Evaluation of Algae-Based Fertilizers on Kentucky Bluegrass Quality and Soil Health

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Sustainable turfgrass management practices have gained popularity over recent years. Algae has been used to effectively remove and recover nutrient from wastewater. The algae then can be harvested and processed into a sustainable, natural, organic fertilizer. In addition to sustainable management practices, there also has been an interest in improving soil health. Improving soil health can enhance soil structure and water holding capacity, and increase nutrient availability. The components of soil health can be broken down into three categories: physical, chemical, and biological. The objective of this study was to evaluate Kentucky bluegrass *(Poa pratensis L.)* quality and soil health parameters fertilized with an algae-based product.

Materials and Methods

Research was conducted at the Iowa State University Horticulture Research Station in Ames, Iowa. The Kentucky bluegrass was established 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: algae + cellulosic filler (blended), Milorganite, and a non-treated control. The blended and Milorganite were applied at 1 lb. N per 1000 ft. in August, September, and October.

Turfgrass visual quality (1-9, 6 minimally acceptable) was collected weekly starting at the time of the first fertilizer application. Digital images also were collected weekly and analyzed using Turf Analyzer to obtain percent green cover and dark green color index (DGCI). Volumetric soil moisture was measured weekly using a FieldScout TDR Meter with 3 in. probes. Soil samples were collected at the end of the field season to determine nutrient concentrations, pH, CEC, and organic matter (SureTech Laboratories). Soil cores were collected two weeks after the first fertilizer application and at the end of the field season to measure potentially mineralizable carbon (PMC), which is a way to quantify soil microbial activity. PMC was determined by measuring the CO_2 produced through a soil incubation. The CO_2 concentration was determined using a LiCor-830 CO_2 analyzer (Lincoln, Nebraska). All data was analyzed using SAS at the $P \leq 0.05$ level of significance and means separated with Fisher's LSD (least significant difference).

Table 1. Effects of an algae-based fertilizer on a native soil Kentucky bluegrass percent green cover (PGC), soil phosphorus (P) and potassium (K) concentrations, pH, organic matter (OM), cation exchange capacity (CEC), and potentially mineralizable carbon (PMC).

Treatment[a]	PGC[b]	P[c]	K	pH	OM	CEC	PMC[d]
	%	mg kg^{-1}	mg kg^{-1}		%	$cmol_c$ kg^{-1}	mg CO_2-C kg^{-1}
Blended	92.2	18.7	79.3	7.1	4.1	12.4	222.2
Milorganite	92.5	16.7	84.0	7.1	4.1	13.7	204.9
Nontreated	84.6	11.7	78.7	7.0	4.3	11.7	243.8
$LSD_{(0.05)}$[a]	1.7	4.1	NS[f]	NS	NS	NS	37.1

[a]Treatments were applied at 1 lb. N per 1000 ft.[2] in August, September, and October.
[b]PGC was determined using digital image analysis.
[c]Soil P, K, pH, OM, CEC were determined by soil test conducted by SureTech Laboratories.
[d]PMC was determined by measuring the CO[2] production during a 14-day soil incubation.
[e]Treatment mean comparisons were separated using Fisher's protected least significant difference (LSD).
[f]NS, nonsignificant at the 0.05 probability level.

Results and Discussion

Significant differences occurred between treatments for visual turfgrass quality (data not shown), volumetric soil moisture (data not shown), percent green cover, PMC, soil phosphorus (P) concentrations (Table 1). No differences were found between treatments for soil potassium concentrations, pH, cation exchange capacity, and organic matter (Table 1). Overall, blended and Milorganite had increased turfgrass quality, percent green cover, and soil P concentrations.

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