Comparison of Cultivation Techniques in Turfgrass

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Objectives:

1. Compare deep solid-tine aerification with a soil-slicing implement to reduce soil compaction, salinity, and sodium in turfgrass.

Start Date: 2008
Project Duration: one year
Total Funding: $3,000

Soil compaction is a problem associated with turfgrass management due to continuous traffic contributed by equipment, golf carts, and players. Irrigation water quality is less than optimal with the use of reclaimed water and the high sodium content contributes to poor soil structure, reduced water infiltration, limited rooting depth, and less favorable nutrient availability for growing and maintaining high quality turfgrass.

Two aeration implements were compared in field experiments, a Vertidrain equipped with 0.625 inch by 10-inch solid tines and a Blec GB1500 soil-slicer with 10-inch slit spacing (6 slits with 0.75-inch width) set to a depth of 4 to 10 inches. On each of four golf courses in 2006, a fairway was cultivated one time with treatments replicated three times in a randomized complete block design and soil samples were collected and analyzed at intervals after cultivation.

Additional soil compaction measurements were observed with the Clegg impact hammer device and infiltrometers attempted to measure water penetration and did not provide consistent data. All aeration treatments exhibited beneficial effects that were observed for 2 weeks after treatment (WAT). Sodium (Na+) reduction was observed by all aeration treatments. Blec treatments tended to enhance Na+ reduction compared to the Vertidrain.

Blec treatments reduced Na+ 25% compared to 18% for the Vertidrain at one site, nearly 20% versus 8%, respectively, at two other sites, and no changes were observed at the fourth golf course. Na+ reduction decreased at 4 and 8 WAT when soil samples were analyzed.

In 2007 and 2008 at only two golf courses, gypsum at 100 lb/1000 ft^2 was applied in addition to aeration done 1, 2, or 3 times at monthly intervals in June, July, and August. In 2007, electrical conductivity (EC) tended to be reduced at one site for the untreated treatments with or without gypsum compared to the cultivated treatments. Only the Vertidrain treatment done three times exhibited a significantly lower EC at only one site.

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At the end of the season, gypsum added to both the Blec and Vertidrain cultivations showed only slightly better Na+ reduction relative to the untreated. At one site, only the Vertidrain showed improvement with slightly lowered Na+. Turf quality and density was visually worse for non-cultivated treatments.

In 2008, additional measurements were made for irrigation precipitation rate and distribution uniformity was calculated, salinity was measured using the EM-38, and the TruFirm instrument measured turf firmness. Soil analysis indicated that in 2008, Na+ levels were variable among treatments at most sampling dates. Similarly, the EM-38 salinity measurements were variable among treatments. The TruFirm data was not consistent within treatment replicates.

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Summary Points

- Cultivation techniques exhibited short-term reduction of salinity and Na+ levels.
- Blec and Vertidrain cultivations were effective in reducing Na+ levels though not consistent at all sites or all years.
- Blec and Vertidrain cultivations were effective in reducing Na+ levels for up to 2 weeks.
- Application of gypsum following cultivations contributed to enhanced reduction of Na+ levels.
- Benefits of multiple cultivations were significant for only one implement in one year.
- Small size plots were not conducive for high variability encountered with irrigation distribution uniformity and soil variability at golf course sites.
- Measuring water infiltration, soil compaction, or turfgrass firmness was not consistent among cultivation treatments.
- EM-38 measurements were not effectively correlated to laboratory soil analysis for salinity measurements.