Seeding Rate Effects on the Quality and Traffic Tolerance of Overseeded Meadow Fescue and Tetraploid Perennial Ryegrass

Josh Summerford[1], Doug Karcher[1], Mike Richardson[1], Aaron Patton[2], and John Boyd[3]

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Photo by Josh Summerford

Overseeding trials at the University of Arkansas in Fayetteville

Summary. Overseeding is a common practice used by turf managers in the transition zone to provide actively growing, green turf surfaces during winter dormancy of warm-season grasses such as hybrid bermudagrasses. The most commonly used turf species for overseeding is perennial ryegrass due to its excellent turf characteristics and rapid establishment. Continued improvements in perennial ryegrasses have resulted in cultivars that persist into the summer and interfere with the spring green-up of bermudagrass. Two new turf species, meadow fescue and tetraploid perennial ryegrass, have demonstrated good turf characteristics in overseeding, as well as easier spring transition. Seeding rates for overseeding are commonly higher than the rates used for permanent turf; however, rates vary depending on the overseeding species because of growth habit and seed size. The objective of this study was to determine the optimum seeding rates for meadow fescue and tetraploid perennial ryegrass that optimize turf quality and traffic tolerance. Three seeding rates, comparable to recommended overseeding rates, were examined in this study. Moderate and high seeding rates provided similar turf quality and green turf coverage for each species. Low seeding rates produced the lowest turf quality and green turf coverage for each species. Meadow fescue was the least traffic tolerant of the three species producing the lowest green turf coverage. The medium and high seeding rates produced the most traffic tolerant turf, with the low seeding rate provided the lowest green turf coverage.

[1] University of Arkansas, Department of Horticulture, Fayetteville, Ark. 72701
[2] University of Arkansas, Cooperative Extension Service, Department of Horticulture, Fayetteville, Ark. 72701
[3] University of Arkansas, Cooperative Extension Service, Little Rock, Ark. 72204

The demand for year-round high quality sports turf surfaces has resulted in the practice of overseeding becoming more common at all levels of turf management. The most common turf species used in overseeding is perennial ryegrass (*Lolium perenne*). In the transition zone, overseeding is commonly done in the fall when bermudagrass (*Cynodon dactylon*, *C. dactylon* x *C. transvaalensis*) enters dormancy, and ideally the overseeded species will naturally die out in the spring when temperatures increase and bermudagrass breaks dormancy. In such cases, perennial ryegrass acts as an annual species; however, improvements in the heat tolerance of perennial ryegrass cultivars have increased the tendency of this species to behave as a perennial and persist late into the summer interfering with bermudagrass spring green-up (Horgan and Yelverton, 2001).

Currently, there are two solutions for the problem of overseeded perennial ryegrass persisting into the summer. An overseeding species with less heat tolerance, such as annual ryegrass (*Lolium multiflorum*), can be used but annual ryegrass produces inferior turf quality compared to perennial ryegrass. Alternatively, a spring application of herbicide to remove perennial ryegrass from the bermudagrass is a more expensive solution for species transition.

Recent breeding efforts have resulted in two species that have demonstrated turf quality characteristics similar to those of perennial ryegrass, but with a much earlier spring transition, potentially without the need for expensive chemicals (Richardson et al., 2007). Both tetraploid perennial ryegrass (*Lolium perenne*, 2n=4x=28) and meadow fescue (*Festuca pratensis*) have shown promise for use as overseeding species due to good turf quality and early spring transition (Richardson et al., 2007). Seeding rate is an important part of a successful overseeding, and seeding rates vary depending on which species is used. The objective of this research was to determine the effect of seeding rate on establishment and turf quality of these new species in the fall and on traffic tolerance the following spring.

Materials and Methods

This study was conducted at the University of Arkansas Research and Extension Center, Fayetteville, Ark., and replicated on two sites: a native Captina silt loam soil, and a silt loam with a 5-inch sand-capped layer. Diploid perennial ryegrass (cv. Integra), tetraploid perennial ryegrass (cv. T3), and meadow fescue (Expt. AMF29) were each seeded at three different seeding rates at both sites. The seeding rates were adapted to apply the same number of seeds per area for each of the three species, and were set at low, moderate, and high rates of 2400, 3150, and 3900 pure live seeds / ft^2 (9.5, 12.4, and 15.4 lbs. / 1000 ft^2 diploid ryegrass, 17.9, 23.4, and 28.9 lbs. / 1000 ft^2 tetraploid ryegrass, and 10.0, 13.0, and 16.1 lbs. / 1000 ft^2 meadow fescue). All plots were seeded on 20 September 2006. Turf quality and coverage ratings were taken bi-weekly beginning two weeks after planting. Traffic was applied weekly to half of each species x seeding rate plot at a rate of three passes per week, beginning 21 March 2007, using a Cady Traffic Simulator, which simulates the forces of a football game on the turf surface (Henderson et al., 2005). Traffic tolerance was assessed by evaluating green turf cover using digital image analysis, one week after each traffic application (Richardson et al., 2001).

Results and Discussion

Turf quality. Turf quality was significantly affected by overseeding species and seeding rate at the soil site (Fig. 1). The low seeding rate produced lower turf quality than the moderate and high seeding rates during the first six ratings of the study, with the exception of the third rating. In January, the low and moderate seeding rates had lower quality compared to the high rate; however, by mid-February all seeding rates produced similar turf quality.

Species had a greater effect on turf quality throughout the fall and winter evaluations than seeding rate. Tetraploid ryegrass was the earliest to germinate and produced the highest turf quality at two weeks after planting at the soil site (Fig. 1). By six weeks after planting, all three species produced similar turf quality. Throughout the remainder of the study meadow fescue produced lower turf quality than both tetraploid perennial ryegrass and diploid perennial ryegrass, which were similar. The decline in quality of meadow fescue was due to a loss of green color during extended cold periods, demonstrating a lack of cold tolerance compared to the perennial ryegrass. Species and seeding rate affected quality similarly at the sand site (data not shown).

Turf cover. On the soil site, seeding rate did not affect turf coverage on the untrafficked plots, with the exception of the first evaluation date (Fig. 2), where differences were present although the differences in coverage were small (< 5%). The trafficked plots decreased in turf coverage at the low seeding rate from mid-April through early May (Fig. 2). On average, trafficked turf at the low seeding rate had 10% lower turf coverage from mid-April through early May than the medium and high seeding rates, which were similar. Seeding rate did not affect turf coverage under trafficked conditions at the sand site (data not shown) likely because sand is more resistant to compaction.

The turf coverage in trafficked plots was affected more by overseeding species than seeding rate, with meadow fescue showing the least tolerance to traffic at the soil site (Fig. 3). Diploid perennial ryegrass produced the highest turf coverage throughout the study when the turf was trafficked. Tetraploid perennial ryegrass provided the next highest turf cover, and was similar to diploid ryegrass throughout most of the study, except for one evaluation date in mid-April. Meadow fescue was the least tolerant species to traffic providing less than 80% turf coverage for five of the evaluation dates and even dropping below 50% turf coverage at the 16 April evaluation date. The untrafficked plots had near 100% turf coverage throughout the spring evaluations, with the exception of mid-April when temperatures dropped below 20°F and leaf senescence reduced green turf coverage. On that date, meadow fescue had significantly less coverage than the ryegrasses. Turf coverage was similar at the sand site (data not shown).

Moderate and high seeding rates produced higher turf quality and cover for all three species throughout the study compared to the low seeding rate. Therefore, the low seeding rate should be avoided, especially for turf areas that will be subjected to traffic. This study also demonstrated that the amount of traffic and cold tolerance should both be considered when selecting an overseeding species. Tetraploid ryegrass is much more traffic and cold tolerant than meadow fescue; however if traffic and cold stress are not anticipated then meadow fescue may be a viable option.

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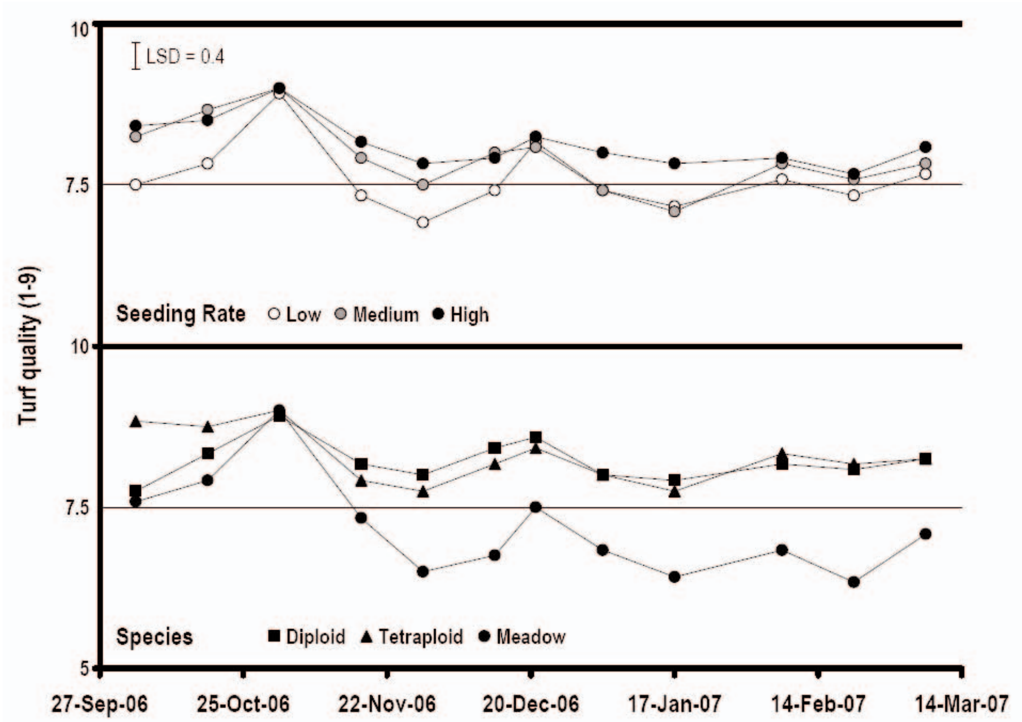

Fig. 1. Turf quality of overseeded species as affected by seeding rate (top) and species (bottom) at a soil site. Error bar represents Fisher's least significant difference value ($\alpha = 0.05$), within dates.

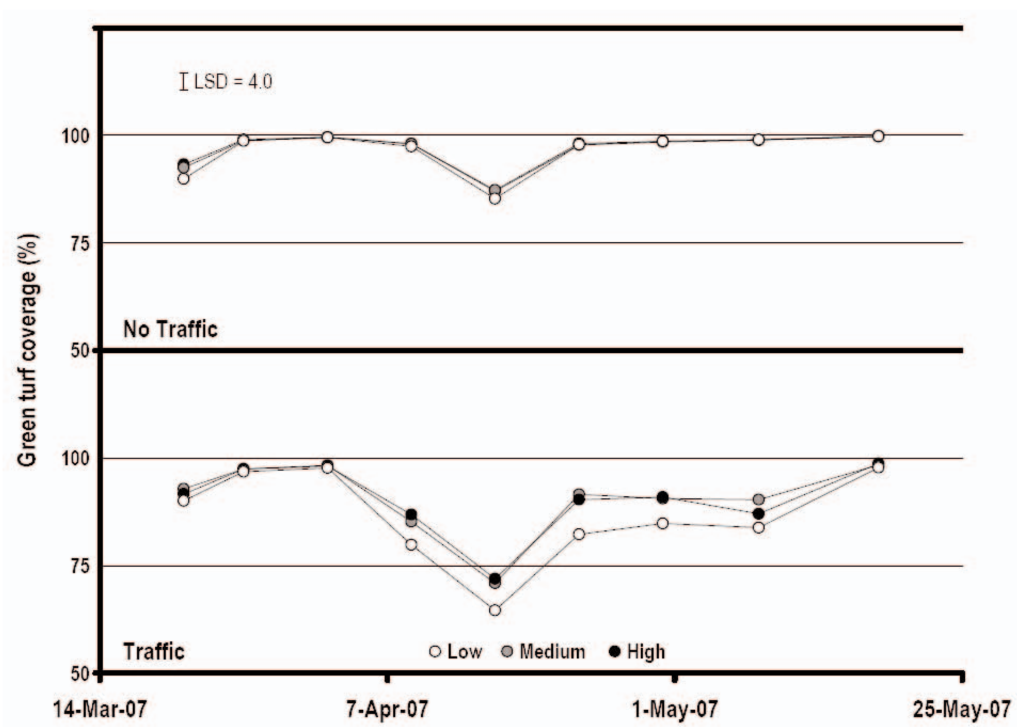

Fig. 2. Turf coverage as affected by seeding rate for trafficked (bottom) and non-trafficked (top) turf at a soil site. Error bar represents Fisher's least significant difference value ($\alpha = 0.05$), within dates.

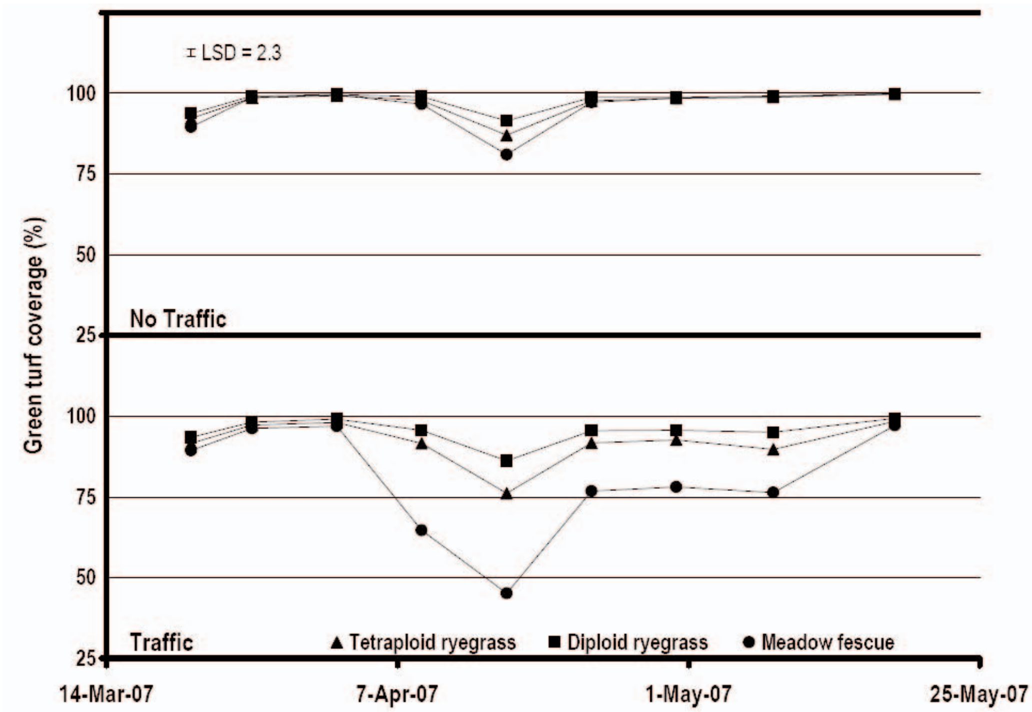

Fig. 3. Turf coverage as affected by overseeding species rate for trafficked (bottom) and non-trafficked (top) turf at a soil site. Error bar represents Fisher's least significant difference value (α = 0.05), within dates.