

Weed Control During Zoysiagrass Establishment from Seed

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Zoysiagrass seed

Photo by Aaron Patton

Summary. Effective weed control is critical when establishing zoysiagrass from seed. The objective of this experiment was to identify herbicides and herbicide strategies that will reduce weed competition following planting without reducing zoysiagrass establishment. Half of the plots received an application of Tupersan (siduron) immediately following planting of Zenith zoysiagrass. Plots then were treated with Acclaim Extra (fenoxaprop), Fusilade (fluazifop), Turflon Ester (triclopyr), Acclaim Extra + Turflon Ester, or Fusilade + Turflon Ester at two different timings of either a single application at 2 weeks after emergence (WAE) or sequential applications at 2 + 6 WAE. Tupersan reduced zoysiagrass coverage between 8.0 to

9.1%. Injury caused by Acclaim Extra alone or Fusilade alone was decreased with the addition of Turflon Ester. Zoysiagrass coverage 6 WAE was lowest for Acclaim Extra alone or Fusilade alone while coverage was greatest for Turflon Ester, Acclaim Extra + Turflon Ester, and Fusilade + Turflon Ester. Single or sequential applications of Acclaim Extra or Fusilade tank-mixed with Turflon Ester will reduce zoysiagrass injury, decrease weed coverage, and allow for improved zoysiagrass establishment compared to applications of Acclaim Extra alone or Fusilade alone.

Abbreviations: WAE (weeks after emergence)

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Weed control is necessary when establishing zoysiagrass (*Zoysia japonica*) from seed because of its slow germination and growth rate. Germinating summer annual grassy weeds or perennial weeds not controlled prior to planting reduces zoysiagrass establishment from seed (Patton et al., 2004a). Weeds that commonly reduce zoysiagrass establishment from seed include warm-season perennials like common bermudagrass (*Cynodon dactylon*) and warm-season annual grassy weeds such as crabgrass (*Digitaria* spp.) and goosegrass (*Eleusine indica*).

Previous research (Patton et al., 2004b) recommends applications of siduron at the time of seeding for control of summer annual grasses in zoysiagrass seedlings. Other herbicides useful for bermudagrass suppression in zoysiagrass, such as Acclaim Extra (fenoxaprop) and Fusilade (fluazifop), are known to injure zoysiagrass seedlings (Patton et al., 2007). Recently, McElroy and Breeden (2006) reported that Turflon Ester added to Acclaim Extra or Fusilade reduced herbicide injury on established zoysiagrass, but this effect has not been documented on zoysiagrass seedlings.

This research project examines the use of Tupersan (siduron), Turflon Ester, Fusilade, and Acclaim Extra for control of weeds during zoysiagrass establishment from seed. The objectives of this experiment were to (1) determine if adding Turflon Ester to Acclaim Extra or Fusilade would reduce herbicide injury on zoysiagrass seedlings, and (2) identify herbicides and herbicide strategies that would reduce weed competition following planting without reducing zoysiagrass establishment.

Materials and Methods

Research was conducted at the University of Arkansas Agricultural Research and Extension Center, Fayetteville, Ark. Plots were seeded on 26 June 2008 with 1.0 lbs pure live seed/1000 ft² of 'Zenith' zoysiagrass. The experimental area was treated with three applications of glyphosate prior to planting, and was tilled and raked to prepare the soil for seeding. Plots were covered with a germination blanket until germination occurred

to prevent the movement of seed. This experiment included four replications and an individual plot size of 5 by 5 ft. Half of each plot received an application of Tupersan at 12 lbs/A (6 lbs a.i./A of siduron) immediately following planting with the other half remaining untreated. Plots were treated with Acclaim Extra at 28 oz/A (0.125 lb a.i./A of fenoxaprop), Fusilade II at 6 oz/A (0.09 lb a.i./A of fluazifop), Turflon Ester at 16 oz/A (0.5 lb a.i./A of triclopyr), Acclaim Extra at 28 oz/A + Turflon Ester at 16 oz/A, or Fusilade II at 6 oz/A + Turflon Ester at 16 oz/A at two different timings of either a single application at 2 WAE or sequential applications at 2 + 6 WAE. Emergence occurred on 14 July 2008 and was defined as a uniform stand of one-leaf seedlings. A non-ionic surfactant (Latron AG-98, 0.25% v/v) was added to each herbicide, except Tupersan, prior to application. Herbicides were applied on 28 July 2008 and 26 August 2008 at 30 gal/A using an XR8001VS Teejet nozzle with a CO₂-pressurized sprayer at 30 psi. An untreated check was included for comparison. Plots were mown as needed at 0.5 inch when seedlings first reached 0.75 inch.

Zoysiagrass injury and coverage and weed coverage were visually estimated. A final rating of turf coverage was collected using a modified grid. A 3 by 4 ft frame with an internal filament grid of 88 intersections was placed in the center of each plot. The total number of times that zoysiagrass was present under an intersection was recorded for each plot. Percent coverage using the grid was calculated by dividing the number of times zoysiagrass occurred under a filament intersection by 88.

Results and Discussion

Herbicide injury was greatest when rated on 12 August (15 days after application) in plots treated with Acclaim Extra (Table 1). With the exception of Turflon Ester alone, all other herbicides caused more injury than the untreated check, but less injury than Acclaim Extra alone. Injury caused by Acclaim Extra alone or Fusilade alone was decreased with the addition of Turflon Ester, which is consistent with reports on estab-

lished zoysiagrass (McElroy and Breeden, 2006) and reports on seedling turf (McElroy and Lewis, 2008; Rutledge and Reicher, 2008).

Early in the experiment (12 August), weed coverage was predominated by carpetweed (*Mollugo verticillata*). When weed coverage was rated on 24 September, prostrate spurge (*Chamaesyce humistrata*) was the predominant weed with some crabgrass and goosegrass also present. On all dates, weed coverage was reduced from applications of Tupersan at seeding (Table 1). Weed coverage was also reduced from single and sequential applications of Turflon Ester or herbicides tank-mixed with Turflon Ester more so than from single or sequential applications of Acclaim Extra alone or Fusilade alone. Applications of Acclaim Extra alone or Fusilade alone would likely provide better weed control than reported in this experiment if the predominant weeds were grasses instead of the broadleaf weeds present in our experiment.

Unlike previous reports (Patton et al., 2004b; McElroy and Lewis, 2008), Tupersan reduced zoysiagrass coverage between 8.0 to 9.1% on each of the rating dates (Table 1). Tupersan did not reduce coverage when zoysiagrass coverage was estimated using the grid intersection method. McElroy and Lewis (2008) reported a 51% increase in zoysiagrass coverage when Tupersan was applied at seeding, which was likely due to the reduction in crabgrass coverage in their experiment. Although Tupersan did reduce zoysiagrass coverage in our experiment, the beneficial reduction in weed coverage would likely be more helpful than harmful.

On only one occasion did herbicide selection impact zoysiagrass coverage. Zoysiagrass coverage on 26 August was lowest for Acclaim Extra alone (41.0%) or Fusilade alone (44.7%) while coverage was greatest for the untreated check (70.1%) and from single applications of Turflon Ester (66.6%), Acclaim Extra + Turflon Ester (58.1%), and Fusilade + Turflon Ester (59.9%). These results are similar to previous reports, where applications of Acclaim Extra alone or Fusilade alone should be avoided on seedling

zoysiagrass (Patton et al., 2007; Rutledge and Reicher, 2008).

Differences in treatments on zoysiagrass coverage were significant at $P < 0.10$ probability levels on 24 September. The analysis of zoysiagrass coverage resulted in few treatment differences despite large differences in treatment means likely because of the variability in establishment across the experimental area. However, trends in zoysiagrass coverage as affected by various herbicides were similar for later rating dates to those seen on 26 August. Zoysiagrass coverage means were lowest for Acclaim Extra alone or Fusilade alone with single or sequential applications. Zoysiagrass coverage means were greatest for the untreated check and from single and sequential applications of Turflon Ester or herbicides tank-mixed with Turflon Ester.

It is crucial to select herbicides that cause the least injury while providing the best weed control to maximize zoysiagrass establishment. Exact herbicide strategy will depend on the primary weed species present. Tupersan applied immediately following seeding reduced zoysiagrass coverage in our study, but in other studies it did not reduce coverage (Patton et al., 2004b) and increased zoysiagrass coverage by suppressing weeds (McElroy and Lewis, 2008). Therefore, Tupersan is recommended for use immediately following zoysiagrass seeding since it will reduce weed coverage with little to no reduction in zoysiagrass coverage. Single or sequential applications of Acclaim Extra or Fusilade tank-mixed with Turflon Ester will reduce zoysiagrass injury, decrease weed coverage, and allow for improved zoysiagrass establishment compared to applications of Acclaim Extra alone or Fusilade alone.

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Table 1. Herbicide injury, weed control, and zoysiagrass coverage as influenced by applications of Tupersan, Acclaim Extra, Fusilade II, Turflon Ester, and their combinations.

Herbicide	Application timing	Herbicide injury ^z	Weed coverage			Zoysiagrass coverage				Zoysiagrass grid ^y
		12 Aug.	1 Aug.	12 Aug.	24 Sept.	12 Aug.	26 Aug.	5 Sept.	24 Sept.	24 Sept.
	WAE ^x	-----%								
Acclaim Extra	2	48 a	14 a	26 a	2.9 ab	40	41 b	40	57	68
Fusilade II	2	35 b	12 a	23 a	1.6 c	37	45 b	56	80	91
Turflon Ester	2	7 d	8 b	1 b	0.3 bc	58	67 a	77	91	98
Acclaim Extra + Turflon Ester	2	31 b	7 b	1 b	0.6 bc	48	58 a	64	88	96
Fusilade II + Turflon Ester	2	18 c	10 ab	1 b	0.5 bc	53	60 a	64	86	96
Acclaim Extra	2 + 6				4.5 a			47	70	83
Fusilade II	2 + 6				3.0 a			37	63	84
Turflon Ester	2 + 6				0.0 c			70	91	96
Acclaim Extra + Turflon Ester	2 + 6				0.1 c			68	89	97
Fusilade II + Turflon Ester	2 + 6				0.0 c			64	87	96
untreated check		5 d	14 a	20 a	2.1 abc	64	70 a	77	95	98
Tupersan	at seeding	28	7 b	9 b	0.6 b	43 b	50 b	56 b	77 b	89
no Tupersan		27	14 a	12 a	2.2 a	52 a	58 a	64 a	86 a	93

^z Injury was rated as 100% = dead turf and 0% no visible injury.

^y Zoysiagrass grid counts were performed. The number of times that zoysiagrass was present under a grid with 88 intersections was determined and that value was divided by 88 for each plot to calculate the percent zoysiagrass coverage.

^x WAE, weeks after emergence. Seedling emergence occurred on 14 July.

^w Values in a column followed by the same letter are not significantly different from one another (LSD, α=0.05).