Shade Effects on Athletic Field Playing Characteristics of Overseeded and Non-Overseeded Bermudagrass

INTRODUCTION. In many athletic stadiums around the world, reduced light levels from the stadium structure can significantly reduce turfgrass quality and playing characteristics. In most warm-weather stadiums, the primary surface is bermudagrass (*Cynodon dactylon*) which is commonly overseeded with perennial ryegrass (*Lolium perenne*) to provide a winter and spring playing surface.

OBJECTIVE. The objective of this study was to examine the effects of four shade levels on turfgrass quality and playing characteristics of overseeded and non-overseeded bermudagrass.

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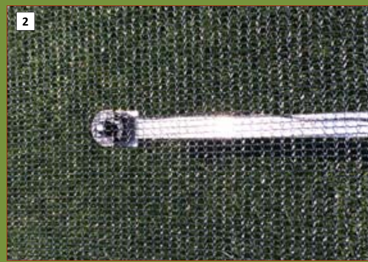

PHOTO 1. Moveable structures designed to impose various shade levels on plots.
PHOTO 2. PAR light sensors under various shade treatments.

MATERIALS AND METHODS

LOCATION - Arkansas Agricultural Research and Extension Center, Fayetteville, AR.

TURFGRASSES - 'Riviera' bermudagrass was overseeded with a perennial ryegrass blend in the fall of 2013.

MOWING - 3 times each week at 2.5 cm with clippings returned.

FERTILIZATION – Soluble nitrogen applied monthly at 5 g N m^{-2} to overseeded and non-overseeded plots. Rate of N for overseeded plots was reduced to 2.5 g N m^{-2} in July and August.

SHADE LEVEL: Four shade levels were tested in this trial, including a non-shaded control and shade treatments which blocked 30%, 60%, or 90% of ambient light (Photo 1). Photosynthetically-active radiation (PAR) was measured continuously under shade cloth (Photo 2) to determine daily light loads. PAR data is summarized in the following table:

% shade	April	May	June	July	Aug	Sep	Season AVG
	---------- Average PAR radiation (mol m^{-2} day) ----------						
0	41.9	44.9	43.6	49.9	51.9	38.0	45.0
30	25.8	29.7	30.1	33.0	34.3	26.2	29.9
60	15.0	17.0	16.5	18.5	19.2	14.4	16.8
90	4.1	4.7	4.7	5.2	5.3	4.1	4.7

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Photos 3-4, Canaway device to measure rotational resistance; Photos 5-6, TAFT device to measure horizontal and vertical force.

DATA COLLECTION

COVER DATA: Pictures were taken every week and analyzed using digital image analysis using SigmaScanPro software (Richardson et al., 2001).

ROTATIONAL RESISTANCE: Data collected using the Canaway method (Canaway and Bell, 1986). Data collected monthly with two data points per plot.

HORIZONTAL AND VERTICAL FORCE: Data collected using the Tennessee Athletic Field Tester (TAFT – Photo 5) one time in late July (Thoms et al, 2012). Three measurements were taken from each plot with Nike vapor talon hyperfuse shoe (Photo 6).

RESULTS AND DISCUSSION

COVER DATA

- **Non-overseeded plots:** Turfgrass coverage was similar for various shade treatments until mid-May (Figure 1). Shading effects became more obvious in June, with the 90% shade plots losing almost all cover and the 60% shade plots losing up to 40% cover through June and July. The 30% shade plots had a slight decline in turfgrass coverage although retained close to 90% coverage.
- **Overseeded plots**: The only shade treatment that caused a significant reduction in turfgrass coverage was the 90% shade treatment. The light saturation point for most cool-season grasses is approximately 50% of full sun, which allowed better coverage at low light.

ROTATIONAL RESISTANCE

- In both overseeded and non-overseeded plots, rotational resistance decreased even with modest levels of shade (Figure 2). This is likely due to a decrease in turfgrass density as the turf is shaded and could also be caused by an increase in succulence of the turf. Non-overseed plots had higher rotational resistance than overseeded plots due to more % of bermudagrass (data not shown).

HORIZONTAL AND VERTICAL FORCE

- Similar to rotational resistance, horizontal and vertical forces decreased under increasing shade.
- Non-overseeded plots produced more horizontal resistance than overseeded plots, but vertical force was unaffected by overseeding.

Literature Cited

Canaway, P. M., and M. J. Bell. 1986. Technical Note: An Apparatus for Measuring Traction and Friction on Natural and Artificial Playing Surfaces. J. Sports Turf Res. Inst. 62:p. 211-214.

Richardson, M. D., D. E. Karcher, and L. C. Purcell. 2001. Quantifying turfgrass cover using digital image analysis. *Crop Sci.* 41(6):p. 1884-1888.

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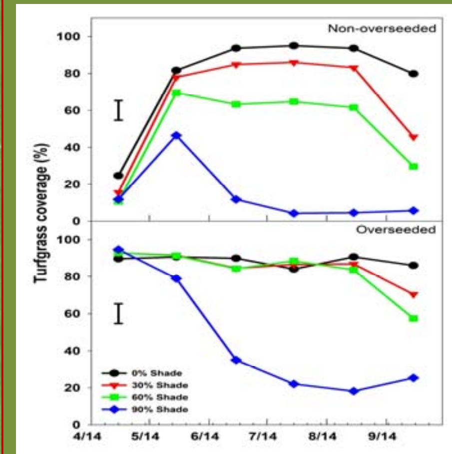

FIGURE 1. Turfgrass coverage over the 2014 growing season as affected by various shade levels. Error bar represents least significant difference between means (P=0.05).

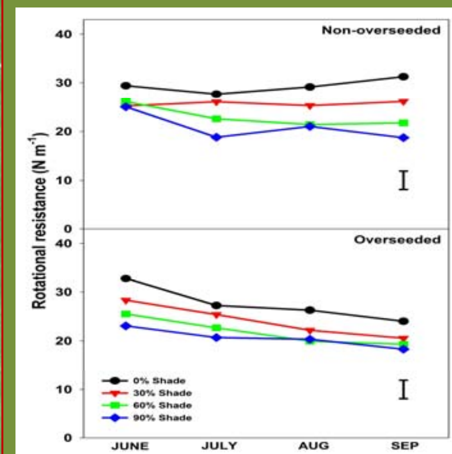

FIGURE 2. Rotational resistance over the 2014 growing season as affected by various shade levels. Error bar represents least significant difference between means (P=0.05).

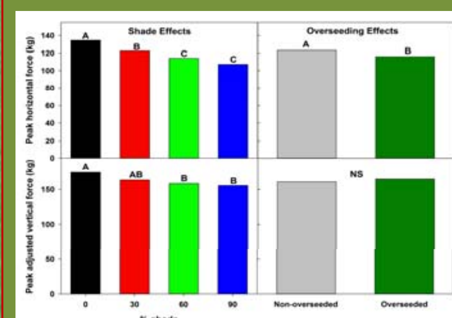

FIGURE 3. Vertical and horizontal forces, as affected by shade level and overseeding. Different letters within a chart represent significant differences in means using LSD (P=0.05)

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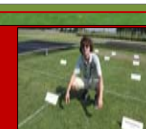

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