Turfgrass Research 2014

K-STATE TURFGRASS RESEARCH

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Irrigation Management and Nitrogen Fertilization Effects on Water Application Amounts and Nitrate Leaching in Turfgrass[1]

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Summary. Irrigation based on soil moisture sensors saved water compared with frequency-based irrigation while providing acceptable turfgrass quality, and nitrate leaching was negligible under the conditions of this study.

Rationale. Urbanization in the United States has increased the area covered with turf, causing greater concern about water amounts used for irrigation and the potential for leaching from nitrogen (N) fertilization in urban watersheds.

Objectives. Evaluate differences between frequency-based irrigation and soil moisture sensor (SMS)-based irrigation in: (1) total amount of water applied; (2) nitrate leaching levels among various N fertilizer rates and types; and (3) turfgrass quality.

Study Description. Field studies were conducted in 2012–13 on a Chase silt loam soil at the Rocky Ford Turfgrass Research Center in Manhattan, KS, in tall fescue (*Festuca arundinacea*). Irrigation treatments included: (1) frequency-based irrigation, set to run automatically three times weekly to mimic irrigation scheduling of a typical homeowner; and (2) SMS-based irrigation that was triggered when soils dried to a predetermined threshold. Nitrogen treatments consisted of no N fertilizer (control), urea, and polymer-coated urea, each at 2.5 and 5.0 lb/1,000 ft^2 per year; fertilizer was applied in five applications in

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each year. To measure leaching, soil solution was extracted from a depth of 30 in. using suction lysimeters every two months during the growing season. Data were subjected to analysis of variance, and Fisher's protected LSD ($P \leq 0.05$) was used to detect treatment differences.

Results. The SMS-based irrigation applied 32 to 70% less water than frequency-based irrigation (Table 1). Water savings were greater in the wet year of 2013 than the drier year of 2012. In the wet year (2013), precipitation maintained the soil moisture at higher levels, which allowed the SMS system to bypass irrigation cycles more often than in the dry year (2012). There were no differences in nitrate leaching between irrigation treatments or among N sources, and leaching did not exceed 0.6 mg/L. All fertilized turf had acceptable quality throughout the study.

Table 1. Yearly total irrigation values for frequency- and soil moisture sensor (SMS)-based irrigation treatments and total precipitation during the study periods

Irrigation/precipitation[1]	2012	2013
	---------- in. ----------	
Frequency-based	19.5 a[2]	15.8 a
SMS-based	13.2 b	4.8 b
Difference[3]	-32%	-70%
Total precipitation	12.1	23.7

[1] Values for the study period from May 28 through October 15 in 2012 and May 27 through October 14 in 2013.
[2] Means followed by different letters within a column were significantly different ($P = 0.05$).
[3] (SMS – frequency) / frequency.

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