

Nitrogen Leaching in a Mature Kentucky Bluegrass Stand

Dr. Kevin W. Frank, Kevin O'Reilly, Jon Bristol, Jeff Bryan, and Ronald N. Calhoun
Department of Crop and Soil Sciences

Historically, many of the studies on fertilizer fate have been conducted on relatively new turf. Most of these studies found very low levels of nitrate-nitrogen leaching from the turf. However, it is important to determine if this response holds true for mature turf as well. At Michigan State University, researchers are investigating the amount of nitrate-nitrogen leaching from a mature turf stand of Kentucky bluegrass originally established as sod in 1990. The turf stand being studied has been under continual management and fertilization for over ten years. Research conducted on this site in the early 1990's showed that less than 1% of applied nitrogen leached through the 4 foot deep lysimeters.

Current research is investigating the amount of nitrate leaching from two nitrogen rates, 2 and 5 lbs. N/1000 ft.²/year. The high N rate treatment (5 lbs. N) was split among 5 applications per year: May, June, July, September, and October. The low N rate treatment (2 lbs. N) was split among 4 applications per year: May, June, July, and October. The October 2000 urea application was made with ¹⁵N double-labeled urea to facilitate fertilizer identification among clippings, verdure, thatch, soil, roots, and leachate.

Results

The average total N recovery for the low and high N rates was 78 and 74%, respectively. NO₃-N concentrations in leachate for the low N rate were typically below 5 ppm. For the high N rate, NO₃-N concentrations in leachate were typically greater than 20 ppm. Over approximately two years, 1.3 and 10.9% of labeled fertilizer-N was recovered in leachate for the low and high N rates, respectively. Our research indicates that total yearly applications of 5 lbs. N/1000 ft.² in the form of urea to a mature Kentucky bluegrass stand may result in high levels of NO₃-N leaching from the soil profile.

Future Research 2003-2008

Over the next five years nitrogen and phosphorus fate will be measured in the lysimeters and the adjacent microplots. The high nitrogen rate will be adjusted from 5 lbs. N/1000 ft.²/year to 4 lbs. N/1000 ft.²/year. The low nitrogen rate will remain at 2 lbs. N/1000 ft.²/year. Nitrogen will be applied in May, July, September and October at 0.5 and 1.0 lbs. N/1000 ft.² for the low and high N rate, respectively. Phosphorus from triple superphosphate (20% P) will be applied at two rates, 1 and 2 lbs. P/1000 ft.²/year split over two applications in May and September.

The ongoing research over the next 5 years will identify nitrogen and phosphorus fate in a mature turfgrass system and will provide further data on whether or not fertilizer recommendations for "mature" turfgrass stands need to be altered after a certain period of time to eliminate the potential for excessive nitrate-nitrogen leaching and possible phosphorus leaching.