

Sand Topdressing Effects on Earthworm Activity in Warm-Season Golf Course Turfgrass

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As earthworms burrow, they ingest soil and organic matter and excrete casts within the soil profile or on the soil surface. Typically, earthworms are viewed as beneficial; however earthworm surface casting in low-cut turfgrass systems can create muddy, inconsistent playing surfaces, increase water retention, result in disease, weed and pest invasion, and reduce photosynthesis and overall aesthetics. Pesticide use for earthworm control is illegal in the United States, so turfgrass managers must implement cultural practices to reduce surface casting. Sand topdressing is a cultural practice used on golf courses to reduce organic matter buildup and to provide a smooth, consistent playing surface. Since sand is abrasive against the soft-bodied earthworms, sand topdressing has been suggested as one method of earthworm casting control.

In an ongoing research trial at our location, significantly more earthworm casts have been observed in zoysiagrass and bermudagrass plots receiving heavy sand topdressing compared to light topdressing, regardless of turf establishment method, use or absence of core aeration, or root zone. The objective of this research is to quantify the effect of rootzone soil texture and long-term sand topdressing rates on earthworm casting activity in simulated golf course tee boxes.

Methods

This experiment was conducted at the University of Arkansas Agricultural Research and Extension Station, Fayetteville, AR, and consisted of simulated golf course tee boxes established in 2008 with *Cynodon dactylon* L. 'Patriot' maintained at a height of 1.3 cm. The treatments included two rootzone treatments, including the native Captina silt loam soil (Typic Fragiudult) and a sand-capped system (15 cm of USGA sand) over the native silt loam soil. In addition, two topdressing treatments were also imposed over the rootzones, including light topdressing (0.64 cm yr⁻¹) and heavy topdressing (2.54 cm yr⁻¹) treatments.

Cast counts (no. m⁻²) were conducted weekly throughout the growing season. Volumetric moisture content and temperature (data not shown) were measured weekly at a 7.5 cm depth using a TDR-300 (Spectrum Technologies, Aurora, IL) and a handheld Checktemp probe (Hanna Instruments, Woonsocket, RI), respectively. The experimental design of the study was a two-factor (rootzone and topdressing) randomized complete block. Month was included as a factor in a repeated measures analysis model in PROC MIXED (SAS v. 9.4, SAS Institute, Inc., Cary, NC).

Results

There was a significant three way interaction between rootzone, topdressing, and month on earthworm casting activity (Table 1). Peak casting activity, regardless of rootzone, occurred in the fall and spring (Fig. 1). The sand rootzone had significantly greater casting activity compared to the soil rootzone (Fig. 1). Heavy topdressing resulted in significantly greater casting activity compared to light topdressing in the soil rootzone, but there was no significant difference in casting activity between topdressing treatments in the sand rootzone (Fig. 2). Preliminary data suggest that the predominant earthworm species present in the experimental area are likely native *Diplocardia* species. In addition, a survey of golf courses in the Arkansas-Oklahoma region is ongoing to determine earthworm species composition and Shannon-Weaver density, and diversity.

Table 1. Analysis of variance showing main effects and interaction of rootzone, topdressing, and month on casting activity at the University of Arkansas Agricultural Research and Extension Station, Fayetteville, AR

Effect	DF	F value	<i>Pr</i> > F
Rep	3	0.32	0.8141
Rootzone	1	3.23	0.1702
Topdressing	1	10.64	0.0172
Rootzone*Topdressing	1	3.49	0.1109
Month	36	32.57	<.0001
Rootzone*Month	36	8.05	<.0001
Topdressing*Month	36	7.09	<.0001
Rootzone*Topdressing*Month	36	5.57	<.0001

Fig. 1. Monthly average of weekly cast counts by rootzone between November 2015 and June 2016. Error bar represents the least significant difference ($P=0.05$) and can be used to compare treatment means.

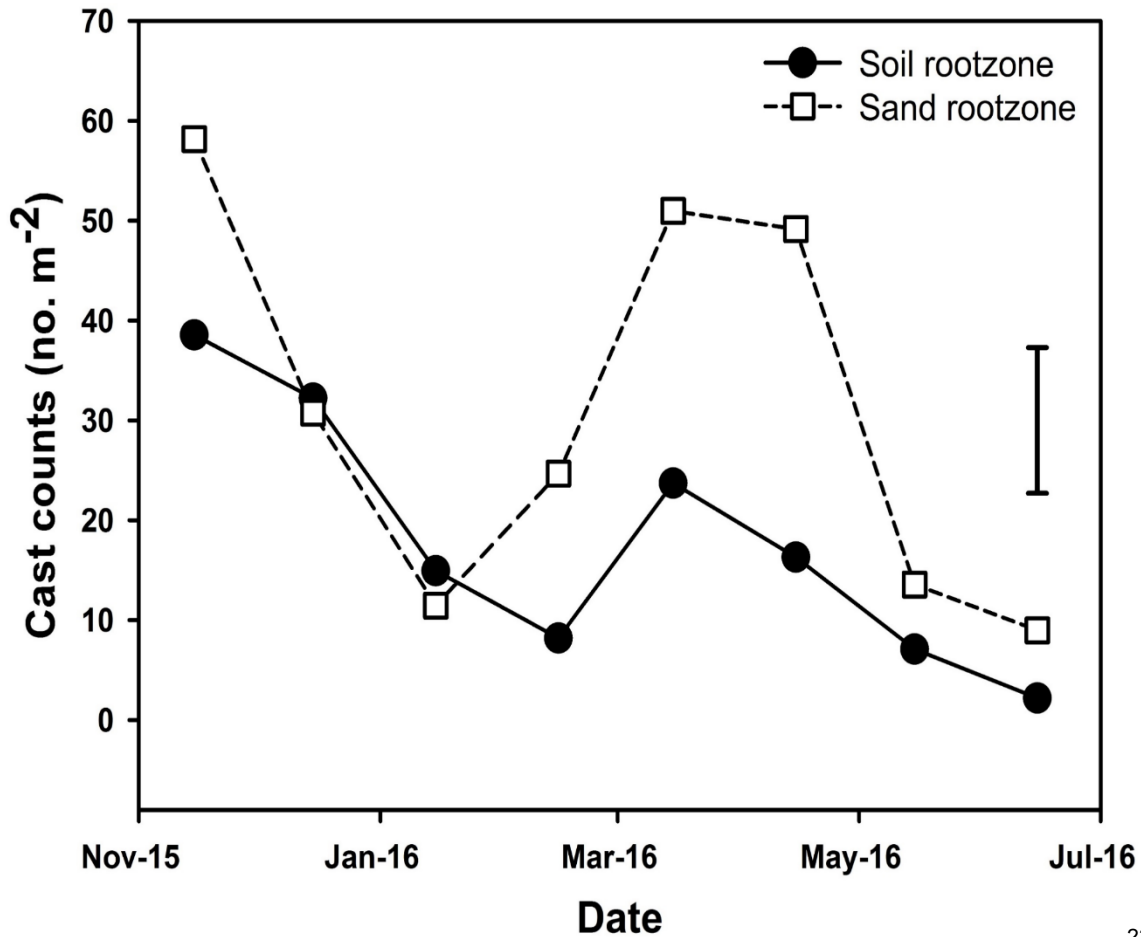


Fig. 2. Monthly average of weekly cast counts by soil (top) and sand (bottom) rootzone and topdressing treatment between November 2015 and June 2016. Error bar represents the least significant difference ($P=0.05$) and can be used to compare treatment means.

