Soil Compaction and Goosegrass Infestation in Bermudagrass.

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Introduction

Recreational turf receives frequent vehicular and foot traffic resulting in soil compaction and wear. Goosegrass (Eleusine indica) is a major weed problem in heavily trafficked areas of bermudagrass (Cynodon dactylon) sports fields and golf courses, across a range of soils.

It is not known if goosegrass infestation in trafficked areas is due to a reduction in the growth of bermudagrass caused by compaction, or wear, or both (Fig. 1). Because compaction and wear occur concurrently in trafficked areas, procedures are needed to examine their separate effects. The hypothesis of this study was that soil compaction reduces bermudagrass growth to a greater degree than goosegrass.

Objective

The objective of this study was to compare root and shoot growth of annual goosegrass compared with bermudagrass, under controlled levels of soil compaction.

Materials and Methods

Research was begun May 2005 at UF/IFAS Fort Lauderdale Research and Education Center. A greenhouse experiment was set up with 19.5 cm diam. PVC pots filled with Margate fine sand (siliceous, hyperthermic Mollic Psammaquent) that was dried and mixed with water to 25% gravimetric content. Soil was compacted in each pot with a 13.5 kg weight dropped from a height of 42.0 cm onto a circular piece of wood cut to fit the inside of the pot (Fig. 2). The number of drops resulted in a series of bulk density values (Table 1). Goosegrass seedlings and bermudagrass stolons were transplanted in separate pots (Fig. 3) of each compaction treatment, resulting in a factorial treatment design. There were two experiments, with four replications of each treatment combination in the first experiment, and five in the second. Treatments were completely randomized.

A soluble 15-35-15 (N-P2O5-K2O) fertilizer was added twice during each experiment to provide N at 14.7 g m⁻² per application. Root and shoot dry weight were determined for washed samples harvested 43 days after transplanting each experiment.

Results and Discussion

Root and shoot growth response to compaction differed among species (Fig. 4). Non-compacted treatment (0 drops) was unrepresentative because of poor bermudagrass establishment, probably due to poor contact between soil and stolons, and was removed from the second experiment. Root growth of goosegrass was affected by compaction in both experiments, decreasing 53% under high compaction, compared with low compaction, in the first experiment, and decreasing 26% under high compaction, compared with low compaction, in the second experiment. Shoot growth declined in goosegrass only in the first experiment. No differences in root and shoot growth due to compaction treatments were observed in bermudagrass.

The lack of significance of compaction effect on bermudagrass may have been due to the high variability in dry weights. Although not significant, there was a trend for reduced bermudagrass root and shoot growth in both experiments.

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Table 1. Number of drops and bulk density values for both experiments.

<table>
<thead>
<tr>
<th>Compaction level</th>
<th>Drops</th>
<th>Expt. 1</th>
<th>Expt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td>0.90</td>
<td>-</td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
<td>1.19</td>
<td>1.08</td>
</tr>
<tr>
<td>Med</td>
<td>10</td>
<td>1.29</td>
<td>1.18</td>
</tr>
<tr>
<td>High</td>
<td>42</td>
<td>1.37</td>
<td>1.28</td>
</tr>
</tbody>
</table>

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Conclusions

• Goosegrass root growth was significantly decreased by compaction in both experiments and shoot growth was affected in one experiment.
• Bermudagrass was slow growing but highly variable; it was not significantly affected by compaction in this study. Therefore, there was not sufficient evidence of a differential compaction effect on bermudagrass compared with goosegrass.
• Other factors such as wear or canopy removal of bermudagrass may be the cause of enhanced relative goosegrass growth and infestation in trafficked areas.