Improving

bermudagrass fall traffic tolerance and spring recovery through fall fertilization

BERMUDAGRASS is considered one of the most desired turfgrass species for athletic field use in the United States. Bermudagrass's aggressive growth habit of stolons and rhizomes offers stability and traffic tolerance to maximize player performance with the ability to recuperate from wear stress. Mostly grown in the southern half of the United States, bermudagrass growth north of the transition zone is limited by cold winters. However, with improved cold tolerant cultivars, bermudagrass management in the transition zone and north is becoming more common. When grown in colder climates the bermudagrass enters dormancy sooner, meaning that if a green turf is desired, the field must be overseeded with ryegrass.

Bermudagrass traffic tolerance and outstanding recuperative ability during its active growing periods have allowed bermudagrass athletic fields to become multi-sport facilities. The intensive use of these fields increases the importance of proper cultural practices such as irrigation, cultivation, pest management, and fertilization to obtain maximum bermudagrass performance. Nitrogen (N) fertilization is especially important in order to optimize bermudagrass growth. A typical bermudagrass fertilization program includes N applications up to one pound of soluble N per 1000 square feet per active growing month. Research has shown this amount of N can supply bermudagrass with adequate nutrients without losing valuable resources to the environment during these active growing periods. But what about fall N fertilization applied outside the optimal windows of application to bermudagrass? Can it improve fall traffic tolerance and spring recovery of bermudagrass athletic fields?

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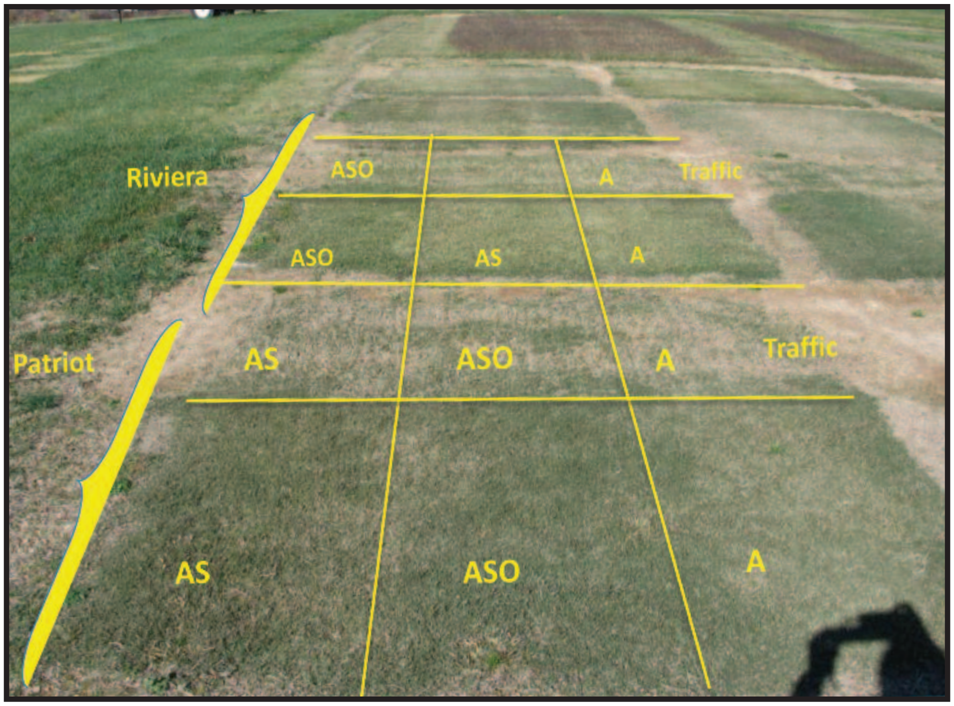


▲ **PICTURE TAKEN OCTOBER 29, 2010.** Two months after traffic initation and one month after last fertility application.

RESEARCH METHODS

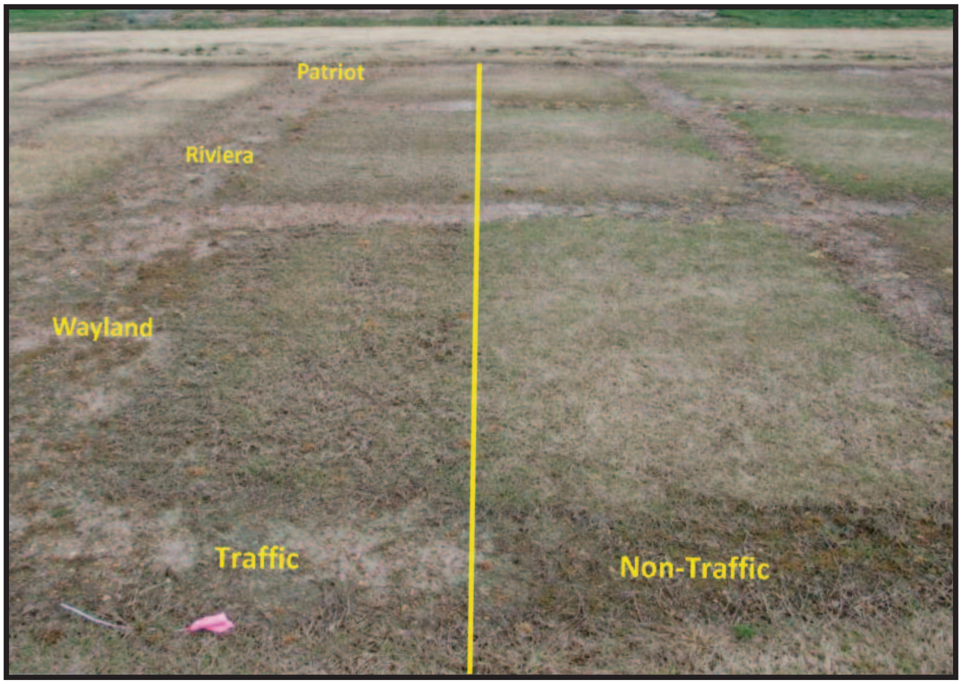
The research was initiated in June 2010 at Virginia Tech's Turfgrass Research Center using plots established by sprigging Patriot, Riviera, and Wayland bermudagrass. Patriot and Riviera are both commercially available cultivars, while Wayland is an experimental ecotype selected at Virginia Tech for its rapid spring green-up and spring dead spot tolerance. The research has continued into 2013. Irrigation was applied to promote active growth; the plots were mowed three times weekly at 1.25 inches, and N (urea, 46-0-0) was applied at 1 lb N/1000ft2 per month on the first day of June, July, and August. The fall fertilization treatments extended N applications into September and October resulting in a possible total of 5 lbs N/1000 sq ft for the season (October fertilization treatments are split into two ½ lb N/1000 sq ft applications on 2 week intervals in case a killing frost event might negate an application). Beginning on approximately August 30 of

	% turfgrass cover							
	------------18 Oct. 2010------------				-------------1 Nov. 2010--------------			
	A	AS	ASO	LSD	A	AS	ASO	LSD
Traffic	67.1b *	73.0a *	75.4a *	2.9	70.8b *	77.5a *	77.5a *	2.9
No Traffic	100	100	100	-	100	100	100	-
Means within the same row and measurement date followed by the same letter are not significantly different at p = 0.05.								
Means within the same column and measurement date separated by a * are significantly different at p = 0.05.								

▲ **Table 1: VISUAL PERCENT TURFGRASS COVER RATINGS** of three bermudagrasses as influenced by traffic and fall N fertilization programs (Aug (A), Aug+Sept (AS), or Aug+Sept+Oct (ASO)) in their establishment year.

	% bare ground							
	---12 April 2011---							
	'Wayland'	'Riviera'	'Patriot'	LSD	A	AS	ASO	LSD
Traffic	34.2a *	31.3a *	20.8b *	6.7	34.2a *	25.8b *	26.3b *	6.7
No Traffic	0	0	0	-	0	0	0	-
Means within the same row and measurement variable followed by the same letter are not significantly different at p = 0.05.								
Means within the same column and measurement variable separated by a * are significantly different at p = 0.05.								

▲ **Table 2: VISUAL PERCENT BARE GROUND RATINGS** of trafficked and non-trafficked bermudagrasses ('Wayland', 'Riviera', and 'Patriot') prior to spring greening as influenced by fall N fertilization programs (Aug (A), Aug+Sept (AS), or Aug+Sept+Oct (ASO)) or cultivar in their establishment year.



▲ **PICTURE TAKEN APRIL 12, 2011** during spring green-up illustrating the percent bare ground of the trafficked plots as compared to the non-trafficked plots. 'Patriot' had less bare ground than the other two cultivars.

each year, simulated traffic was applied at a level of six events per week using a Brinkman traffic simulator, with traffic ending during the first week of November in order to simulate a typical fall high school football schedule.

The lower bare ground ratings of fall fertilization will also lead to faster spring green-up and recovery, allowing for a longer active growth period to increase traffic tolerance for the upcoming sports season.

RESULTS

Establishment year data will be emphasized for this report. Rate of establishment was monitored by tracking visual percent turfgrass cover throughout the weeks following establishment. Two weeks after planting in June 2010, Patriot achieved 50% coverage whereas the other two cultivars had not reached 40% coverage. All grasses reached 95% or greater turfgrass cover by August 6, with Patriot covering the quickest, followed by Riviera and Wayland. The establishment rate of Patriot gives it an advantage over the other two cultivars because Patriot will have time to form a dense canopy to better withstand the fall traffic. This was shown to be true by percent turfgrass cover ratings taken on October 18, 6 weeks after initial traffic treatment. Percent turf cover of trafficked plots was significantly higher in Patriot than Riviera which was significantly higher than Wayland. Compared to the 100% covered non-trafficked plots, trafficked Patriot had 75.8%, Riviera had 72.5%, and Wayland had 67.1% coverage. Patriot tolerated more traffic in its first growing season, suggesting it would be the premier choice for high-use fields during the first football season. The greater traffic tolerance of Patriot compared to the other grasses is further supported by visual percent bare ground ratings prior to spring green-up. Data taken April 12 show Patriot to have significantly less bare ground than Riviera and Wayland which both had greater than 30% bare ground. Even though Patriot has less bare ground in early spring, Wayland and Riviera greened up faster throughout spring until late spring where there were no differences.

The fall fertilization treatments did not yield the same distinct treatment differences as reported for the various cultivars shown. Table 1 shows visual percent turf cover of the three cultivars influenced by traffic and fall nitrogen fertilization programs. Percent turfgrass cover of trafficked September-ending and October-ending fertilization plots was similar on ratings taken 6 and 8 weeks after initial traffic treatment. However, on both the rating dates, the extended fertilization showed significantly higher percent coverage than the August-ending fertilization. These findings suggest applying fall N will increase fall traffic tolerance. Spring turf density was also increased from fall nitrogen applications due to the significantly lower bare ground percentages in early spring. Both September and October-ending fertilization events decreased to below 27% bare ground, whereas the August-ending fertility treatment had greater than 34% bare ground (Table 2).

The lower bare ground ratings of fall fertilization will also lead to faster spring green-up and recovery, allowing for a longer active growth period to increase traffic tolerance for the upcoming sports season. Extended fertilization provided benefits that persisted beyond the current season.

As the research has continued on what are now well-established plots, the degree of treatment responses from the fall fertilization is somewhat less as compared to the establishment year. There are still recorded differences in turf density in the fall and spring rating periods, but the genetic differences in the cultivars result in differing greening and growth rates exceeds the treatment responses due to the fall fertilization. We recommend that transition zone managers strive to keep bermudagrass actively growing as long as they can in the late growing season, but that they use lower levels and split applications of N so that the nutrient is used efficiently and there is little potential for nutrient leaching or runoff.

Establishment and overall growth rates/traffic tolerance are ranked Patriot > Riviera > Wayland. Extending N fertilization treatments into September and October increased fall percent turfgrass cover in trafficked plots for all cultivars, decreased early spring bare ground ratings, and accelerated spring greening. While all three cultivars tend to have better fall and spring turf coverage ratings from extended fall fertilization, the differences in traffic tolerance seem to be more related to differences in inherent growth rates and turf density than fertilization treatments as the plots mature. ■

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