Effect of Greens Type, Irrigation Type, and Rootzone Material on Irrigation Efficiency, Turfgrass Quality, and Water Use on Putting Greens in the Southwest

Bernd Leinauer
New Mexico State University

Objectives:

1. To study the effects of different irrigation systems on turf quality, drought resistance, and irrigation efficiency in greens with a sloping design.
2. To study the effects of rootzone materials (sand, sand-peat mix, and sand- urea-formaldehyde polymer mix) on creeping bentgrass establishment, turf quality, and soil moisture retention in a sloped putting green.

Start Date: 2002
Project Duration: 3 years
Total Funding: $90,000

Sprinkler irrigation has been the accepted practice for irrigating lawns since Joseph Smith patented the first swiveling lawn sprinkler in 1894. Sprinkler overlap, wind drift, and evaporation losses during the irrigation process all contribute to water losses that increase overall water consumption and/or decrease plant stand quality.

Subirrigation systems that apply water laterally to the rootzone from perforated tiles or emitters buried either close to the surface or just below the normal root penetration beneath the surface (subsurface drip irrigation or subirrigation). These systems have been proven to potentially save substantial quantities of irrigation water compared to sprinkler systems. However, subsurface irrigation has received very little acceptance or attention for irrigating turf.

Highly trafficked and low-cut grass stands, which include athletic fields and greens and tees on golf courses, are usually built with either sand alone (California style) or with a sandy rootzone mix (USGA style). Because of this coarse texture, rootzones resist compaction, provide high air filled porosity, but lack in adequate water retention. To increase water-holding capacity, USGA style rootzones are usually amended with peat. Inorganic amendments, such as urea-formaldehyde polymers, may provide a viable alternative to organic amendments for the use in sandy rootzones.

Irrigation research plots were built to study the impact of irrigation type (sprinkler vs. subsurface drip irrigation vs. subirrigation) and type of rootzone mix (straight sand vs. sand mixed with peat vs. sand mixed with urea-formaldehyde polymer) on irrigation efficiency and turfgrass performance of 'Bengal' creeping bentgrass.

A 4000 m² (43,000 ft²) research area was built at the Fabian Garcia Research Center at New Mexico State University to study the impact of irrigation type (sprinkler vs. subsurface drip irrigation vs. subirrigation) and type of rootzone mix (straight sand vs. sand mixed with peat vs. sand mixed with urea-formaldehyde polymer) on irrigation efficiency and turfgrass performance of 'Bengal' creeping bentgrass.

Each of the 12 research greens measures 17 m x 17 m (55' x 55') and includes a 5% south facing slope. The greens were seeded on May 16, 2003, and visual establishment ratings were taken at bi-weekly intervals. Because of the late seeding date and the record heat during establishment, all plots received light watering from sprinklers several times per day in addition to scheduled irrigation.

Overall statistical analysis of establishment data revealed no significant differences between greens type and irrigation type. However, establishment differed significantly between amendments and dates. When data were analyzed separately for each sampling date, USGA built-sprinkler irrigated greens established the fastest and USGA-built subsurface drip irrigated greens established the slowest.

On the first two sampling dates, differences in rate of establishment were significantly different at the 99.9% probability level. Regardless of construction and irrigation type, straight sand plots were the slowest to establish, followed by urea-formaldehyde polymer amended sand. Of all three amendments tested, peat-amended plots were the quickest to establish.

Aerial view of the irrigation research plots at the Fabian Garcia Research Center at New Mexico State University.

Summary Points

- Studies are underway at New Mexico State University to compare sprinkler versus subsurface drip versus subground irrigation for putting greens.
- Studies are also comparing type of rootzone mix (straight sand versus sand mixed with peat versus sand mixed with urea-formaldehyde polymer) on irrigation efficiency.
- At the beginning of the establishment period, peat-amended plots grew in the quickest. At the end of the three-month establishment period, urea-formaldehyde polymer amended plots reached coverage equal to that of peat-amended plots.
- All plots, including sub-irrigated ones, needed additional light watering from sprinklers during the day in addition to scheduled irrigation to prevent drought stress. Despite having received the least total amount of irrigation water, coverage on subground irrigated plots was either highest or second highest.