

Effects of Smooth Crabgrass and White Clover Populations in Athletic Turfgrass Under Simulated Traffic

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Smooth crabgrass (*Digitaria ischaemum*) and white clover (*Trifolium repens*) both are undesirable plant species that consistently infest cool-season athletic fields. Both species are considered weeds and have been shown to reduce the quality of turfgrass within athletic fields, which in turn increases the risk for athlete injury. The most common control method for smooth crabgrass and white clover involves separate applications of pre- and post-emergent herbicides, respectively. The use of herbicides within an athletic turf environment is an effective method for weed control, however, this requires increased input costs, a reentry time in many cases, and increases the risk of damaging the turfgrass in some weather conditions. The objective of this experiment is to understand the effects of varying populations of both smooth crabgrass and white clover to provide athletic turfgrass managers a better understanding of when to apply a control measure to ensure turfgrass quality and athlete playability.

Materials and Methods

Research was conducted at the Iowa State University Horticulture Research Station, Ames, Iowa, on an established Kentucky bluegrass [KBG; *Poa pratensis* L.] athletic field turfgrass stand on a native soil (Webster clay loam). Experimental units were 42-25 ft.² plots. Treatments were assigned based upon 1 m² grid sampling of white clover and smooth crabgrass within each plot area. Treatments were grouped into high (over 70% white clover or crabgrass weed species present), medium (35-60% weed species present), and low (20-30% weed species present) as well as a monostand of KBG as a control. The experimental area was maintained at a 2 in. height of cut (mowed twice per week) and received irrigation as needed to avoid drought stress. Fertility was applied monthly (May-October) at 0.5 lbs. of N/1000² using a 28-0-3 granular fertilizer. A modified Baldree Athletic Field Traffic Simulator was used to apply 20 simulated traffic events (STE; three times per week) between August 23 and October 5. Weed populations were recorded weekly through a 1m² grid with 64 intercepts. After every fifth traffic event, athletic field performance and safety was evaluated within each plot area. Field performance was quantified by measuring percent green cover through the use of digital image analysis. Athletic safety was quantified through surface hardness, shear strength, and volumetric soil moisture. Soil porosity and bulk density were evaluated before and after simulated traffic occurred. After the 20 STEs, turfgrass visual quality was examined in each plot area on a scale of 1-9, with 9 being the best and 1 being the worst. Data were analyzed with Proc Mixed and subjected to ANOVA. Means were separated with Fisher's LSD at the P=0.05 level of significance.

Results and Discussion

Percent green cover data still is being analyzed from the 2021 fall simulated traffic season and is not presented. There were no differences between rating dates for rotational resistance (shear), surface hardness (CIST), and visual quality ratings; as a result, the data was pooled. No differences between treatments were detected for rotational resistance (Table 1). All of the surface hardness values for the plots containing crabgrass were above the NFL 100 GMAX limit, as was the plot containing white clover above 70%. This indicates the NFL would not allow a game to be

played on these surfaces due to the surface hardness without some remediation to the surface. Visual quality of the mono-stand of KBG was higher than any of the weed containing plots. While it is too early to draw a conclusion from this data, it does indicate that plots containing weeds had a lower quality and higher surface hardness than the weed-free plots.

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Table 1. Athletic field safety parameters including rotational resistance (shear), surface hardness (Clegg Impact Surface Tester; GMAX), and visual plot quality rating (1-9 scale) measured for various weed populations under simulated traffic in 2021.

Treatment	Shear (Nm)	CIST (GMAX)	Plot Rating (1-9)
Control (mono-stand Kentucky bluegrass)	27	99	5.3
High Clover (over 70% leaf cover)	27	104	2.8
Medium Clover (35-60% leaf cover)	26	100	3.0
Low Clover (20-30% leaf cover)	27	90	3.2
High Crabgrass (over 70% leaf cover)	27	102	3.4
Medium Crabgrass (35-70% leaf cover)	28	102	3.6
Low Crabgrass (20-30% leaf cover)	27	104	3.7
LSD _(0.05) ^a	NS ^b	NS	0.8

^aPercent green cover is the average quality rated monthly with digital image analysis on a 0-100 scale.

^bMeans were separated using Fisher's LSD.