

Suppressing bermudagrass in zoysiagrass

A combination of Turflon Ester and Fusilade II or Acclaim Extra suppresses bermudagrass in zoysiagrass without significantly harming the zoysia.

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Bermudagrass (*Cynodon* species) has an extensive rhizome and stolon system, a tolerance to environmental and management stresses and an aggressive nature that make it difficult to control in warm-season grasses, such as zoysiagrass (*Zoysia* species), centipedegrass (*Eremochloa ophiuroides*) and St. Augustinegrass (*Stenotaphrum secundatum*), as well as cool-season grasses, such as tall fescue (*Festuca arundinacea*), Kentucky bluegrass (*Poa pratensis*) and bentgrass (*Agrostis* species). Bermudagrass is especially a problem in zoysiagrass turf because they are both C-4 warm-season grasses with similar herbicide tolerances.

Acclaim Extra (fenoxaprop) and Fusilade II (fluazifop) have been the primary herbicides evaluated for controlling bermudagrass in zoysiagrass turf. Previous research has found that Acclaim Extra suppressed bermudagrass 97% to 99%, but caused yellowing of Korean common zoysiagrass (*Zoysia japonica* Steud.) (3). Other researchers have reported up to 80% bermudagrass suppression with Acclaim Extra (5). Fusilade II applications have been reported to injure and reduce stand quality of Emerald zoysiagrass (*Zoysia japonica* Steud. × *Zoysia tenuifolia* Willd ex. Thiele), but the turf eventually recovered (4).

Turflon Ester (triclopyr) has been reported to significantly injure both common and hybrid bermudagrass [*Cynodon dactylon* (L.) Pers. × *C. transvaalensis* Burt-Davy] when applied at twice the labeled rate (1). Multiple applications of Turflon Ester or Confront have been reported to cause up to 30% injury on bermudagrass and more than 40% injury on seashore paspalum (*Paspalum vaginatum* Swartz.) (6). Injury is so significant that attempts have been made to use Turflon Ester as a selective bermudagrass control herbicide. Sequential applications of Acclaim Extra or Acclaim Extra + Turflon Ester have also been reported to cause similar decreases in bermudagrass ground coverage (2).

However, limited information is available

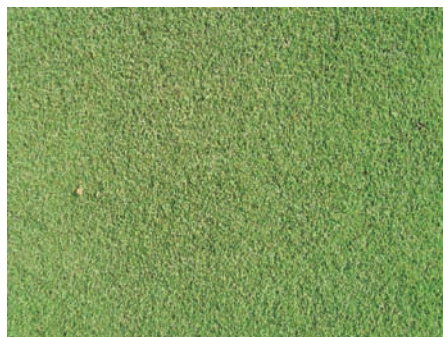


Figure 1. Across experiments, zoysiagrass injury from Turflon Ester alone (left) and from Spotlight alone (right) was 10% or less. These photos were taken two weeks after the last product applications.

regarding Turflon Ester tank-mixtures with Fusilade II or Acclaim Extra on zoysiagrass. Therefore, we investigated the use of Turflon Ester as a selective bermudagrass suppression agent when used with Acclaim Extra or Fusilade II in zoysiagrass turf. Spotlight was also evaluated in this research because its chemistry is similar to that of Turflon Ester and it has recently been registered for use on turf.

Materials and methods

Research was conducted in 2004 and 2005 at the Little Course at Conner Lane, Franklin, Tenn., and in 2005 at the West Tennessee Research and Education Center, Jackson, Tenn. In total, three zoysiagrass tolerance experiments and two bermudagrass suppression experiments were conducted.

Zoysiagrass tolerance

Zoysiagrass tolerance studies at the Little Course were conducted on a Meyer (*Zoysia japonica* Steud.) zoysiagrass fairway in 2004 and on a Cavalier [*Z. matrella* (L.) Merr.] zoysiagrass fairway in 2005. Fairways were mowed at 0.5 inch (1.2 centimeters) and managed with 1.5 to 2.0 pounds nitrogen/1,000 square feet/year (7.3 to 9.8 grams/square meter/year). Soil at the Little Course was a Maury silt loam fine, mixed, semiac-

tive, mesic Typic Paleudalfs with pH 6.3 and 0.9% organic matter.

At WTREC, the zoysiagrass tolerance study was conducted on Meyer zoysiagrass mowed at approximately 2 inches (about 5 centimeters); the turf had not been fertilized or irrigated for the three years before research began. Soil at WTREC was a Loring silt loam fine-silty, mixed, active, thermic Oxyaquic Fragiudalfs with pH 6.4 and 1.1% organic matter.

Bermudagrass suppression

Common bermudagrass suppression was evaluated in 2004 at the Little Course and in 2005 at WTREC. At both locations, common bermudagrass was mowed at 3 inches (about 7.5 centimeters), with no fertility or irrigation for three years before research began.

Treatments

The herbicides evaluated were Acclaim Extra, Fusilade II, Spotlight and Turflon Ester applied alone and in combination treatments at the rates listed in Table 1. Treatments were initiated June 14, 2004, and June 6, 2005, at the Little Course and May 22, 2005, at WTREC.

Three sequential applications of Acclaim Extra (28 fluid ounces/acre [0.20 milliliter/square meter]), Fusilade II (6 fluid ounces/acre [0.04 milliliter/square meter]), Spotlight (20

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fluid ounces/acre [0.15 milliliter/square meter] and Turflon Ester (32 fluid ounces/acre [0.23 milliliter/square meter]) applied at 28-day intervals were evaluated alone and in various combinations for bermudagrass suppression in zoysiagrass turf.

Three applications were made of each herbicide treatment at 28-day intervals. Herbicide applications were made with a CO₂-pressurized spray system calibrated to deliver 30 gallons/acre (280 liters/hectare). The spray boom had four flat-fan nozzles with 10-inch (25-centimeter) spacing. Plots were not mowed the day before or the day after application. Experiments were arranged in a randomized complete block design with four replicates. Experimental plots were 50 square feet (4.6 square meters).

Visual ratings

Visual ratings of zoysiagrass injury and



Figure 2. Applications of Acclaim Extra + Spotlight caused 18% to 38% zoysiagrass injury. This photo was taken two weeks after the last product application.

bermudagrass suppression were made two weeks after the third herbicide application. Zoysiagrass injury was visually rated for both experiments using a scale of 0 to 100, where

0 = no visual injury and 100 = complete plant death. To facilitate discussion, an injury rating of 20 or higher was considered unacceptable visual injury. Mild phytotoxic bronzing of the leaf tissue is representative of an injury rating of 20. Bermudagrass suppression was rated on a similar scale of 0 to 100, where 0 = no visual phytotoxicity and 100 = complete plant browning of the aboveground vegetation. (Suppression is different from control ratings, which would evaluate regrowth of belowground structures over time.)

Results

Zoysiagrass injury

Data from each experiment are presented individually in Table 2 because zoysiagrass injury from herbicide treatments was not the same in 2004 and 2005. Although differences in injury were observed between locations, some trends were observed.

Across experiments, zoysiagrass injury from Turflon Ester alone and from Spotlight alone was 10% or less (Figure 1).

Adding Spotlight to Fusilade II did not significantly reduce zoysiagrass injury in any of the experiments.

Acclaim Extra alone caused 18% to 42% zoysiagrass injury, and Acclaim Extra + Spotlight (Figure 2) caused 18% to 38% injury.

Fusilade II + Turflon Ester (Figure 3) did not injure the zoysiagrass in any of the experiments; these results were not significantly different from those for Turflon Ester alone, Spotlight alone or

PRODUCTS AND RATES

Herbicide product	Herbicide active ingredient	Active ingredient rate (pounds a.i. or a.e./acre)*	Product rate (fluid ounces/acre)
Acclaim Extra	fenoxaprop	0.12 (a.i.)	28
Fusilade II	fluzifop	0.09 (a.i.)	6
Spotlight	fluroxypyr	0.23 (a.e.)	20
Turflon Ester	triclopyr	1.00 (a.e.)	32

*Because of differences in herbicide chemistry, fluroxypyr and triclopyr active ingredient rates are presented in acid equivalents per acre, while fenoxaprop and fluzifop are presented as active ingredient per acre. a.e., acid equivalents; a.i., active ingredient.

Table 1. Active ingredient and product names and equivalent active ingredient and product rates used in the studies.

% ZOYSIA INJURY

Herbicide treatment	Product rate (fluid ounces/acre)	Meyer zoysia*		Cavalier zoysia*
		Little Course 2004	Jackson 2005	Little Course 2005
		% injury		
Untreated control	---	---	---	---
Acclaim Extra	28	38 a	18 ab	42 a
Fusilade II	6	9 c	23 a	38 b
Spotlight	20	0 d	0 c	0 c
Turflon Ester	32	1 d	10 abc	0 c
Acclaim Extra + Spotlight	28 + 20	18 b	16 ab	38 b
Acclaim Extra + Turflon Ester	28 + 32	1 d	5 bc	0 c
Fusilade II + Spotlight	6 + 20	9 c	20 ab	39 ab
Fusilade II + Turflon Ester	6 + 32	0 d	0 c	0 c

*Means within columns followed by the same letter are not significantly different.

Table 2. Response of Meyer and Cavalier zoysiagrass cultivars two weeks after three consecutive herbicide treatments.

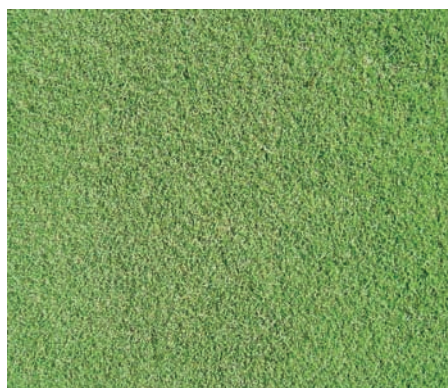


Figure 3. Fusilade II + Turflon Ester did not injure the zoysiagrass in any of the experiments. This photo was taken two weeks after the last product application.

Acclaim Extra + Turflon Ester.

Zoysiagrass injury from Acclaim Extra + Spotlight was similar to injury from Fusilade II + Spotlight, and injury from Acclaim + Turflon Ester was similar to injury from Fusilade + Turflon Ester (Table 2).

Adding Turflon Ester to both Acclaim Extra and Fusilade II reduced zoysiagrass injury to 0% to 5%.

Bermudagrass suppression

Bermudagrass suppression data are presented as an average because the data were statistically similar between both years. Even though tank-mixing Turflon Ester with Fusilade II reduced zoysiagrass injury, bermudagrass suppression was similar for Fusilade II + Turflon Ester (69%), Fusilade II (74%) and Fusilade II + Spotlight (76%) (Table 3).

Acclaim Extra + Turflon Ester suppressed bermudagrass (67%) more than Acclaim Extra alone (39%) or Acclaim Extra + Spotlight (35%).

THE RESEARCH

says . . .

- ▶ **Three sequential applications** of Acclaim Extra, Fusilade II, Spotlight and Turflon Ester applied at 28-day intervals were evaluated alone and in various combinations for bermudagrass suppression in zoysiagrass turf.
- ▶ **Adding Turflon Ester** to Acclaim Extra and Fusilade II reduced toxicity in zoysiagrass turf without decreasing bermudagrass suppression when compared to Acclaim Extra or Fusilade II alone. Turflon Ester + Acclaim Extra suppressed bermudagrass more than Acclaim Extra alone.
- ▶ **Although Spotlight is** similar in chemistry to Turflon Ester, it was less phytotoxic to bermudagrass and did not make Acclaim Extra or Fusilade II safe to use on zoysiagrass.

Turflon Ester alone suppressed bermudagrass (47%) more than Spotlight alone.

Summary

Although Turflon Ester is primarily active on broadleafweeds, it is beneficial for suppressing bermudagrass in zoysiagrass turf. Superintendents have been reluctant to use multiple applications of Acclaim Extra or Fusilade II, which have been reported to injure zoysiagrass or reduce its quality (3,4). However, the addition of Turflon Ester has caused zoysiagrass injury from Acclaim Extra or Fusilade II to disappear or decrease to tolerable levels. Because multiple applications of Turflon Ester are phytotoxic to bermudagrass, adding Turflon Ester to Acclaim Extra tank-mixtures improves suppression of bermudagrass, and adding it to Fusilade II tank-mixtures maintains levels of bermudagrass suppression similar to using Fusilade II alone.

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% BERMUDAGRASS SUPPRESSION

Herbicide treatment	Rate (fluid ounces/acre)	% bermudagrass suppression*
Untreated control	---	---
Acclaim Extra	28	39 b
Fusilade II	6	74 a
Spotlight	20	9 c
Turflon Ester	32	47 b
Acclaim Extra + Spotlight	28 + 20	35 b
Acclaim Extra + Turflon Ester	28 + 32	67 a
Fusilade II + Spotlight	6 + 20	76 a
Fusilade II + Turflon Ester	6 + 32	69 a

*Means within the column followed by the same letter are not significantly different.

Table 3. Common bermudagrass suppression two weeks after three consecutive herbicide treatments.