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Van:	Bernd Leinauer [leinauer@nmsu.edu]
Verzonden:	donderdag 21 november 2002 20:14
Aan:	John Koevoet (fytogroup); Maarten de Vroom
Onderwerp:	Re: test report

STATEMENT

On the fact that an increase in water retention from 7 to 15 % (= an increase of 100%) this means you save 50% of irrigation water.

Inorganic amendments, especially urea formaldehyde polymers, could provide a viable alternative to organic amendments for the use in turfgrass root zones. Urea formaldehyde polymers have been used as amendment for potting soil in greenhouse plants for decades and to date no negative side effects have been reported. More recently, a urea formaldehyde polymer with the trade name 'Fytofoam' has been used successfully all over Central and Southern Europe in the modification of root zones in green and tee construction, in athletic field renovation and construction, and in sod production. Research conducted at Michigan State University and at New Mexico State University showed that water retention increased from 7% to 15% after 20% (by volume) Fytofoam was added to sand. Because of the doubling of plant available water in the soil profile, this technically translates into a 50% reduction in irrigation water use. In practice however, the number is probably closer to 30% because of factors such as wind drift, sprinkler overlap and maintenance practices.

Laboratory research also showed that the water release of the Fytofoam/sand mix appears to be more gradual over a wide water tension range compared to the steeper decline in water retention of the sand/peat mix. Based on this laboratory research, urea formaldehyde polymer amended sand could provide more plant available water over a longer period of time than straight sand or a sand-peat mix. This could also lead to water savings in turfgrass irrigation, especially when a sand-Fytofoam mix is used instead of straight sand.

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Research Green Progress Report

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Effect of subirrigation and soil amendments on water consumption, irrigation efficiency, and turfgrass quality

Bernd Leinauer and Tim Jones, New Mexico State University

Sprinkler irrigation has been the accepted practice for irrigating lawns since Joseph Smith patented the first swiveling lawn sprinkler in 1894, despite its low efficiency in distributing water to the plant stand. Sprinkler overlap, wind drift, and evaporation losses during the irrigation process all contribute to water losses that increase overall water irrigation consumption and/or decrease plant stand quality. Subirrigation systems that apply water laterally to the root zone from perforated tiles or emitters buried either close to drought resistance in flat and sloping areas

2. 2. To study the long term effects of irrigation systems and different root zones on turf quality on sloping and flat areas
3. 3. To study the effects of type of irrigation systems on turf establishment
4. 4. To study the effects of urea-formaldehyde polymer on turf grow-in and turf quality during the establishment phase
5. 5. To study the long-term effects of irrigation systems and urea-formaldehyde polymer on changes in soil physical and chemical properties in rootzones

The project is sponsored by:

- • Chaparral Sand & Gravel
- • Dakota Peat & Equipment
- • ECS (Evaporative Control System)
- • Ewing Irrigation Golf Industrial
- • Fytogreen Networks
- • GCSAA (Golf Course Superintendents Association of America)
- • Helena Chemical Company
- • New Mexico State University's Agricultural Experiment Station
- • New Mexico State University Extension Plant Sciences Department
- • Rio Grande Golf Course Superintendents Association
- • SWTGA (Southwest Turfgrass Association)
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- • USGA (United States Golf Association)

the surface or just below the normal root penetration from beneath the surface (subsurface drip irrigation or subground irrigation) have been shown to save substantial quantities of irrigation water compared to sprinkler systems. Many agricultural studies have demonstrated improved water use efficiency and crop productivity through subirrigation. Although the benefits of subsurface irrigation have been extensively studied in agriculture, this irrigation method has received very little acceptance or attention in the field of turf irrigation. Golf courses in southern Portugal that use subsurface drip irrigation reportedly use 50% less irrigation water than other courses in the area that use sprinkler systems with no loss of turf quality. This region of Portugal has an annual precipitation rate of less than 250 mm (10") and temperatures during the growing season that are similar to those in the Southwestern USA. However, these numbers are based only on anecdotal information, and the systems have never been tested under rigorous experimental conditions. In addition to water savings, other advantages of subirrigation systems include the uninterrupted use of the turf area during irrigation and energy savings due to a lower operating water pressure. Despite the data demonstrating potential benefits of subirrigation systems, it still has a long way to go to achieve market acceptance. One argument against the use of subirrigation is that spacing and depth of emitters is extremely difficult to determine, especially in sloping areas. Other reasons for the limited success of subsurface irrigation are the relatively high cost of installation, the difficulty in monitoring underground systems, and the lack of urgency for water conservation.

Other factors that contribute to the increased water demands of these highly trafficked, low cut grass stands are related to the nature of the soil mixes used to construct root zones. These areas, which include athletic fields and greens and tees on golf courses, are usually built with sandy root zone mixes that have low water holding capacity. The United States Golf Association (USGA) introduced specifications for the properties of root zone mixes for turfgrass areas four decades ago. These recommendations have become the standard in root zone construction, and since 1960 thousands of tees, putting greens, and athletic fields have been built in accordance to them. To provide optimum soil conditions for turfgrass growth, these specifications utilize a stratified coarse-textured sandy root zone. In exchange for high air filled porosity, these high sand content root zones lack in adequate water retention. To increase water-holding capacity, root zones are usually amended with peat. To date, peat is the only recommended organic amendment for root zone construction. However, during recent years, peat has become increasingly scarce, as bogs become more and more restricted for harvesting peat. Alternative organic and/or inorganic amendments will therefore need to be considered in the future.

Synthetic inorganic amendments, especially urea-formaldehyde polymers, could provide a viable alternative to organic amendments for use in sandy root zones. Urea-formaldehyde polymers have been used as amendments for potting soil in greenhouse plants for decades. More recently, a urea-formaldehyde polymer with the trade name 'Fytofoam' has been used successfully throughout Central and Southern Europe in the modification of root zones in green and tee construction, in athletic field renovation and construction, and in sod production. Laboratory experiments with these products have proven that sand amended with Fytofoam was just as effective at increasing soil moisture retention as sand that was amended with peat. However, to date no field research has been conducted to investigate the long-term effects of Fytofoam amended turfgrass root zones on turfgrass quality, irrigation water consumption, or soil physical properties.

Because of the increasing pressure to conserve water in this country, it is imperative that efforts be made to determine the most efficient method of irrigation and available and cost effective soil amendments to produce high quality turfgrass with as little irrigation water consumption as possible. No published studies are known of that have investigated the effect of irrigation type (subirrigation vs. sprinkler irrigation) in combination with the potential benefits of using alternative soil amendments on irrigation efficiency, plant stand quality and soil physical properties of turf root zones. The combination of 1) irrigation through microsystems and 2) the amendment of root zones with urea-formaldehydes could positively affect water retention in the root zone and increase efficiency of irrigation systems in flat and sloping turf areas.

Research Objectives

1. 1. To study to effects of type of irrigation systems on irrigation water consumption, turf quality and

Progress:

The original plan was to build the research area in the northwest corner of New Mexico State University's golf course. In January 2002 the area was cleared and prepared for construction. However, in March the University administrators decided to sell part of the golf course, including the research area, to generate funds for the construction of a new clubhouse. A new location had to be found.

An alternative area at the south side of the golf course turned out to be inadequate because of an arroyo that runs through this part of the course. The arroyo would have had to be channeled and relocated, but funds for the relocation of the arroyo were not available. The researchers then decided to move the project to the Fabian Garcia Research Center at the west side of the campus.

In May an area large enough to build the research field was made available by New Mexico State University's Agricultural Experiment Station. Pine trees first had to be felled and the stumps had to be removed before the subgrade could be shaped.

By June 15, José Makk, a research specialist, was hired to supervise and oversee the construction of the research site. José holds a Masters degree in turfgrass science from Michigan State University and worked for 2 years as an assistant golf course superintendent.