Tailored Water Effect on Bermudagrass Establishment

Polly Lentz, ReNUWIt REU Participant, Summer 2013, New Mexico State University
Mentor: Elena Sevostianova, PhD
Professor: Dr. Bernd Leinauer

My research examined the effects of tailored water irrigation on the establishment of bermudagrass (*Cynodon dactylon* L.) variety Princess 77. We investigated whether planting turf with sod or seed establishes better when irrigated with tailored water compared to using potable water. Tailored water for the purpose of our study consisted of treated effluent with a nitrate level of 15 mg l^{-1}, which is higher than the Environmental Protection Agency's recommended threshold of 10 mg l^{-1}. Bermudagrass is a drought-resistant, heat and salinity tolerant warm-season turfgrass, an ideal grass for lawns, football fields, and golf courses in the American Desert Southwest. The overall goal of the research was to determine whether tailored water can be used to establish turf from either seed or sod in the context of conserving potable irrigation water.

> Hypothesis: Sodded grass will absorb nitrogen more efficiently than seeded, because roots are already present. Therefore, nitrate leaching from sodded grass will be less, as nitrogen uptake in seeded grass will be delayed since the plants must first germinate and develop roots. Furthermore, we hypothesize that grass irrigated with tailored water will establish faster than grass irrigated with potable water, because tailored water delivers nitrogen in low amounts throughout the growing period.

The study was conducted inside a greenhouse, providing a controlled environment free of extraneous variables such as precipitation and temperature variability. Twelve buckets were drilled with holes at ten and twenty centimeters below the soil surface, as well as in the bottom to allow for drainage. Buckets were filled with loamy sand, a soil typical for desert areas. Suction cup lysimeters were placed at ten and twenty centimeter depths. A drip pan was placed under each bucket to collect drainage water, which would represent the water that filters through the soil into the groundwater in a field setting. The grass was either sodded or seeded, and irrigated with either tailored water (treated effluent spiked with calcium nitrate to 15 ppm) or potable water supplemented with granular calcium nitrate fertilizer every 14 days.

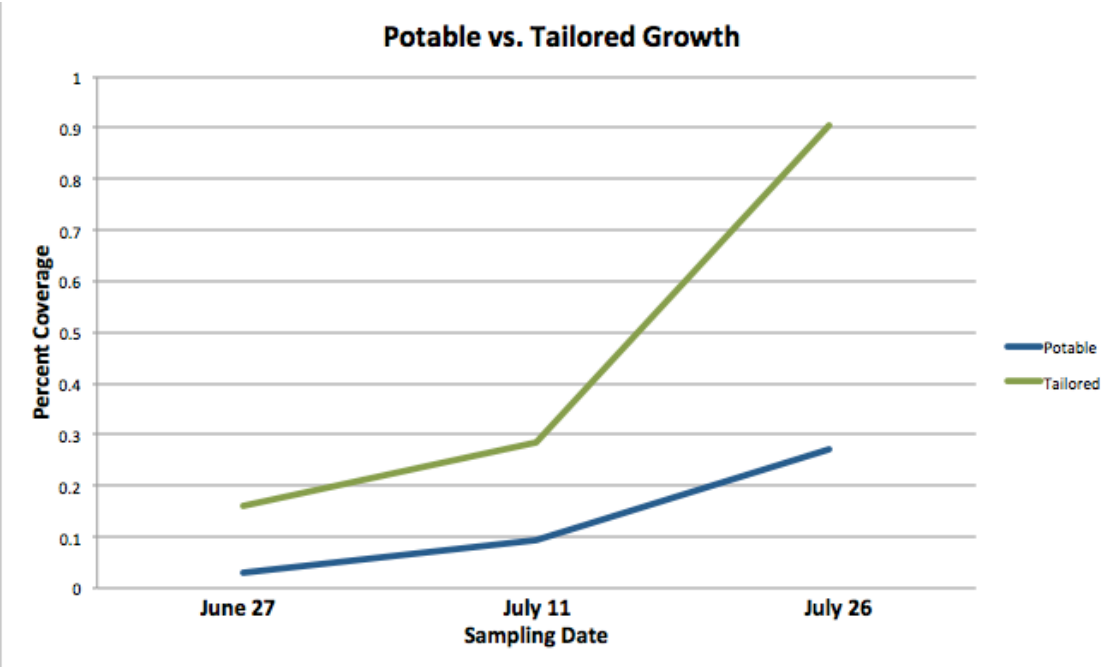
Leachate was collected every 14 days (9 days after the potable treatments were fertilized with granular fertilizer) and analyzed for nitrate, electrical conductivity, pH, and sodium adsorption ratio (SAR). From these results we can estimate the extent of the nutrients that move through the soil profile and end up below the root system but also the portion of the nutrients that were taken up by the grass. Photos were taken of each bucket every 14 days and analyzed for percent green cover using Sigma Scan Pro. The results from this analysis showed the growth over time.

Results

The average nitrate concentration was found to decrease at every soil depth over time. On the first sampling date (6/20/13), all average nitrate levels at each depth exceeded the EPA standard of 10 ppm. However, on all subsequent sampling dates (7/6 and 7/20), levels were

below the standard. Nitrate concentration at 10 cm soil depth in containers irrigated with potable water and fertilized granularly was not significantly different between sampling dates, but declined in container irrigated with tailored water from the first to the second sampling date. At 20 cm, the decrease was not found to be significant for either treatment, due to a wide variability between the replicates. At 50-60 cm, there is a significant change in nitrate concentration for both potable and tailored treatments from the first to the second dates. Aside from the first sampling date at 50-60 cm, there was never a significant difference in nitrate levels between potable and tailored treatments, meaning one treatment does not leach more nitrate than the other.

The growth of seeded bermudagrass irrigated with tailored water was greater than the grass irrigated with potable water and fertilized granularly. The graph below shows the difference in growth between the 2 water qualities. On each sampling date, tailored water resulted in significantly greater coverage than potable.



Conclusions

Based on our controlled environment, greenhouse study, using tailored water for irrigation during bermudagrass establishment does not result in any more groundwater contamination than the standard practice procedure of using potable water and fertilizing with granular fertilizer every two weeks. All results after the first sampling date were not significantly different from one another, and all leachate samples were below the EPA standard of 10 ppm of nitrate. In addition, the establishment and growth of seeded bermudagrass was significantly higher when irrigated with tailored water than the potable treatments. Therefore, using tailored water is not only on par with the current standard practice for establishment, but will result in even faster establishment of bermudagrass.