Dr. Carrow’s cultivation research to improve compaction, water use

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Dr. Bob Carrow, researcher at the University of Georgia Experiment Station, significantly reduced surface and subsurface compaction and improved water uptake of a common Bermudagrass turf grown on a compacted clay soil. As part of the $5 million 1983-92 United States Golf Association (USGA) Turfgrass Research Program, this discovery will help turf managers develop and justify cultivation programs for tees and fairways that will ultimately result in more efficient use of irrigation water.

Numerous studies to evaluate different cultivation techniques have been funded by the USGA Research Committee at the University of Georgia. This study was performed on a Cecil sandy clay loam with 55 percent sand, 18 percent silt, 27 percent clay and a 2 percent organic matter content. Each common Bermudagrass plot was compacted with a smooth power roller and then watered at 100 percent of field capacity. Verti-drain was most effective in making physical soil improvements deeper in the profile, while hollow tine coring was best at improving soil surface conditions. The frequency of Verti-drain treatments, as well as the combination of Verti-drain and hollow-tine coring, were further explored in this new study.

Two annual Verti-drain and hollow-tine coring combination treatments consistently reduced soil compaction and improved root water extraction. Penetration resistance reductions of at least 25 percent occurred in all zones. Root water extraction was improved from 33 percent to 71 percent within the soil profile.

In very hard soils, loosening the surface initially with core cultivation will allow improved Verti-drain penetration. With the upper three inches of the profile less compacted, the Verti-drain will expend maximum energy at lower depths. After the first year, the research demonstrated core aeration could be omitted once the upper three inches are softer.

A dense root system is often thought to be the most efficient for water extraction. The Verti-drain actually decreased total root length density and total root length in this study! However, the roots left behind were more viable and extracted water from the soil more efficiently than roots in the compacted control. Root data may not always correlate well to water uptake in cultivation studies. The Verti-drain also enhanced overall water uptake as demonstrated by evapotranspiration (ET).