

Evaluation of Humic Fertilizers on Kentucky Bluegrass Soil Health

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Introduction

Improving soil health has gained popularity over recent years. Humic substances are organic compounds that have been shown to improve nutrient availability for plant absorption, increase soil water holding capacity, and increase cation exchange capacity of soils. There are many claims of the benefits of humic products on turfgrass, which include a better-developed root system, improved stress tolerances, increased nutrient uptake and efficiency, improved soil structure, and increased effectiveness of fertilizers. However, minimal research has been conducted to substantiate these claims. The objective of this study is to evaluate soil health parameters of a native soil turfgrass fertilized with humic substances. This is part of the first year of a two-year study.

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. Turf was maintained at a 3-in. mowing height and received irrigation as needed.

The experimental design was a randomized complete block with three replications. Fertilizer treatments included 22-0-4 w/black gypsum; poly-coated humic-coated urea (PCHCU-two rates); urea + humic dispersing granules (HDG-two rates); urea; Uflexx (stabilized nitrogen fertilizer); HDG; and a nontreated control (Table 1).

Soil parameters measured included microbial biomass, phosphorus and potassium concentrations, pH, cation exchange capacity (CEC), percent organic matter, volumetric water content, and soil compaction. Microbial biomass was determined using the fumigation-extraction method. Microbial biomass carbon and microbial biomass nitrogen were measured using a Shimadzu TOC analyzer. Turfgrass visual quality (1–9, 6 minimally acceptable) was collected biweekly April–October 2019. Phosphorus and potassium concentrations, pH, CEC, and organic matter was determined by sending soil samples to Solum, Inc. (Ames, Iowa). Soil volumetric water content was collected using a FieldScout TDR Meter with 3-in. probes. Soil compaction was determined using a Turf-Tec Penetrometer. All data was analyzed using SAS at the 0.05 level of significance and means separated with Fisher's LSD (least significant difference).

Results and Discussion

Minimal differences occurred in the first year of the study. There was no treatment effect on volumetric water content and soil compaction (data not shown). No differences were found between treatments for phosphorus and potassium concentrations, pH, CEC, or organic matter (Table 2). All treatments that received nitrogen had higher visual turf quality. Applications of HDG alone did not improve turf quality relative to the nontreated.

Treatments will be repeated over two years. Additional analysis will occur after data from the second year have been collected.

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Table 1. List of fertilizer treatments, application rates, and application timing, ISU Horticulture Research Station.

Treatment	Application rate	Application timing
22-0-4 w/black gypsum	1 lb N 1,000 sq ft ⁻¹	April, May, September, October
Poly-coated humic-coated urea (PCHCU)	1 lb N 1,000 sq ft ⁻¹	April, May, September, October
PCHCU	0.75 lb N 1,000 sq ft ⁻¹	April, May, September, October
Urea + humic dispersing granules (HDG)	0.75 lb N 1,000 sq ft ⁻¹ + 0.92 lb HDG 1,000 sq ft ⁻¹	April, May, September, October
Urea + HDG	0.50 lb N 1,000 sq ft ⁻¹ + 0.92 lb HDG 1,000 sq ft ⁻¹	April, May, September, October
Urea	1 lb N 1,000 sq ft ⁻¹	April, May, September, October
Uflexx	1 lb N 1,000 sq ft ⁻¹	April, May, September, October
Humic DG	0.92 lb HDG 1,000 sq ft ⁻¹	April, May, September, October
Nontreated	-	-

Table 2. Effect of various fertilizers on soil parameters and visual quality of Kentucky bluegrass, ISU Horticulture Research Station.

Treatment	Phosphorus ¹	Potassium	pH	CEC	Organic matter	Visual quality ²
	ppm	ppm		cmol _c kg ⁻¹	%	
22-0-4 w/black gypsum	23.6 ³	148.2	6.9	18.2	5.1	7.5 ⁴
Poly-coated humic-coated urea (PCHCU)	20.8	119	7.0	17.6	5.2	7.4
PCHCU	20.2	127.4	7.0	17.3	5.0	7.1
Urea + humic dispersing granules (HDG)	18.4	129.5	6.9	17.2	4.9	7.2
Urea + HDG	18.7	125	7.0	17.4	4.9	7
Urea	19.0	129.2	6.9	18.7	5.0	7.1
Uflexx	21.7	129.8	7.0	18.6	5.0	7.2
Humic DG	22.4	144.9	7.0	18.6	4.8	5.9
Nontreated	20.2	143.3	7.0	17.8	4.8	5.5
LSD _{0.05}	NS ⁵	NS	NS	NS	NS	0.3

¹Soil samples collected May 13, 2019 (after one fertilizer application) and October 31, 2019 (end of field season). Phosphorus and potassium concentrations, pH, cation exchange capacity (CEC), and organic matter values determined by Solum, Inc. (Ames, Iowa).

²Visual quality ratings (1–9, 6 minimally acceptable) taken biweekly April–October.

³No interaction between sampling date and treatment effect, means are pooled across dates.

⁴Means are pooled across rating dates.

⁵NS = nonsignificant.