TURFGRASS RESEARCH
2016

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Evaluating Zoysiagrass-Tall Fescue Mixtures in Kansas

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Summary. Seeding zoysiagrass at 1 lb PLS/1,000 sq ft in June with subsequent seeding of tall fescue into established zoysiagrass in September at 8 lbs PLS/1,000 sq ft resulted in the best mixture of these two species.

Rationale. Water conservation is an increasingly important factor when selecting turfgrasses for use in the landscape. Zoysiagrass (*Zoysia japonica*), a warm-season grass, is more drought resistant than cool-season grasses. However, there is resistance on the part of homeowners, and some golf course managers, to use zoysiagrass due to its brown color when dormant.

Mixing zoysiagrass with a cool-season grass, such as tall fescue (*Lolium arundinacea*), to establish a perennial sward has several potential advantages. First, tall fescue enhances late fall and early spring color of the sward while zoysiagrass provides quality during periods of drought stress. In addition, a mixture will allow adaptation across a range of environmental conditions and enhanced resistance to biotic pests. Therefore, this mixture may provide a quality sward requiring reduced irrigation, fertilizer, and pesticide inputs compared to monostands of either species, but which also maintains acceptable visual color in autumn and early spring when zoysiagrass monostands exhibit a brown, dormant color.

Objective. Evaluate the effects of mowing height, and tall fescue seeding time and rate, on establishment of a perennial mixed sward with 'Compadre' zoysiagrass in Kansas.

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Study Description. A field study was initiated in July 2015 at the Rocky Ford Turfgrass Research Center in Manhattan, KS. Plots were arranged in a split-plot design, with mowing height (0.75 inches or 2 inches, representing fairway and lawn height, respectively) as the whole plot. Sub-plots consisted of timing and rate of tall fescue seeding. Whole plots measured 10 by 15 ft and were replicated four times. Sub plots were 5 by 5 ft and there were six sub-plot replicates within each whole plot. At Rocky Ford, 'Compadre' zoysiagrass was seeded in all plots at 1 lb PLS/1,000 sq ft on June 9, 2015. 'Corona' tall fescue was seeded at differing times and rates as the sub-plot treatments: 1) June, at the same time zoysiagrass was seeded; and 2) in September into the established stand of zoysiagrass. Data were collected on visual turf quality each week on a 1 to 9 scale (1 = poorest color, density, and uniformity; 6 = minimum acceptable quality; 9 = optimum color, density, and uniformity) and fall color (on a 1 to 9 scale, 1 = brown and 9 = dark green). Tall fescue incidence was determined in December, when zoysiagrass had lost all green color, by counting the presence of tall fescue under a 196-intersection grid that measured 4.6 × 4.6 ft with 10 cm between each of 14 gridlines in either direction (% tall fescue incidence = tall fescue frequency/196 × 100). Percentage of tall fescue cover in December was also determined using digital image analysis. All data were subjected to analysis of variance using the GLIMMIX procedure of SAS. Fisher's Protected LSD ($P \leq 0.05$) was used to detect treatment differences.

Results. A significant tall fescue seeding rate effect occurred on all rating dates and a significant mowing height × timing of seeding interaction occurred on most rating dates on turf color. Fall-seeded tall fescue mowed at 0.75 inches had better late fall and early spring color compared to other seeding time by mowing height treatment combinations (Table 1). Seeding tall fescue at 8 lbs PLS/1,000 sq ft provided better fall and spring color compared to other seeding rates (Table 1). A significant mowing height × timing of seeding interaction and a significant rate effect were observed on tall fescue incidence (%) and tall fescue cover (%). Seeding tall fescue in fall into zoysiagrass mowed at 0.75 inches resulted 51% tall fescue incidence on grid counts and 5.7% green cover for digital image analysis, respectively, the highest of all treatment combinations (Table 2). Tall fescue seeded at 8 lbs PLS/1,000 sq ft resulted in a higher percentage of tall fescue in the mixture than seeding at 2 or 4 lbs PLS/1,000 sq ft (45% of tall fescue incidence for grid counting and 7.8% green cover for digital image analysis, respectively) (Table 2).

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Table 1. Effect of the interaction of mowing height and tall fescue seeding time, and the main effect of tall fescue seeding rate on turf color in fall 2015 and spring 2016

	Turf color[†]							
Effect	Oct. 16	Oct. 30	Nov. 13	Nov. 20	Dec. 4	Jan. 1	Jan. 29	Feb. 27
Timing[‡§]								
June	7.1a	5.3a	3.0c	2.7c	2.4c	2.0b	1.3	1.5bc
September	6.5b	5.1a	4.4a	4.0a	4.2a	2.7a	1.3	1.7a
June	6.1b	4.1b	3.4b	2.9c	3.0b	2.8a	1.5	1.6ab
September	4.8c	3.5c	3.6b	3.5b	3.9a	3.0a	1.3	1.4c
Rate (lbs/1,000 sq ft)								
2	5.9b	4.1a	3.0c	2.7c	2.5c	2.2b	1.1b	1.8a
4	6.0b	4.3b	3.5b	3.1b	3.3b	2.4b	1.2b	1.4b
8	6.5a	5.1a	4.4a	3.9a	4.4a	3.2a	1.6a	1.8a

[†] Turfgrass color was rated on a 1 to 9 scale (1=yellow, 9=dark green).
[‡] Zoysiagrass and the June seeded tall fescue were seeded on 9 June, 2015, and the September seed tall fescue was seeded on September 17, 2015.
[§] There was a significant mowing heightseeding timing interaction and significant seeding rate effect on all the rating dates beside on 29 Jan. 2016. There was a significant seeding rate effect only on 29 Jan. 2016.
Within columns, means with the same letters are not significantly different ($P \leq 0.05$).
[¶] Plots were mowed at 0.75 inches three times weekly with a reel mower or 2 inches once weekly with a rotary mower.

Table 2. Effects of mowing height, time of seeding, and seeding rate on tall fescue incidence and percentage cover in December 2015

Effect	Tall fescue incidence (%)[‡]	Percentage cover[§]
Timing[†]	December 2015[§]	December 2015
June	15.0d	3.2b
June	23.8c	6.0a
September	51.1a	5.7a
September	34.4b	4.6ab
Rate[¶] (lbs/1,000 sq ft)		
2	19.9c	2.6c
4	28.0b	4.3b
8	45.2a	7.8a

[†] Zoysiagrass and the June seeded tall fescue were seeded on June 9, 2015, and the September seed tall fescue was seeded on September 17, 2015.
[‡] Percentage of tall fescue incidence was determined by counting the number of intersections under a 196-intersection grid (4.6 × 4.6 ft) at which tall fescue was present (% tall fescue incidence = tall fescue frequency/196 × 100).
[§] Percentage cover was determined by digital image analysis. Data were not normally distributed and were subject to an arcsin (*y/100*) transformation to normalize prior to analysis.
[¶] For both parameters, there was significant mowing height × seeding timing interaction and significant rate effect, means were averaged over the significant effect. Within columns, means with the same letters are not significantly different ($P \leq 0.05$).

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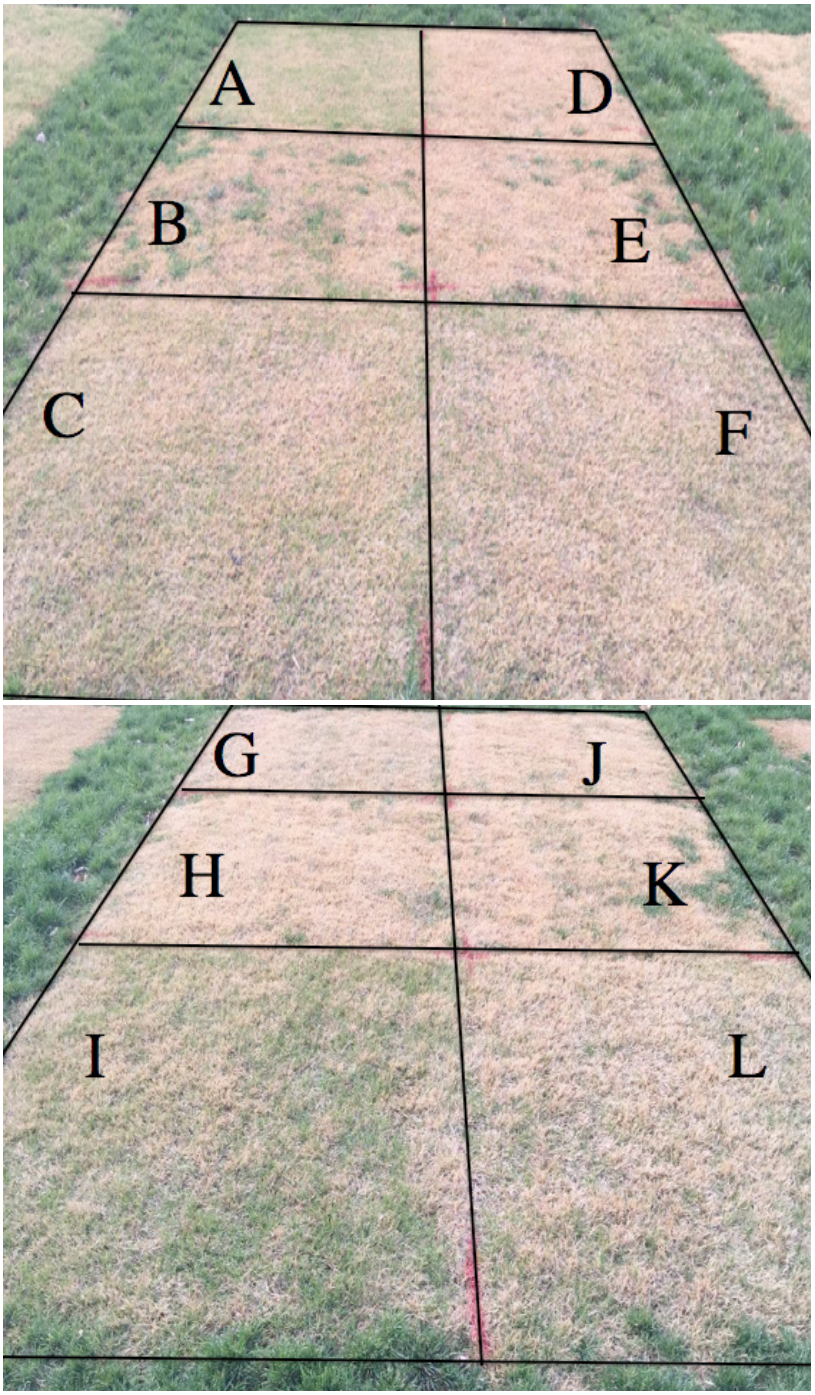

Figure 1. Study area at the Rocky Ford Research Center in Manhattan, Kansas on December 4, 2015. A-F at 0.75 inch mowing height. All plots seeded with 4lbs/1,000 sq ft in June. Tall fescue seeding: A) 8 lbs/1,000 sq ft in September; B) 8 lbs/1,000 sq ft in June; C) 4 lbs/1,000 sq ft in September; D) 2 lbs/1,000 sq ft in June; E) 4 lbs/1,000 sq ft in June; and F) 2 lbs/1,000 sq ft in September.
G-L at 2 inch mowing height. All plots seeded with 1 lb/1,000 sq ft zoysia in June. Tall fescue seeding: G) 2 lbs/1,000 sq ft in September; H) 2 lbs/1,000 sq ft in June; I) 8 lbs/1,000 sq ft in September; J) 1 lb/1,000 sq ft zoysia in June; 4 lbs/1,000 sq ft in June; K) 8 lbs/1,000 sq ft in June; and L) 4 lbs/1,000 sq ft in September.

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