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Title: Use of Frazee Mowing and Herbicides to Eradicate Bermudagrass in Putting Greens or Production Fields

Project Leaders: Mike Richardson¹, John McCalla¹, Jim Brosnan², and Greg Breeden²

Affiliation: ¹University of Arkansas; ²University of Tennessee

Objective: Determine the effects of aggressive dethatching (frazee mowing) on the efficacy of herbicides for bermudagrass control.

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Summary Text:

When golf courses decide to switch bermudagrass fairway or putting green surfaces to a newer cultivar, it is imperative that the existing bermudagrass be eradicated completely to ensure a pure stand of the new cultivar. Sod producers also must have sites completely free of other bermudagrasses before starting production with an ultradwarf or any improved bermudagrass cultivar. Historically, methyl bromide was commonly used to fumigate sites and was a very effective means of controlling bermudagrass (Edwards and Barnes, 1958). However, methyl bromide was phased out of production in 2005 due to environmental concerns and alternative fumigants have not proven as effective for controlling problematic weeds, especially bermudagrass (Unruh and Brecke, 2013). As such, the use of herbicides remains a common method of removing an existing bermudagrass turf prior to planting a new cultivar.

Herbicide control options for bermudagrass include non-selective herbicides such as glyphosate, as well as selective grass herbicides such as fenoxaprop and fluazifop (Boyd, 2000; Johnson, 1988; Teuton et al., 2005). Regardless of the herbicide(s) used, effective bermudagrass control can only be achieved with multiple (2-4) applications of the herbicides, typically on a 3-4 week interval (Boyd, 2000; Teuton et al., 2005). As such, bermudagrass eradication is a long-term process that can take a minimum of 6-8 weeks to complete all the herbicide applications.

Over the past few years, a new mechanical dethatching system called “frazee mowing” has been introduced into the golf and sports turf industries. These machines are designed to aggressively remove thatch down to a maximum depth of approximately 5.0 cm (Fig. 1). The cultivation practice was originally introduced to aggressively dethatch turf areas, but also has been used to reduce weed seed populations (Neil Stuble, All England Lawn Tennis Club, personal communication), prepare sites for seeding (Hansen and Christians, 2015), and may even be useful for controlling pathogens such as spring dead spot (Miller et. al, 2015).

One aspect of fraze mowing that has not been investigated is whether aggressive fraze mowing might influence the efficacy of certain herbicides. Our hypothesis is that if a high percentage of the growing points (crowns, stolons, and possibly some rhizomes) of a bermudagrass are physically removed with fraze mowing, the remaining growing points may be more easily eradicated with various combinations of selective and non-selective herbicides. The objective of this proposed work is to investigate various, single application herbicide treatments for bermudagrass eradication, applied either prior to or after fraze mowing.

Materials and Methods

This study was conducted on two sod production farms, including Modern Turf in Rembert, SC and Bayou Bend Turf Grass in Bastrop, LA. The study was set up as a split-split plot design with fraze mowing treatments being assigned to the whole plots and herbicide timing and treatments applied as the split plots. The experiment was conducted on two cultivars at both locations (Table 1), including one common fairway type of bermudagrass (Celebration or Tifway) and one ultradwarf cultivar (MiniVerde or Tifeagle). For brevity, this report will only present the results from the fairway cultivars. Dates of pre-fraze herbicide applications, fraze mowing, and post-fraze herbicide applications are outlined in Table 1.

The fraze mower was a Koro Field Top Maker 1200 (Campey Turf Care Systems, Cheshire United Kingdom) set to a depth of 3.75 cm. Herbicide treatments included the following:

1. Roundup Pro at 7.7 L ha⁻¹
2. Roundup Pro at 7.7 L ha⁻¹ + Fusillade II at 1.75 L ha⁻¹ + nonionic surfactant (0.25%)
3. Untreated control

Data collection involved both visual and digital image analysis of bermudagrass coverage. Recovery and reappearance of bermudagrass in plots was monitored until the end of the growing season. For this report, results will primarily focus on the end-of-season, bermudagrass control observations.

Results

- There were significant 2-way interactions at both locations, including fraze mowing by herbicide timing, fraze mowing by herbicide treatment, and herbicide timing by herbicide treatment. The 3-way interaction of fraze mowing x herbicide timing x herbicide treatment was not significant at either location (data not shown).
- Regardless of herbicide timing, the use of fraze mowing improved bermudagrass control at both locations (Table 2). At the SC location, herbicides applied before fraze mowing were not significantly different from herbicides applied 3 weeks after fraze mowing.
- There were no differences in bermudagrass control between Roundup Pro and Roundup Pro + Fusilade II within either of the fraze mowing treatments (Table 3). However, the best control with both products was observed when the herbicides were used in conjunction with the fraze mowing treatment.

- When comparing timing of herbicide application, both the Roundup Pro and Roundup Pro + Fusilade II treatments provided better control when sprayed 3-4 weeks after fraze mowing compared to applying the herbicide before the fraze mowing (Table 4).

Overall, these results demonstrated that fraze mowing, especially prior to applying herbicides, can significantly improve bermudagrass control. It should be noted that these trials only investigated a single application of herbicide and those treatments failed to produce 100% control of bermudagrass. Future studies should investigate multiple applications of herbicides, either before and/or after fraze mowing, in an effort to achieve 100% bermudagrass control in a timely fashion.

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Literature Cited

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Figure 1. Fraze mowing operation at Bayou Bend Sod Farm in Bastrop LA.

Table 1. Site descriptions and application dates for herbicide timing and fraze mowing treatments.

Location	Cultivar	Pre-fraze herbicides	Fraze mowing	Post-fraze herbicides
		----- date applied -----		
Modern Turf, Rembert SC	Celebration	6/5/2017	6/13/2017	7/11/2017
Bayou Bend Sod, Bastrop LA	Tifway	6/30/2017	7/10/2017	7/31/2017

Table 2. Bermudagrass control, as affected by fraze mowing and timing of herbicide application.

Fraze treatment	Herbicide timing	Bastrop LA 'Tifway'		Rembert SC 'Celebration'	
		----- Bermudagrass control (%) -----			

Fraze mowed	1 wk before fraze mowing	88.0	A	19.2	B
	3 wks after fraze mowing	86.4	A	61.3	A
No fraze mowing	1 wk before fraze mowing	31.9	C	0.0	C
	3 wks after fraze mowing	62.6	B	22.9	B

Within each location, means followed by the same letter are not statistically different at the 0.05 level of probability according to Fisher's protected least significant difference test.

Table 3. Bermudagrass control, as affected by fraze mowing and herbicide treatment.

Fraze treatment	Herbicide	Bastrop LA 'Tifway'		Rembert SC 'Celebration'	
		-----	-----	-----	-----
----- Bermudagrass control (%) -----					
Fraze mowed	Roundup Pro	97.6	A	58.8	A
	Roundup Pro + Fusilade II	98.0	A	57.5	A
	Untreated control	66.0	B	4.4	CD
No fraze mowing	Roundup Pro	62.1	B	13.8	BC
	Roundup Pro + Fusilade II	79.6	AB	20.6	B
	Untreated control	0.0	C	0.0	D

Within each location, means followed by the same letter are not statistically different at the 0.05 level of probability according to Fisher's protected least significant difference test.

Table 4. Bermudagrass control, as affected by herbicide timing and herbicide treatment.

Herbicide timing	Herbicide	Bastrop LA 'Tifway'		Rembert SC 'Celebration'	
		-----	-----	-----	-----
----- Bermudagrass control (%) -----					
1 wk before fraze mowing	Roundup Pro	64.3	B	13.8	B
	Roundup Pro + Fusilade II	79.6	AB	11.9	B
	Untreated control	36.0	C	3.1	B
3 wks after fraze mowing	Roundup Pro	95.5	A	58.8	A
	Roundup Pro + Fusilade II	98.0	A	66.3	A
	Untreated control	30.0	C	1.3	B

Within each location, means followed by the same letter are not statistically different at the 0.05 level of probability according to Fisher's protected least significant difference test.