.1 and 3.2. In 1994, drought occurred throughout the growing season, significantly reducing the levels of bermudagrass control with fenoxaprop and fluazifop on the non-irrigated roadside test site. This substantiated the hypothesis of researchers that moisture stress reduces the effectiveness of fenoxaprop and other aryl propanoic acids (12).

The test site at VTTRC was irrigated daily unless rainfall occurred; however, the roadside test proved difficult to irrigate due to the extreme drought and increased evapotranspiration from test site. The turfgrasses were mowed weekly at 3.8 cm during the study period. A mixture of 2,4-D at 0.6 kg ai/ha and dicamba at 0.3 kg ai/ha was applied in June of both years to control broadleaf weeds. Trinexapac, [4-(cyclopropyl-1-hydroxy-methylene)-3,5-dioxo-cyclohexa neccarboxylic acid ethyl] at 0.37 kg ai/ha was applied in May and June of each year to suppress vertical growth of the tall fescue. The roadside test was a Groseclose-Urban land complex (Clayey, mixed, mesic type Hapludults) with a pH of 6.7 and an organic matter content of 1.7 %. The VTTRC sites were a Groseclose-Poplimento-Duffield with a pH of 7.1 and an organic matter content of 4.0%.

Experiments were established as randomized complete block split plot design with herbicide rates as main plots with bermudagrass cultivars as subplots. Cultivars were maintained in a fixed order in each main plot to simplify the establishment process. Three replications of the main chemical plots were utilized in these experiments.

Visual estimates of bermudagrass control, injury, and percent cover, and tall fescue injury were conducted on the first treatment date and continued on biweekly intervals until eight weeks after the third herbicide treatment was applied. Each plot was rated as a direct comparison to the control plot in the same replication.

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[4] Kinetic, Helena Chem. Co., 6075 Popular Ave., Memphis, TN 38119. Organosilicon and nonionic surfactant.

Turf injury was rated on a 0 to 10 scale. The numeric values indicate the following:

0	no apparent injury to turfgrass
1 to 3	slight injury, acceptable color, very little discoloration
4 to 6	definite turfgrass injury, noticeable discoloration
7 to 9	unacceptable injury to serious injury, necrosis
10	dead and brown turfgrass

Bermudagrass control was rated on a 0 to 100 scale. The numeric values indicate the following:

0	no apparent response
10 to 30	slight control or injury, slight yellowing
40 to 60	poor to fair control, number of green shoots minimally reduced
70 to 80	fair to good control, number of green shoots moderately reduced
80 to 90	good weed control, number of green shoots severely reduced
90 to 95	excellent weed control, 90 to 95% green shoot reduction
97 to 99	excellent weed control, 97 to 99% green shoot reduction
100	complete control of targeted weed

Bermudagrass percent cover is rated as a percentage of actively growing or green bermudagrass in the plot being observed.

Data were subjected to analysis of variance and means were separated using Duncan's new multiple range tests at the 0.05 significance level.

3.3. RESULTS AND DISCUSSION

The central purpose or objective of this research was not solely to evaluate measures to suppress bermudagrass cultivars, but rather to selectively suppress them in tall fescue stands. Furthermore, our objectives were to determine differences among bermudagrass cultivars in susceptibility to herbicide treatments. Therefore, treatments that suppress bermudagrass cultivars without significantly injuring the desirable turfgrass could be utilized to selectively control bermudagrass. Herbicide treatments that significantly injure both the bermudagrass and the desirable turfgrass would not be considered acceptable to use for selective control.

In the 1994 roadside test, bermudagrass control levels were below 30% for all cultivars within four weeks after both initial and sequential fenoxaprop applications regardless of the rate (Tables 3.9 and 3.11). Fluazifop at 0.20 kg ai/ha displayed 50-75% control four weeks after application among all cultivars. Bermudagrass control was low for the 0.10 and 0.20 kg ai/ha rates of the combination treatment four weeks after application when over 90% control was exhibited at the two weeks after treatment ratings. The combination treatment at 0.40 kg ai/ha rate displayed over 70% control on all cultivars except Midiron.

In the1995 test at Virginia Tech Turfgrass Research Center (VTTRC), bermudagrass control results for the initial application were very similar to those of 1994; however, control ratings at four and five weeks after application were higher at all treatment levels at the four week ratings (Tables 3.5 and 3.6). Substantial regrowth of bermudagrass occurred by the week six rating (Table 3.7) in the fenoxaprop treatment and the 0.10 kg ai/ha rate of the combination treatment. The 0.20 and 0.40 kg ai/ha displayed over 85% control over six weeks after application.

Bermudagrass control levels with fluazifop and fenoxaprop in the roadside-experiment in which moisture stress occurred varied greatly from those achieved under non moisture stress conditions (Tables 3.4 and Table 3.11) and recovery was much quicker in roadside-experiment. Tifway at the 0.20 kg ai/ha rate was controlled at a level of 93% four weeks after second application in 1995 with adequate moisture while only 37% control was observed five weeks after the third application in 1994. Midiron control at the 0.40 kg ai/ha of the mixture was 100% during 1995 in comparison to 27% in 1994. These differences are quite possibly related to differential herbicide metabolism or uptake rates as a function of moisture stress.

Differences were also observed in tolerance levels among the various cultivars. Vamont bermudagrass displayed a delayed response to chemical application relative to the other cultivars. A longer period was required before visual symptoms of injury could be observed; however, the recovery from treatment was also delayed relative to that of the other cultivars (Table 3.4). Tifgreen was more tolerant with respect to lower application rates of the mixture and exhibited 10% control at .10 kg ai/ha rate in comparison to 65% control in Tifway at six weeks after treatment (Table 3.7). Brute and Navy Blue both seemed to display greater tolerance to lower levels of fenoxaprop and fluazifop as observed in the control levels observed at four weeks after the second application (Table 3.4). However, the higher application rates (i.e. 0.20 and 0.40 kg/ha) caused levels of injury equal to those observed in the other cultivars.

Injury to tall fescue: Fenoxaprop was safe on tall fescue; however, the rates evaluated did not significantly suppress bermudagrass for an extended period of time. Fluazifop at 0.20 kg ai/ha produced moderate injury levels with no visible injury four weeks after the second application. The premix containing fenoxaprop plus fluazifop produced an injury level of 5.0 at the 0.40 kg ai/ha rate. Moreover, fluazifop alone at 0.20 kg ai/ha produced statistically equal injury levels to that of the 0.40kg ai/ha rate of the mixture which includes a 0.30 kg ai/ha rate of fluazifop at the 0.40 kg ai/ha rate of the mixture (Table 3.12 and 3.13).

Table 3.1.

Precipitaion Data 1994 and 1995 for Blacksburg, Virginia

	mm precipitation	
Feb	85.09	43.94
March	132.08	39.88
April	86.87	18.03
May	32.51	90.06
June	107.68	198.13
July	135.88	70.61
August	107.70	29.93
September	12.44	62.73

Table 3.2.

Precipitation data in 1994 and 1995 for Blacksburg, Virginia

	Days of precipitation <0.25 mm	
Feb	10	7
March	14	7
April	11	6
May	8	14
June	12	16
July	11	6
August	7	4
September	4	9

Table 3.3

Bermudagrass control (0-100) ratings for two weeks after second application in Blacksburg during 1995[a]

Cultivar		kg ai/ha						
	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		45Bc[bc]	91Aa	97Aa	99Aa	90Aa	95Aa	100Aa
Tifway		58Bb	95Aa	98Aa	98Aa	92Aa	98Aa	99Aa
Vamont		94Aa	98Aa	98Aa	98Aa	96Aa	100Aa	100Aa
Brute		68Cc	96Aa	96Aa	93ABa	82Bb	99Aa	100Aa
Navy Blue		30Dd	87Bb	95Aa	83Bb	70Cc	99Aa	100Aa
Midiron		22Ed	50Cc	92Aa	82Bb	77Cb	95Aa	100Aa

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.4.

Bermudagrass control (0-100) ratings for four weeks after second application in Blacksburg during 1995[a]

		kg ai/ha						
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		0Bb[bc]	7Bc	13Cc	88Aa	25Cb	87Aa	97Aa
Tifway		0Bb	5Bd	5Cd	72Bb	40Bc	93Aa	100Aa
Vamont		30Ac	28Ac	58Ab	93Aa	53Ab	90Aa	99Aa
Brute		0Bb	10Bd	13Cd	75Bb	27Cc	92Aa	98Aa
Navy Blue		2Bd	7Bd	27Bc	87Ab	13CDd	93Aa	99Aa
Midiron		8Bd	25Ac	58Ab	91Aa	23CDc	63Bb	100Aa

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.5.

Bermudagrass control (0-100) ratings for two weeks after third application in Blacksburg during 1995[a]

		------------------			kg ai/ha			------------------
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		47ABd[bc]	48ABd	62ABc	90Ab	55Bcd	95Aa	100Aa
Tifway		23Cf	45Be	68ABc	88Ab	52Bd	97Aa	100Aa
Vamont		30BCd	28Ce	58Bc	98Ab	83Ab	97Aa	100Aa
Brute		55Ab	33Cc	58Bb	96Aa	57Bb	96Aa	98Aa
Navy Blue		38Bc	58Ab	67ABb	95Aa	60Bb	92Aa	100Aa
Midiron		53Ac	57Ac	70Ab	95Aa	38Cd	92Aa	67Bb

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.6.

Bermudagrass control (0-100) ratings for four weeks after third application in Blacksburg during 1995[a]

		---------- kg ai/ha ----------						
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		82Ac[bc]	67Bd	87Bbc	93Bb	93Ab	100Aa	100Aa
Tifway		68Bc	67Bc	93ABb	99Aa	93Ab	97Aa	100Aa
Vamont		83Ac	89Ab	96Aa	98Aa	92Ab	99Aa	100Aa
Brute		50Dc	53Cc	96Aa	98Aa	85Bb	98Aa	100Aa
Navy Blue		62Cd	68Bc	95Aa	100Aa	89Ab	99Aa	100Aa
Midiron		58Cd	65Bc	88Bb	98Aa	90ABb	99Aa	100Aa

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.7.

Bermudagrass control (0-100) ratings for six weeks after third application in Blacksburg during 1995[a]

		---- kg ai/ha ----						
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		3Be[bc]	7Be	20Cd	87Bb	10De	78Cc	100Aa
Tifway		0Bc	0Bc	65Ab	98Aab	65Ab	99Aa	78Bb
Vamont		27Ac	20Ac	73Ab	97Aa	27Cc	92ABa	100Aa
Brute		0Be	7Be	53Bc	95ABa	45Bd	85BCb	99Aa
Navy Blue		0Bc	3Bc	23Cb	93Ba	20Cb	91ABa	98Aa
Midiron		3Bd	0Bd	13Dc	78Cb	0Ed	86Bab	95Aa

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.8.

Bermudagrass control (0-100) ratings for two weeks after initial application in Blacksburg during 1994[a]

		kg ai/ha					
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		30Ef[bc]	50Ce	83BCb	100Aa	60Ad	47De	77Cc
Tifway		50Ce	63Bd	83BCb	100Aa	63Ad	63Cd	70Dc
Vamont		73Ac	83Ab	87Bab	83Bb	60Ad	73Bc	93ABa
Brute		63Bd	77Ac	100Aa	100Aa	57ABe	67BCd	90Bb
Navy Blue		40Df	50Ce	80Cb	100Aa	60Ad	67BCc	97Aa
Midiron		33Ed	67Bc	77Cb	88Ba	53Bc	83Aa	27Ee

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.9.

Bermudagrass control (0-100) ratings for four weeks after initial application in Blacksburg during 1994[a]

		kg ai/ha						
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		0Be[bc]	0Be	30Bc	63Ab	0Ce	17Cd	77Aa
Tifway		0Bd	0Bd	20Cc	50Bb	27Ac	17Cc	70Aa
Vamont		17Ac	13Ac	33Bb	50Ba	10Bc	27ABb	57Ba
Brute		0Bd	0Bd	50Ab	60Abb	0Cd	30Ac	73Aa
Navy Blue		0Bd	0Bd	17Cc	60ABa	20ABc	20ABc	40Cb
Midiron		0Bd	0Bd	0Dd	33Cb	0Cd	17Cc	50BCa

a All treatments contained 0.25 % v/v non-ionic surfactant
b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test
c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.10.

Bermudagrass control (0-100) ratings for two weeks after second application in Blacksburg during 1994[a]

		kg ai/ha						
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		47Ac[bc]	47ABc	77Ab	100Aa	73Ab	90Aa	100Aa
Tifway		47Ac	50Ac	70Ab	100Aa	70Ab	93Aa	100Aa
Vamont		33Bd	37Bcd	50Cc	100Aa	77Ab	90Aa	100Aa
Brute		30Be	43ABd	67Bc	100Aa	70Ab	87Ab	100Aa
Navy Blue		37Abd	37BCd	70ABc	100Aa	70Ac	87Ab	100Aa
Midiron		0Ce	27Cd	37Dd	80Bb	50Bc	73Bb	100Aa

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.11.

Bermudagrass control (0-100) ratings for five weeks after second application in Blacksburg during 1994[a]

		----- kg ai/ha -----						
Cultivar	Fenoxaprop	0.4	0.8	1.18		0.025 +	0.05 +	0.1 +
	Fluazifop				0.2	0.075	0.15	0.3
Tifgreen		0Cd[bc]	0Cd	20Cb	70Aa	13Bc	20Db	70Da
Tifway		0Cd	0Cd	23Cc	73Aa	20Ac	37Bb	77Ca
Vamont		17Ae	23Ad	33ABc	60Bb	10Cf	37Bc	77Ca
Brute		7Bd	0Ce	23Cc	60Bb	13Bd	27Cc	90Ba
Navy Blue		7Be	17Bd	37Ac	75Ab	17ABd	43Ac	97Aa
Midiron		0Cd	0Cd	30Bb	60Ba	3Dd	20Dc	27Eb

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means in a row followed by the same lower case letter do not differ at the 0.05 significance level using Duncan's multiple range test

c Means in a column followed by the same upper case letter do not differ at the 0.05 significance level using Duncan's multiple range test

Table 3.12.

Tall fescue injury (0-10) with fenoxaprop and fluazifop applied alone and in combination in Blackburg during 1994 [a]

		Days after each of the sequential treatments			
		Treatment 1		Treatment 2	
Fenoxaprop	Fluazifop	14 DAT	28 DAT	14 DAT	35 DAT
------ kg ai ha $^{-1}$ -----					
0.4		0b [b]	0b	0b	0b
0.8		0b	0b	0b	0b
1.18		0b	0b	0b	0b
0.2		3.7a	2.5a	4.3a	3a
0.025	0.075	1b	0b	0.7b	0b
0.05	0.15	0.3b	0b	1.3ab	0.7b
0.1	0.3	3a	1.3ab	4a	4.7a
Untreated		0b	0b	0b	0b

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means within a column followed by the same letter do not differ at the 0.05 significance level by Duncan's Multiple Range Test

Table 3.13.

Tall fescue injury (0-10) with fenoxaprop and fluazifop applied alone and in combination in Blacksburg during 1995[a]

		Days after each of the sequential treatments					
		Treatment 1		Treatment 2		Treatment 3	
Fenoxaprop	Fluazifop	14 DAT	28 DAT	14 DAT	28 DAT	14 DAT	42 DAT
------ kg ai ha -1 ----							
0.4		0b[b]	0b	0b	0a	0b	0b
0.8		0b	0b	0b	0a	0b	0b
1.18		1b	0b	0b	0a	0b	0b
0.2		3.3a	4.7a	2.3a	0a	2.7a	1b
0.025	0.075	1.3b	0b	0.7b	0a	0.7b	0b
0.05	0.15	2.7a	0b	1b	0a	1.7b	0b
0.1	0.3	4.3a	2.7a	4.7a	0a	4a	4a
Untreated		0b	0b	0b	0a	0b	0b

a All treatments contained 0.25 % v/v non-ionic surfactant

b Means within a column followed by the same letter do not differ at the 0.05 significance level by Duncan's Multiple Range Test

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