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Using Ethephon for Seedhead Suppression of ‘Innovation’ Zoysiagrass

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Abstract

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Keywords

Proxy, transition zone, KSUZ 0802

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Cover Page Footnote

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Using Ethephon for Seedhead Suppression of 'Innovation' Zoysiagrass

Manoj Chhetri, Jack Fry, and Megan Kennelly¹

Summary

The performance of ethephon (Proxy) on seedhead suppression of 'Innovation' zoysiagrass was evaluated during the 2019–2020 growing season in Manhattan, KS. Treatments evaluated Proxy applied in a single autumn application at 5 fl. oz./1,000 ft² on multiple dates between August 28 and November 26, 2019. Seedhead suppression ranged from 15% (application on November 1) to 82% (applied on September 4). Dates between September 4 and October 3 were the optimum application window for ethephon application on Innovation zoysiagrass as seedhead suppression was at least 62% with minimal turf injury occurring.

Rationale

Zoysiagrass (*Zoysia* spp. Willd.) provides high-quality turf and playing surfaces for golf fairways and tees throughout the transition zone of the United States (Lyman et al., 2007). Innovation zoysiagrass, evaluated experimentally as 'KSUZ 0802' (*Zoysia matrella* 'Cavalier' × *Z. japonica* 'Anderson 1'), is a fairly new cultivar that has cold tolerance equivalent to 'Meyer', but also enhanced density and a finer leaf texture (Chandra et al., 2017; Patton et al., 2017). However, Innovation produces seedheads in late spring that impact the playing surface and aesthetics. Seedheads appear to leave a purple cast across fairways and tees on golf courses when they emerge, and after mowing seed stalks that remain leave a white cast to these areas. Playability is also affected, and ball roll distance is reduced due to lingering seedheads on playing surfaces. This is concerning to golf course superintendents and golfers (Kane and Miller, 2003).

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A recent study by Patton et al. (2018) on Meyer zoysiagrass showed that the use of ethephon, a plant growth regulator, has been effective in seedhead suppression with negligible injury when applied in autumn. The efficacy of ethephon on suppressing Innovation zoysiagrass seedheads has not been evaluated. We hypothesized that ethephon, when applied on Innovation zoysiagrass in autumn, works similarly on Meyer as both cultivars produce seedheads in late spring in the transition zone.

Objective

To determine the efficacy of ethephon in suppressing seedheads on Innovation zoysiagrass and determine the optimum application window.

Study Description

The experiment was conducted at the Rocky Ford Turfgrass Research Center in Manhattan, KS. The study area was sprigged with Innovation zoysiagrass in June 2017. The soil type was a Chase silty clay loam (fine, smectitic, mesic Aquertic Argiudolls) with a pH of 7.3. The site was mowed at 0.625 inches three times weekly with a walk-behind reel mower and clippings were returned. Nitrogen was applied on June 3 and July 1 to provide 1 lb/1,000 ft² at each application. The area was sufficiently irrigated to prevent visible wilting.

The experiment was arranged in a randomized complete block design with four replicates. Each plot measured 4 × 4 ft. The treatments consisted of 11 application timings of ethephon (Proxy 2L, Bayer Environmental Science) applied from late August through early November, and a nontreated control (Table 1). Proxy was applied at 5 fl. oz./1,000 ft² with a CO₂-pressurized sprayer equipped with TP8006EVS flat-fan nozzles (TeeJet Technologies, Glendale Heights, IL) calibrated to deliver 2 gallons/1,000 ft² at 40 psi. The irrigation and mowing were withheld for at least 2 days after ethephon treatment application throughout the study period.

Dithiopyr (Dimension 2EW, Dow AgroSciences) was applied to prevent crabgrass on April 19, 2019. Speedzone was applied on April 19 and June 20, 2019, to control broadleaf weeds. ProStar 70 WG was applied on September 7, 2019, to prevent large patch infection.

Seedhead data were collected in the following spring in 2020. Once formation of seedheads was visible in the canopy, mowing was ceased until the peak inflorescence development was observed (determined through visual inspection). A 20- × 20-inch template was randomly placed in each experimental plot and visible seedheads were counted once the peak inflorescence stage was determined on May 31, 2020. Percent seedhead suppression (PSS) was determined as:

$$PSS = 100 \times [1 - (\text{seedheads count on treated plot}) / (\text{seedheads count on nontreated plot})]$$

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Phytotoxicity was measured as change in turf color determined visually on a scale of 1–9 in which 9 = dark green turf with no discoloration; 6 = minimally acceptable discoloration with some browning; and 1 = completely bleached white leaf. Turf injury was rated weekly starting one week after initial treatment (WAIT) until the first frost occurred. Also, spring green up was rated visually on a scale of 1–9 in which 1 = brown turf and 9 = fully green turf on April 8 and 21, and May 5, 2020.

Results

Ethephon application timing affected Innovation seedhead suppression and the results ranged from 15 to 82% (Figure 1). The treatment applied on September 4 had the greatest suppression (82%) and was statistically similar to the treatments applied on September 11, 18, and 25; and October 3. The applications made between September 4 and October 23 had at least 62% suppression. However, the 62% suppression result may not be commercially acceptable in all instances. This suggests that the optimum application window for effective seedhead suppression in Innovation zoysiagrass is rather narrow. Furthermore, the large variation observed between replications, as indicated by the error bars in Figure 1, raises questions on the consistency of seedhead suppression. For example, the treatment applied on September 25 had large variability. Treatments applied after the first frost on November 1 and 6 had the lowest suppression and revealed the poor efficacy of ethephon when applied late in the season.

Ethephon application caused some discoloration, and the timing affected the level of injury (Table 1). Innovation suffered injury below the commercially acceptable level for at least four weeks after initial treatment (WAIT) when ethephon was applied on August 28. The second timing applied on September 4 resulted in slight discoloration and was statistically different from the nontreated control plots, but the discoloration was subtle and above the acceptable level of injury. The injury for rest of the timings was not different from nontreated control plots. Spring green up data rated in April and May in the following year were not different from the nontreated plots on any of the dates (data not shown).

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Table 1. The effect of ethephon (Proxy) application timing on Innovation zoysiagrass injury as determined by turf color ratings

Treatment ^a	Turf color [†]											
	Weeks after initial treatment (WAIT)											
	1	2	3	4	5	6	7	8	9	10	11	
Nontreated	9.0a [‡]	8.8a	8.8a	8.5ab	9.0a	8.8a	8.5a	7.8 ^{NS}	7.0a	6.0 ^{NS}	5.8 ^{NS}	
28-Aug	5.0b	4.0c	4.3c	5.0c	6.0c	7.0b	7.0b	7.0	6.0b	5.8	5.8	
4-Sept	- [§]	7.0b	7.0b	7.8b	7.8b	7.8b	7.8ab	7.8	6.8ab	5.8	5.8	
11-Sept	-	-	7.8ab	7.8b	8.8a	8.8a	8.8a	7.8	7.0a	5.8	5.8	
18-Sept	-	-	-	8.8a	9.0a	8.8a	8.8a	7.8	6.8ab	6.0	6.0	
25-Sept	-	-	-	-	8.8a	9.0a	8.8a	7.8	7.3a	5.5	5.8	
3-Oct	-	-	-	-	-	8.8a	8.8a	7.8	6.8ab	6.0	5.8	
10-Oct	-	-	-	-	-	-	8.8a	8.0	7.3a	5.8	5.8	
16-Oct	-	-	-	-	-	-	-	7.8	7.0a	5.8	6.0	
23-Oct	-	-	-	-	-	-	-	-	7.3a	5.5	6.0	
1-Nov	-	-	-	-	-	-	-	-	-	6.0	5.8	
6-Nov	-	-	-	-	-	-	-	-	-	-	5.5	
<i>P</i> -value	*** [¶]	***	***	***	***	***	***	***	0.227	0.005	0.584	0.943

[†] Turf color was rated visually on a scale of 1–9 in which 9 = dark green leaf with no discoloration, 6 = minimally acceptable discoloration with some browning, and 1 = completely bleached, white leaf.

^a Proxy was applied once on each treatment date at 5 fl. oz./1000 ft².

[‡] Within columns, means followed by different letters are statistically different ($\alpha = 0.05$) and NS represents not significant.

[§] Treatments not yet applied on this rating date.

[¶] *** indicates $P < 0.0001$.

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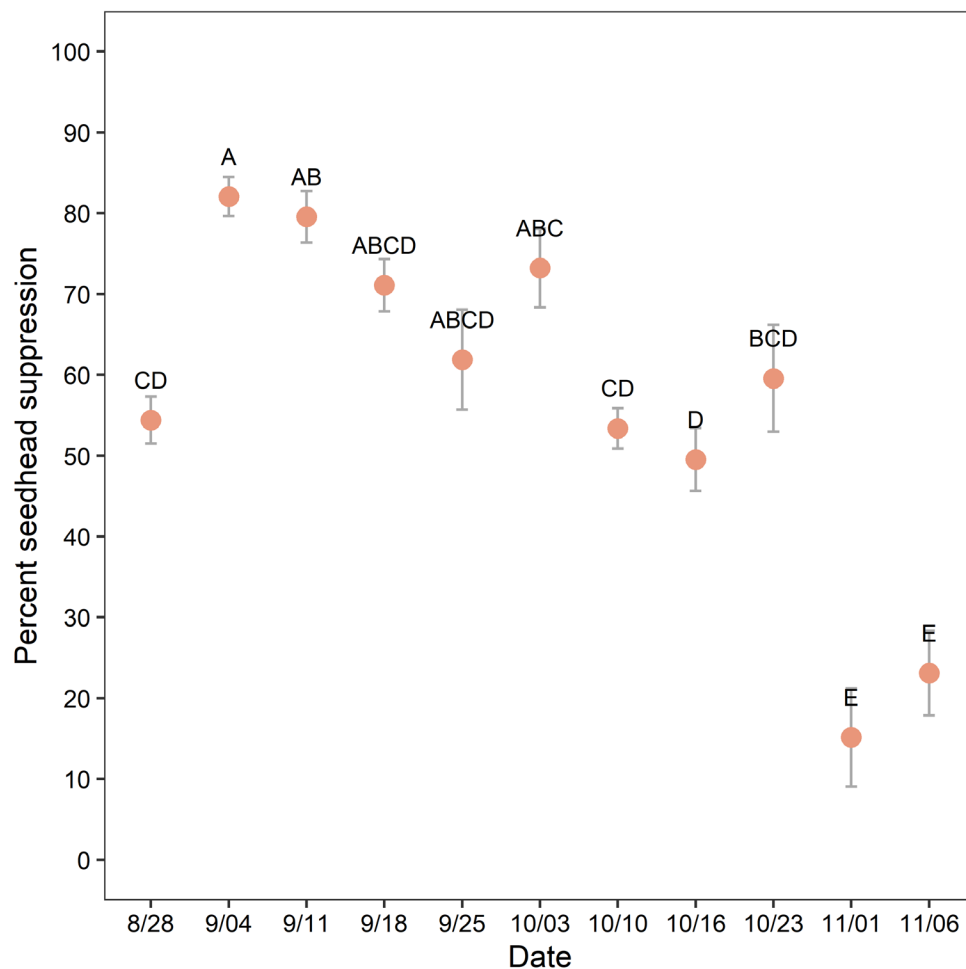


Figure 1. The influence of ethephon (Proxy) application timing on seedhead suppression of Innovation zoysiagrass in Manhattan, KS. Proxy was applied once on each treatment date at 5 fl. oz./1000 ft² from August through November in 2019. Percent seedhead suppression was determined as percentage of seedheads reduced compared to nontreated plots at a peak flowering stage in June 2020. Error bar represents standard error of the mean.

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