Effect of Mesotrione on Sod Quality of Tifway Bermudagrass

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Photo by Mike Richardson

Sod harvested for sod strength trials.

Summary. Commercial sod production has been in existence since the 1920s. Sod growers must have weed-free, high-quality sod to sell their product. Producing weed-free sod is a priority of sod producers; therefore, the evaluation of these new herbicides being introduced into the market is important because it reveals the proper rates for application and the effects of these applications. The objective of this trial was to evaluate the effects of mesotrione, a relatively new herbicide in the turfgrass market, on sod regrowth after harvest and sod strength at the time of harvest. Tifway bermudagrass sod was harvested on 24 May 2008 and 2 June 2009 and five different rates of mesotrione were applied at different timings during the regrowth of the sod. Herbicide injury was evaluated seven days after each herbicide application and sod regrowth was monitored. Sod was harvested three weeks after final herbicide application (17 October 2008 and 2 October 2009) in the fall. An early-summer harvest (6 June 2009) was done on the same plots to see if there were any residual effects from the previous year's treatments. There were no significant effects of mesotrione on turfgrass coverage for any of the application dates for both the 2008 and 2009 growing seasons. The highest rate (0.5 lb ai/acre) of mesotrione applied at six and nine weeks after initial treatment had a negative effect on sod quality and produced less harvestable sod with weaker sod strength compared to most other treatments in 2008. In 2009, plots treated with the highest rate produced weaker sod but there were no statistical differences in percentage harvestable sod.

Abbreviations: WAIT, weeks after initial treatment

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Commercial sod production began in the United States around 1920 (Mitchell and Dickens, 1979). High-quality sod is generally characterized as healthy, strong enough for handling, and weed free. Bermudagrass (*Cynodon* spp.) is the most widely-used grass for sod production in the southern United States and can often be harvested multiple times in a growing season. For producers to harvest two crops in a single season, growers must develop and follow stringent fertilizer and pesticide applications. Proper herbicide timing in sod production not only affects the appearance of the grass but may also affect the sod strength and rooting ability after harvest (Sharpe et al., 1989).

Mesotrione (Tradename Tenacity™ , Syngenta, Wilmington, Del.) is a relatively new herbicide in turfgrass systems and has both pre- and post-emergence activity on broadleaf weeds and annual grasses (Gardner, 2008). Annual grassy weeds such as crabgrass are the most common in turf, and mesotrione provides turf producers with another option to control these weeds. With the recent introduction of mesotrione to the turfgrass industry, studies are needed to evaluate its effectiveness on weed control and how it may adversely affect the desirable grass in different situations such as sod production.

Bermudagrass is typically injured by mesotrione (Boyd, 2008, Fig. 1). This phytotoxicity (injury) may be less problematic in certain situations such as sod farms, since the phytotoxicity is short-lived and the turf can recover from injury prior to harvesting and marketing the sod. However, there have been no studies to date to investigate the effects of mesotrione on bermudagrass sod production. The objective of this trial was to evaluate mesotrione for phytotoxicity and how it effects sod regrowth of 'Tifway' bermudagrass.

Materials and Methods

This study was conducted at the University of Arkansas Agricultural Research and Extension Center in Fayetteville on a 'Tifway' bermudagrass area that was established with sprigs in the summer of 2003. Sod was initially harvested from the entire experimental area using a Gandy Jr. sod cutter (18-inch width) on 24 May 2008 and 2 inch ribbons were left between the harvested strips. In 2009, sod was harvested completely (no ribbons) and regrowth was solely from rhizomes. Herbicide applications were initiated 14 days after sod harvest. Mesotrione was applied at five different rates, including an untreated control, across four different timings (Table 1). Herbicides were applied using a 5-ft boom sprayer with CO_2 as the propellant at a spray volume of 30 gpa. Herbicide plot size was 5 ft by 25 ft. The turf was maintained at a mowing height of 2.0 inch throughout the study, which is typical for sod production. The plot area received 0.5 lb N/1000 ft^2 every 14 days until 100% cover was reached after harvesting and then once per month at 1.0 lb N/1000 ft^2 until the fall sod harvest. There were four replications of each treatment.

Injury and cover ratings were taken seven days following each herbicide application. Injury was rated on a 1 to 9 scale (with 1 = no injury and 9 = dead turf) and turfgrass coverage was measured using digital image analysis (Richardson et al., 2001). A single strip of sod was harvested from each herbicide plot on 17 October 2008, 6 June 2009 and 2 October 2009, which corresponded to three weeks after the final herbicide application date and a summer harvest date for the fall treatments the previous year. Each plot yielded 10 pads of sod that were 18 inches wide by 30 inches long. Each piece of sod was lifted after harvest and determined to be a harvestable piece of sod if it did not break during the lifting. Percent harvestable sod was calculated from each plot. Five sod pads were sampled, if available, from each plot and measured for sod strength using a previously-described sod stretcher (Sorochan et al., 1999; McCalla et al., 2008).

Results and Discussion

There was no significant injury from herbicide applications except on the final treatment date during the 2008 trial. At seven days after the final treatment application, the high rate of mesotrione (0.50 lb ai/acre), caused significantly more injury than the 0.25 lb ai/acre rate, which had significantly more injury than the other two rates and the untreated control (data not shown). There were no

significant differences in turfgrass coverage between treatments following any of the herbicide applications (data not shown). The experimental area had full turf coverage at eight weeks after the initial sod harvest. The early-summer harvest from the 2008 trial yielded no significant differences in strength and percent harvestable sod (data not shown), suggesting that mesotrione residual effects were minimal.

In the 2009 trial, there were no statistical differences for the first herbicide application but there was significant injury at the 3, 6 and 9 WAIT herbicide application dates (Table 2). At 3 WAIT, the 0.156 lb ai/acre rate had more injury than the control, while the 0.125 and 0.156 lb ai/ acre rates were not statistically different. After the 6 WAIT application, the 0.5 lb ai/acre rate produced significantly more injury than all other treatments. The 0.156 and 0.25 lb ai/acre treatments showed significantly higher injury than the control but were not statistically different from the 0.125 lb ai/acre treatment. At the 9 WAIT application date, the injury from the 0.25 and 0.5 lb ai/acre treatments were significantly higher than the control and the 0.5 lb rate also caused more injury than 0.156 and 0.125 lb treatments. Although herbicide injury was observed on these dates, the effects were not long-lasting and did not delay turfgrass coverage.

In the 2008 trial, the highest rate of mesotrione produced significantly less harvestable sod than all other treatments with the exception of the 0.156 lb ai/acre treatment, with only 58% being harvestable in 2008 (McCalla et al., 2009; Table 3). There were no statistical differences between any of the treatments in harvestable sod for the 2009 trial (Table 3). However, the highest rate (0.5 lb ai/acre) of mesotrione did have weaker sod strength than the 0.25 lb ai/acre treatment (Table 3). The sod strength results are similar to other studies that have evaluated the effects of herbicides on sod strength (Turner et al., 1990; Christians and Dant, 2002; and Sharpe et al., 1989). In those studies, herbicide applications did not adversely affect sod tensile strength when compared to the untreated check.

In summary, mesotrione did not affect sod strength when compared to the untreated check. But at the highest rate (0.50 lb ai/acre), which is higher than recommended by the label ("at or below the maximum label rate"), the sod recovered and was ready for harvest approximately eight weeks after initial harvest and there was little to no injury resulting from herbicide applications. Collectively, these data suggest that mesotrione may be safely used in bermudagrass sod production at label rates with minimal effects on sod quality and appearance.

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Table 1. Herbicide timings and rates used in the study. The initial mesotrione treatment was applied on 6 June 2008 and 6 June 2009.

Treatment	Rate	Timing
	lb ai / acre	
Untreated check		
Mesotrione	0.125	Initial treatment, 3 WAIT[z], 6 WAIT, and 9 WAIT
Mesotrione	0.156	3 WAIT, 6 WAIT, and 9 WAIT
Mesotrione	0.25	6 WAIT and 9 WAIT
Mesotrione	0.50	6 WAIT and 9 WAIT

[z]WAIT – weeks after initial treatment.

Table 2. Herbicide injury 7 days following application of mesotrione for 2009.

Treatment	Rate	Injury		
	lb ai / acre	3 WAIT[z]	6 WAIT	9 WAIT
		----------1-9,9=death----------		
Untreated check		1.0	1.0	1.0
Mesotrione	0.125	2.0	1.8	2.0
Mesotrione	0.156	2.8	2.2	2.5
Mesotrione	0.25	1.0	2.5	3.8
Mesotrione	0.5	1.0	4.2	4.5
LSD(P=.05)		0.7	0.6	1.0

[z]WAIT – weeks after initial treatment.

Table 3. Harvestable sod and sod strength, as measured as the peak force to break the sod. Sod was harvested on 10 Oct. 2008 and 2 Oct. 2009.

		Fall 2008		Fall 2009	
Treatment	Rate	Harvest	Strength	Harvest	Strength
	lb ai / acre	%	lb	%	lb
Untreated control		87.5	109.5	100	192
Mesotrione	0.125	97.5	106.4	100	178
Mesotrione	0.156	72.5	108.8	98	151
Mesotrione	0.25	85.0	121.2	100	172
Mesotrione	0.50	57.5	97.1	93	136
LSD(0.10)		22.5	18.4	ns	31

Fig. 1. Bleaching injury (right) caused by mesotrione applications to bermudagrass turf.