Evaluation of Humic Fertilizers on Kentucky Bluegrass Under Simulated Traffic

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Introduction

Athletic field safety is a primary concern for turfgrass managers. Having a successful fertility program is one tool to help ensure field safety. Adequate nutrition promotes turf growth and density, which improves playing conditions and field safety. Humic substances are organic compounds that can improve plant and soil health. Manufacturers of humic products claim many benefits to turfgrass such as improved stress tolerance and improved soil structure. The objective of this study is to evaluate turfgrass performance and recovery to simulated traffic after being fertilized with humic containing products.

Materials and Methods

Research was conducted at the Iowa State University Horticulture Research Station, Ames, Iowa, on Kentucky bluegrass (*Poa pratensis* L.) on a native soil athletic field. Turf was maintained at a 2-in. mowing height and received irrigation as needed.

The experimental design was a randomized complete block with four replications. Treatments included humic coated urea (HCU), poly-coated humic-coated urea (PCHCU), 22-0-4 w/black gypsum (BG; 4 apps.), 22-0-4 w/BG (2 apps.), BG, Uflexx (stabilized nitrogen fertilizer), XCU (slow-release fertilizer), Urea, and a nontreated control (Table 1). Traffic was applied with a modified Baldree Traffic Simulator. Plots received three traffic events per week starting July 29, 2019 and 2020. Traffic continued until 25 traffic events were applied each year.

Data collection included percent green cover, dark green color index (DGCI), surface hardness, volumetric water content, and shear strength. Digital images were collected using a light box and a digital camera. Digital image analysis was performed to get percent green cover and DGCI. Surface hardness was collected using a 2.25 kg Clegg Impact Soil Tester. Soil volumetric water content was measured using a FieldScout TDR Meter with 3-in. probes. Shear strength was measured using a Turf-Tec Shear Tester. All data were analyzed using SAS at the 0.05 level of significance and means separated with Fisher's LSD (least significant difference). Regression analysis was performed on percent green cover over traffic events to obtain estimates of slopes and intercepts for each treatment. Contrast was used to compare the slopes and intercepts of each treatment with the nontreated.

Results and Discussion

There was no treatment effect on volumetric water content, surface hardness, and shear strength (data not shown). A significant year by treatment by traffic event interaction occurred for percent green cover during the traffic portion of the study, data were analyzed by linear regression (Table 2). In 2019, XCU was the only treatment to have a lower percent green cover loss event^{-1} relative to the nontreated. In 2020, no treatment slopes or intercepts differed from the nontreated. A significant year by treatment interaction occurred for percent green cover during the recovery portion of the study (Table 3). Overall, in 2019, XCU had the highest percent green cover after traffic was concluded. In 2020, 22-0-4 w/BG (4 apps.) and urea had a greater percent green cover compared with the nontreated. No other treatment was different than the nontreated.

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Table 1. List of fertilizer treatments, application rates, and application timings in 2019 and 2020, Ames, Iowa.

Treatment	Application rate	Application timing
Humic coated urea	1 lb N 1,000 sq. ft^{-1}	April, May, Sept., Oct.
Poly-coated humic-coated urea	1 lb N 1,000 sq. ft^{-1}	April, May, Sept., Oct.
22-0-4 w/black gypsum (BG; 4 apps.)	1 lb N 1,000 sq. ft^{-1}	April, May, Sept., Oct.
22-0-4 w/BG (2 apps.)	1 lb N 1,000 sq. ft^{-1}	April, Sept.
BG	3 lb BG 1,000 sq. ft^{-1}	April, May, Sept., Oct.
Uflexx	1 lb N 1,000 sq. ft^{-1}	April, May, Sept., Oct.
XCU	1 lb N 1,000 sq. ft^{-1}	April, May, Sept., Oct.
Urea	1 lb N 1,000 sq. ft^{-1}	April, May, Sept., Oct.
Nontreated	-	-

Table 2. Effect of various fertilizers on Kentucky bluegrass percent green cover under simulated traffic applied with a modified Baldree traffic simulator with three traffic events week^{-1} in 2019 and 2020, Ames, Iowa.

Treatment	2019		2020	
	Slope	Intercept	Slope	Intercept
	PGC[1] loss event^{-1}	PGC[2]	PGC[1] loss event^{-1}	PGC
Humic coated urea (HCU)	-3.6	104.0	-3.6	95.5
Poly-coated humic-coated urea (PCHCU)	-3.3	102.8	-3.8	96.7
22-0-4 w/black gypsum (BG; 4 apps.)	-3.4	105.5	-3.6	94.9
22-0-4 w/BG (2 apps.)	-3.4	103.6	-3.7	95.3
BG	-3.2	102.4	-3.5	91.8
Uflexx	-3.6	105.0	-3.7	95.9
XCU	-2.5	103.7	-3.9	95.6
Urea	-3.3	104.6	-3.6	99.0
Nontreated	-3.4	100.6	-3.7	92.9
	Contrast			
HCU vs nontreated	NS[3]	NS	NS	NS
PCHCU vs nontreated	NS	NS	NS	NS
22-0-4 w/BG (4 apps.) vs nontreated	NS	NS	NS	NS
22-0-4 w/BG (2 apps.) vs nontreated	NS	NS	NS	NS
BG vs nontreated	NS	NS	NS	NS
Uflexx vs nontreated	NS	NS	NS	NS
XCU vs nontreated	**	NS	NS	NS
Urea vs nontreated	NS	NS	NS	NS

**Significant at the 0.01 probability level.
[1]PGC, percent green cover.
[2]Percent green cover was determined with digital image analysis.
[3]NS, nonsignificant.

Table 3. Effect of various fertilizers on Kentucky bluegrass percent green cover after simulated traffic applied with a modified Baldree traffic simulator with three traffic events week^{-1} in 2019 and 2020, Ames, Iowa.

Treatment	2019	2020
	%	%
Humic coated urea	20.3[1]	30.1
Poly-coated humic-coated urea	25.6	27.3
22-0-4 w/black gypsum (BG; 4 apps.)	24.8	34.7
22-0-4 w/BG (2 apps.)	21.6	29.8
BG	24.8	25.1
Uflexx	20.7	26.7
XCU	43.3	30.0
Urea	28.8	36.9
Nontreated	19.2	21.2
$LSD_{0.05}$	**9.7**	**10.3**

[1]Percent green cover was determined with digital image analysis.