

Safety of Drive on Creeping Bentgrass Seedlings

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Objective

The objective of this experiment was to evaluate the safety of Drive in spring-seeded creeping bentgrass in varying climatic regions of the United States.

Rationale

Creeping bentgrass is often seeded on golf courses during spring and early summer in new construction projects or after winter damage of existing turf. However, crabgrass often out competes creeping bentgrass seeded at this time of year. There are few herbicides that can be applied to creeping bentgrass shortly before or after seeding to effectively control crabgrass with little risk of damage to seedlings. Our earlier work has shown that Drive is safe to use on Kentucky bluegrass or perennial ryegrass at emergence and within 14 days after emergence (DAE). Since creeping bentgrass is planted on golf courses worldwide, it is important to evaluate the safety of Drive on newly seeded creeping bentgrass.

How It Was Done

Experiments were initiated in Spring 2000 at three sites including Purdue University's William H. Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN; Turfgrass Field Laboratory at North Carolina State University in Raleigh, NC; and Iowa State University Horticulture Research Station in Ames, IA. Seedbeds were prepared at each site by spraying with Roundup, tilling, smoothing, and applying starter fertilizer. Methyl bromide fumigation was also used following tilling in Indiana to limit weed competition. After seeding creeping bentgrass at 1 lb/1000 ft², irrigation was applied as needed to encourage germination and establishment. Plots were mowed at 0.5 inches as needed with clippings returned. More information about individual sites is listed in Table 1.

A 3 X 6 factorial in a split plot design was used at each location with three cultivars of creeping bentgrass as main blocks and six herbicide treatments as subplots. Creeping bentgrass cultivars were selected for each location based upon their use in the respective state. 'L93', 'Putter', and 'Providence' were used in Indiana, while 'L93', 'Penncross', and 'Pennlinks' were used in Iowa and North Carolina. Herbicide treatments included an untreated plot (hereafter referred to as the check), Tupersan at 6.0 lbs ai/A applied immediately before planting (PRE), and Drive 75DF at 75 lbs ai/A applied 7 days before seeding (DBS), PRE, 14, or 28 days after emergence (DAE). Emergence was defined as a uniform stand of at least one-leaf seedlings on each untreated plot. Herbicides were applied with CO₂ powered sprayers in 2 gals H₂O/1000 ft² and watered-in with at least ¼ inch water within 2 days of application.

Cover of creeping bentgrass was visually rated weekly as a percentage cover of each plot. Phytotoxicity was rated weekly on a scale of 1 to 9 where 1 = brown

turf, 5 = acceptable damage and 9 = no visible phytotoxicity. Visual quality was rated weekly on a scale of 1 to 9 where 1 = dead turf, 5 = acceptable and 9 = excellent quality. Percent weed cover was rated weekly in the Iowa study. Data from each site were analyzed in split block designs. Data recorded before 35 DAE were analyzed as a generalized randomized block with multiple replications of the untreated check within each block.

Results

Indiana. Tupersan applied PRE caused noticeable phytotoxicity at 7 DAE and reduced creeping bentgrass cover from 7 to 35 DAE (Table 2). Drive applied 14 DAE caused phytotoxicity at 21 DAE, but again this phytotoxicity was short-lived and caused no permanent detrimental effects. However, Drive applied at 28 DAE caused phytotoxicity lasting from 35 to 49 DAE. Phytotoxicity appeared as a yellowing of older leaf blades and tips. ‘Providence’ was slightly more sensitive to Drive than either ‘L93’ or ‘Putter’. Negative effects of Drive on creeping bentgrass cover were minimal in Indiana. Only Drive applied PRE reduced bentgrass cover compared to the check at 35 DAE by 2%.

Iowa. Unlike the Indiana study, all of the cultivars responded to herbicides similarly. None of the herbicide treatments reduced bentgrass cover compared to the check (Table 4). However, Tupersan-treated plots had greater bentgrass cover compared with the check and Drive applied PRE, 14 DAE, and 28 DAE when rated at 35 DAE (Table 4). This was primarily due to Tupersan controlling purslane and prostrate pigweed. Similar to the Indiana study, Drive applied 14 DAE caused slight discoloration and reduced visual quality at 28 DAE, but this effect was short-lived lasting less than 7 days (data not shown).

North Carolina. Unlike Indiana and Iowa, Drive applications caused significant negative effects on creeping bentgrass. All Drive treatments reduced turf cover rated from 21 through 64 DAE (Table 5). Drive applied at 28 DAE caused the least damage reducing bentgrass cover by 17% at 64 DAE, while Drive applied PRE was the most damaging reducing bentgrass cover 46% at 64 DAE. Drive applied 7 DBS had the least effect on visual quality, producing acceptable quality ratings throughout the study. However, Drive applied PRE, and 14 and 28 DAE reduced visual quality to unacceptable levels at 36, 50 and 64 DAE. Tupersan had no negative effects on bentgrass in North Carolina.

Summary

Drive applications resulted in no long-term damage when applied to ‘L93’, ‘Pennlinks’, and ‘Penncross’ in IA and to ‘L93’, ‘Putter’ and ‘Providence’ in IN. However, results from NC where Drive damaged creeping bentgrass seedlings indicate that caution should be exercised when using Drive on seedlings of creeping bentgrass.

A full report of this study is accepted and will be available in an upcoming issue of HortScience.

Table 1. Site information for experimental locations in Indiana, Iowa, and North Carolina.

	Indiana	Iowa	North Carolina
Seeding date	12 May	17 May	17 Apr
Emergence date ^a	19 May	29 May	27 Apr
Application dates			
7 DBS ^b	3 May	10 May	10 Apr
PRE ^c	12 May	17 May	17 Apr
14 DAE ^d	2 June	13 June	11 May
28 DAE	16 June	27 June	25 May
Soil Type	silt loam	loam	sandy clay loam

^a Emergence was defined as a uniform stand of at least one-leaf seedlings on each untreated plot.

^b Days before seeding.

^c Preemergence application made immediately before planting.

^d Days after emergence.

Table 2. Phytotoxicity^a ratings on ‘L93’, ‘Providence’, and ‘Putter’ creeping bentgrass treated with Tupersan or Drive either before or after seeding in Indiana.

Herbicide	Application timing	7 DAE ^b				21 DAE				35 DAE				49 DAE			
		L93	Prov	Putter	Mean	L93	Prov	Putter	Mean	L93	Prov	Putter	Mean	L93	Prov	Putter	Mean
Check	--	7.4 ^a	7.3	7.6	7.4	9.0	9.0	9.0	9.0	9.0	8.7	9.0	8.9	9.0	9.0	9.0	9.0
Drive	7 DBS ^c	7.3	7.7	7.7	7.6	9.0	9.0	9.0	9.0	9.0	8.7	9.0	8.9	9.0	9.0	9.0	9.0
Tupersan	PRE ^d	7.0	6.0	6.7	6.6	9.0	9.0	9.0	9.0	9.0	8.7	9.0	8.9	9.0	9.0	9.0	9.0
Drive	PRE	7.0	7.0	7.3	7.1	9.0	9.0	9.0	9.0	9.0	8.7	9.0	8.9	9.0	9.0	9.0	9.0
Drive	14 DAE					7.7	5.3	6.7	6.6	9.0	8.7	9.0	8.9	9.0	9.0	9.0	9.0
Drive	28 DAE									7.3	4.7	5.0	5.7	8.3	7.3	8.3	8.0
Cultivar mean		7.2	7.0	7.3		8.7	8.3	8.5		8.7	8.0	8.3		8.9	8.7	8.9	

^a Phytotoxicity rated on a scale of 1 to 9 where 1 = brown turf, 5 = acceptable damage and 9 = no visible phytotoxicity.

^b Days after emergence.

^c Days before seeding.

^d Preemergence application made immediately before planting.

Table 3. Percent cover of ‘L93’, ‘Providence’, and ‘Putter’ creeping bentgrass treated with Tupersan or Drive either before or after seeding in Indiana.

Herbicide	Application timing	7 DAE ^a				21 DAE				35 DAE				49 DAE			
		L93	Prov	Putter	Mean	L93	Prov	Putter	Mean	L93	Prov	Putter	Mean	L93	Prov	Putter	Mean
Check	--	18 ^d	73	15	35	86	99	82	89	98	100	99	99	99	100	100	100
Drive	7 DBS ^b	22	77	20	39	86	98	90	91	99	100	98	99	100	100	98	99
Tupersan	PRE ^c	13	68	7	29	73	96	60	76	94	100	94	96	97	100	97	98
Drive	PRE	20	67	20	36	83	97	78	86	96	99	97	97	98	99	97	98
Drive	14 DAE					82	99	83	88	96	100	98	98	98	100	99	99
Drive	28 DAE									99	100	97	98	100	99	98	99
Cultivar mean		18	71	15		82	98	79		97	100	97		99	100	98	

^a Days after emergence.

^b Days before seeding.

^c Preemergence application made immediately before planting.

^d Percent cover.

Table 4. Percent cover of creeping bentgrass and weeds treated with Tupersan or Drive either before or after seeding in Iowa.

Herbicide	Application timing	Creeping bentgrass cover				Weed cover		
		7 DAE ^a	21 DAE	35 DAE	49 DAE	21 DAE	35 DAE	49 DAE
		-----%-----				-----%-----		
Check	--	25	43	62	75	5	13	28
Drive	7 DBS ^b	26	47	67	74	4	13	21
Tupersan	PRE ^c	24	39	69	78	1	3	7
Drive	PRE	25	43	60	74	6	14	21
Drive	14 DAE		46	59	69	4	13	21
Drive	28 DAE			58	67		19	34

^a Days after emergence.

^b Days before seeding.

^c Preemergence application made immediately before planting.

Table 5. Percent cover and visual quality of creeping bentgrass with Tupersan or Drive before or after seeding in North Carolina.

Herbicide	Application timing	Percent cover				Visual quality ^a			
		21 DAE ^b	36 DAE	50 DAE	64 DAE	21 DAE	36 DAE	50 DAE	64 DAE
		-----%-----							
Check	--	43	76	83	91	6.9	6.9	6.9	7.0
Drive	7 DBS ^c	31	50	61	69	5.8	5.8	5.7	5.7
Tupersan	PRE ^d	44	86	88	93	7.0	6.9	6.7	6.9
Drive	PRE	18	28	40	45	5.0	4.5	4.4	4.3
Drive	14 DAE	44	53	59	64	5.8	4.4	4.5	4.6
Drive	28 DAE		80	72	74		4.8	4.3	4.9

^a Visual quality rated on a scale of 1 to 9 where 1 = dead turf, 5 = acceptable and 9 = excellent turf quality.

^b Days after emergence.

^c Days before seeding.

^d Preemergence application made immediately before planting.