DETERMINING THE IMPORTANCE OF LEAF COMPOST TOPDRESSING WHEN MANAGING ATHLETIC FIELDS ORGANICALLY

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Introduction

Effective July 1, 2010, the state of Connecticut banned the usage of all lawn care pesticides on athletic fields at public and private schools grades pre-K through 8. Currently, the research-based information regarding compost topdressing on athletic fields is limited. Topdressing athletic fields with spent mushroom substrate (SPS) has been evaluated showing many positive impacts such as an increase in percent ground cover after wear, decreased bulk density, increased water retention, and decrease surface hardness (McNitt et al. 2004). However, composts can vary greatly and no research based information exists regarding topdressing leaf composts on athletic fields. Additionally, research on compost topdressing applications to soils ranging in organic matter content is very limited. Therefore, the potential benefit or detriment to increasing the organic matter level in a soil that is already considered suitable (4-8%) is not well understood. The specific objectives of this study are to: 1) Determine the effects of leaf compost and sand topdressing incorporated with core cultivation on soil physical properties when applied to low and high organic matter soils, and 2) Evaluate the effects of leaf compost topdressing and sand topdressing incorporated with core cultivation on the traffic tolerance of Kentucky bluegrass.

Methods and Materials

The study is arranged in a Latin rectangle with three treatments and six replications 1) Leaf compost topdressing applied at ¼" in the spring and fall, 2) Sand topdressing applied at ¼" in the spring and fall (Table 1), and 3) No topdressing applied (Figure 1). Topdressing treatments were applied in the spring and fall of 2011. Plots were split by core cultivation at the end of the 2010 growing season. This means each topdressing treatment (sand, leaf compost and the untreated control) was split into two subplots. Half of each plot was core cultivated in two directions and the other half received no core cultivation. Cultivation was applied using a Ryan GreensAire II equipped with 5/8" hollow core tines. The first topdressing treatments were applied on May 26, 2011. Nutrients were applied according to soil test recommendations and all treatments were fertilized equally. Lime was applied on May 24, 2011 at a rate of 25 lbs per 1000 ft^2 to both plot areas to increase soil pH. Plots were mowed at 2" twice per week.

Figure 1. a) Sand topdressing being applied to the low organic soil plot area. **b)** Compost topdressing being applied to the high organic soil plot area. **c)** Low organic soil plot area after the treatments were applied. **d)** Incorporation of treatments using a Ryan GreensAire II Aerator.

Traffic Simulation was conducted using a Cady Traffic Simulator, a modified walk-behind core cultivation unit. Traffic was applied three times per week for 12 weeks beginning on August 29, 2011 and ending in late November for a total of 23 traffic events. Data collected in this study included ratings of turf quality and color. This was done by visual rating using a scale of 1 to 9, where 1 = brown/dead turf; 6 = minimum acceptable color/quality; and 9 = optimum quality or dark green color. Digital image analysis was utilized in assessing turf color and cover. Controlled light conditions were provided through the use of a light box. Images were scanned using Sigma Scan Software using the following threshold values; hue=55-125 and saturation=10-100. The Dark Green Color Index (DGCI) was calculated based on hue, saturation and brightness values. Color and quality data was collected on a biweekly basis. Surface hardness was measured using a Clegg impact hammer. Data was collected once a month from June 2011 to October 2011. Soil moisture readings were measured using a portable Field Scout TDR 300 probe (12 cm). Data was collected once a month from May 2011 to November 2011. Weed count data was obtained for both crabgrass and broadleaf weeds. Counts were done visually beginning on June 14, 2011 and were completed monthly through November. Percent soil organic matter was assessed in spring 2011before 2011 treatments were applied. Undisturbed soil samples were extracted to assess soil bulk density and percent organic matter.

Table 1: Particle size analyses of sand types. USGA recommendations for putting green.

	Soil Separate %				% Retained					
Treatment	**Sand**	**Silt**	**Clay**	**No. 10 Gravel 2 mm**	**No. 18 VCS 1 mm**	**No. 35 CS 0.5 mm**	**No. 60 MS 0.25 mm**	**No. 100 FS 0.15 mm**	**No. 140 VFS 0.10 mm**	**No. 270 VFS 0.05 mm**
Coarse Sand (AA Will Mat. 2mm)	99.5	0.0	0.4	0.1	11.0	31.5	42.0	13.0	1.6	0.4
USGA Rec. for Putting Green Const		**≤ 5%**	**≤ 3%**	**≤ 3% Gravel ≤ 10% Combined**		**≥ 60%**		**≤ 20%**	**≤ 5%**	

Results to Date

The compost treatments produced significantly darker green turf compared to the sand treatments during the spring and summer on the high organic matter soil. The compost treatments produced significantly darker green turf compared to the sand and untreated control treatments during the spring and summer on the low organic matter soil. Treatments did not affect turfgrass color on either soil type by fall 2011 (Figure 2.)

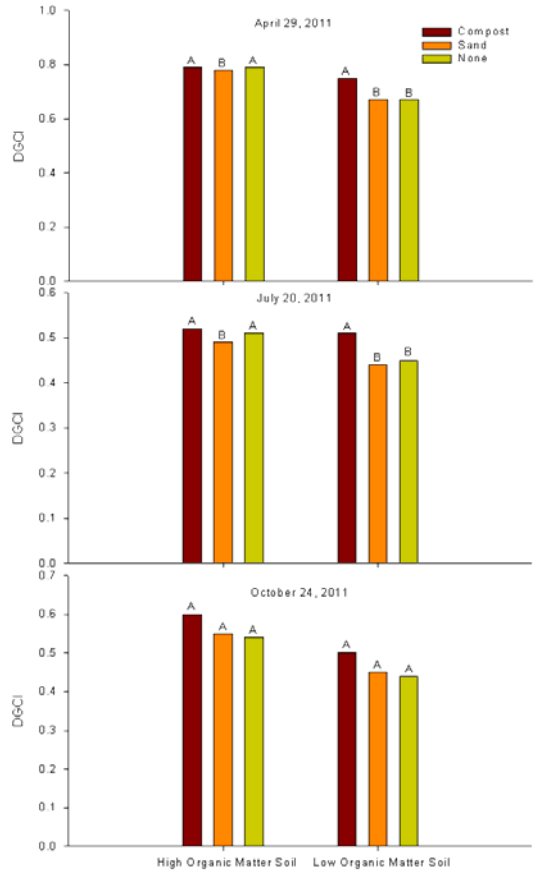

Figure 2. The effect of leaf compost and sand topdressing treatments on turfgrass color when applied to two soils, 2011. Turfgrass color was quantified using digital image analysis.

The compost treatments produced significantly greater percent cover regardless of soil type during the spring and summer, but not in fall during the second growing season (Figure 3).

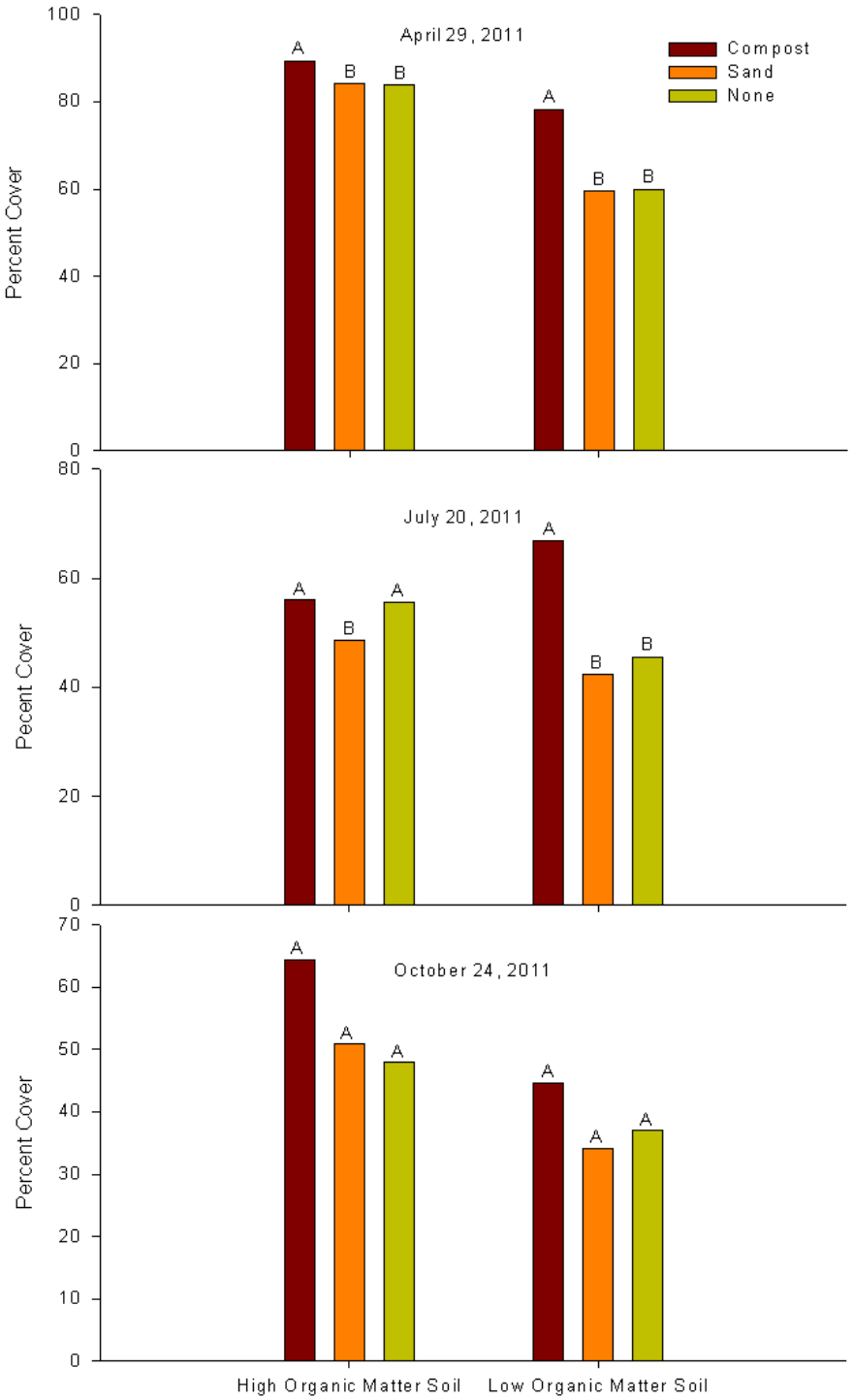

Figure 3. The effect of leaf compost and sand topdressing treatments on percent cover when applied to two soils, 2011.

Applying leaf compost produced significant differences in volumetric soil moisture in the top 2” of the profile when compared to the sand or untreated control during the summer and fall, but not during the spring of the second growing season (Figure 4).

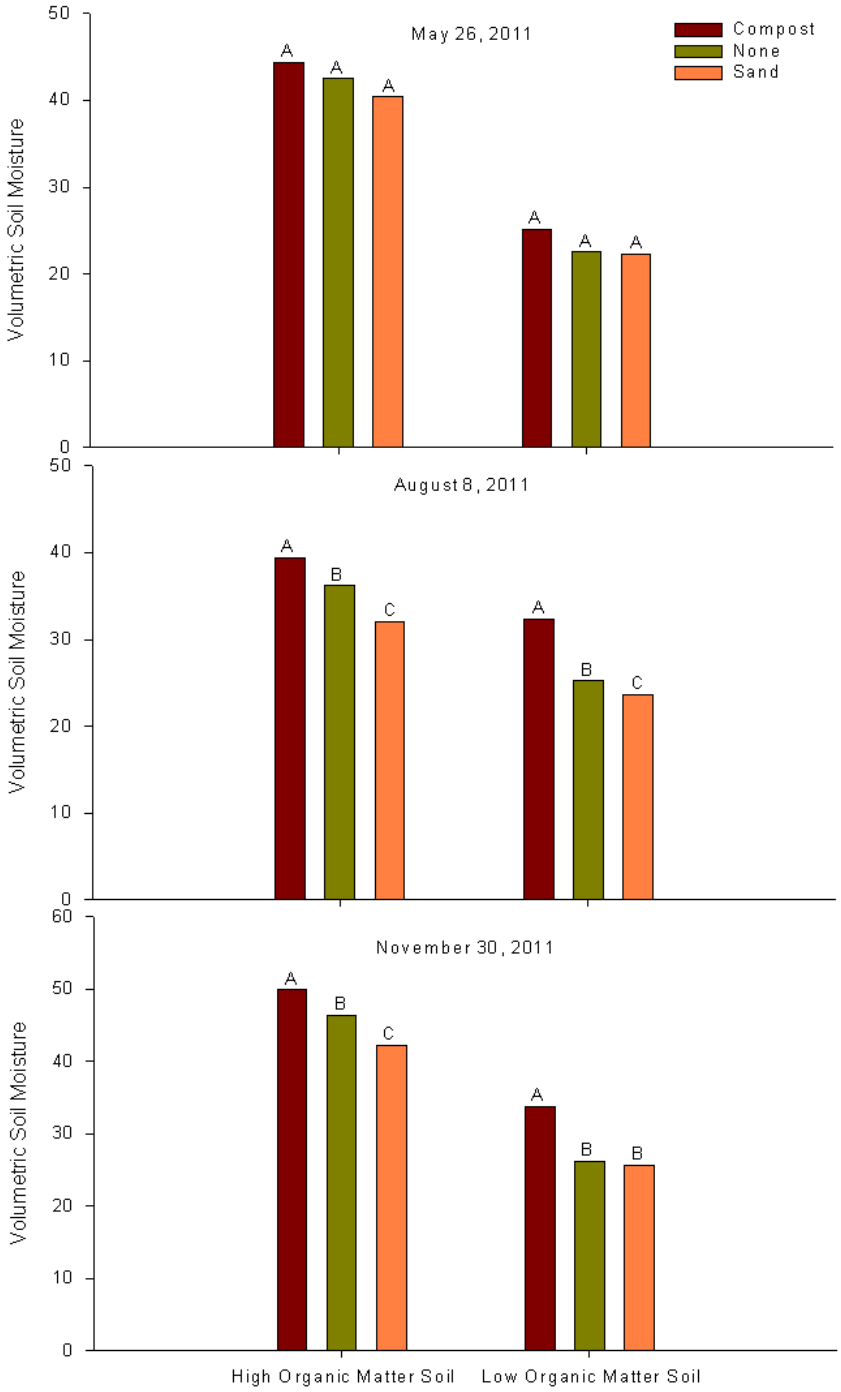

Figure 4. The effect of leaf compost and sand topdressing treatments on volumetric soil moisture when applied to two soils, 2011.

Differences in surface hardness were observed as an overall soil and treatment effect. The high organic matter soil had lower gmax values than the low organic matter soil. Additionally, an overall treatment effect was observed with the leaf compost significantly reducing surface hardness compared to the untreated control in both soil types (Figure 5).

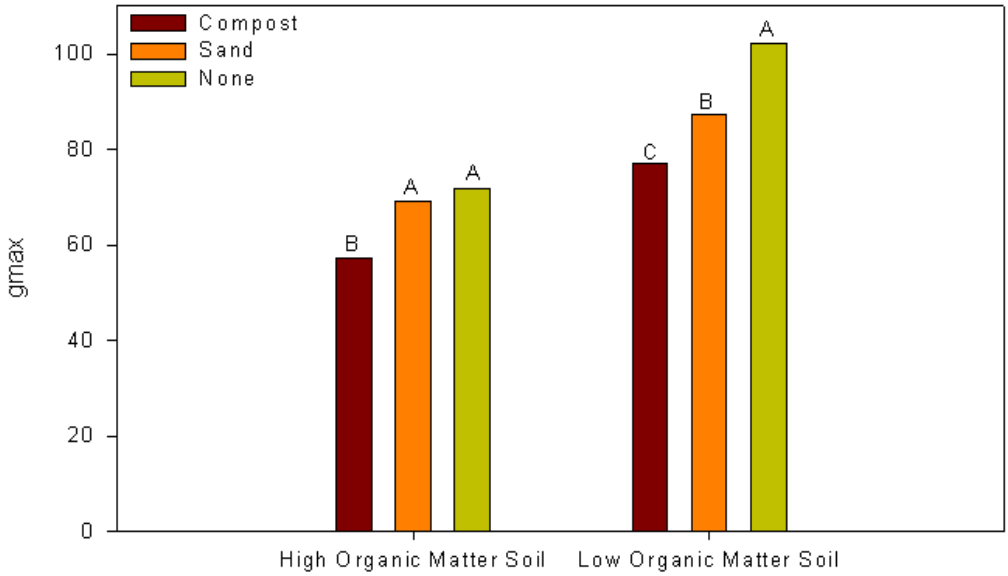

Figure 5. The effect of leaf compost and sand topdressing treatments on surface hardness when applied to two soils, July 7, 2011.

Compost applied to the high organic matter soil produced significantly greater organic matter content when compared to the sand and untreated control plots. No differences were noticed in organic matter content when treatments were applied to the low organic matter soil (Figure 6).

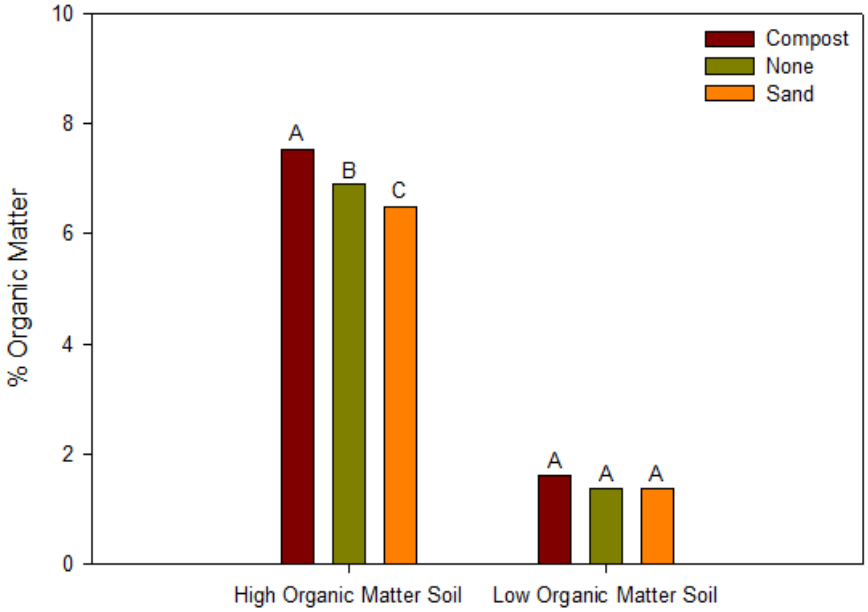

Figure 6. The effect of leaf compost and sand topdressing treatments on percent soil organic matter (0-3") when applied to two soils, May, 2011.

2012 and 2013 Growing Seasons

The 2011 growing season was an opportunity to continue to evaluate the potential effects from the topdressing treatments and core cultivation. The study will be repeated again in 2012 and data collection will continue. This will provide two full years of data to analyze and determine if there are any benefits or detriments to incorporating these topdressing materials utilizing core cultivation.

Summary to Date

The composted treatments showed significantly greater turf color on each soil during the spring and summer, but not in the fall.

Leaf compost applications resulted in greater cover during the spring and summer, but not in the fall. Leaf compost applications resulted in greater moisture retention in both soils during the summer and fall.

Leaf compost treatments had lower surface hardness values compared to the untreated control and sand treatment, regardless of soil type.

Organic matter was significantly greater in the compost treatment when compared to the sand and untreated control plots in the high organic matter soil only.

Cultivated treatments had lower surface hardness values in July, but had no effect during the traffic season.

Literature cited

McNitt, A. S., D. M. Petrunak, and W. X. Uddin. 2004. Evaluation of spent mushroom substrate as a topdressing to established turf. *Annu. Res. Rep. [Penn State]*. p. [102-110].