N, K and Winter Hardiness

Few issues send shivers down a turfgrass manager's spine as much as winter injury. What seemed to be a once every seven to ten year phenomenon appears to be increasing in frequency. The challenge has always been: what can we do to prevent it and, more specifically, can we enhance winter hardiness with fertility?

Researchers at the University of Massachusetts investigated the effect of nitrogen and potassium fertilization on perennial ryegrass cold tolerance while plants are coming out of dormancy in late winter–early spring. They looked at five rates of N from 1 lb. to 9 lbs. per one thousand square feet per year and three rates of K from 1 to 9 lbs per thousand square feet per year. The fertilizer treatments were applied in the field and plants were harvested and tested for freeze stress tolerance under controlled environment conditions in the lab.

In general, the research found that N and K rates independently did not afford enhanced winter hardiness, however, as has been suggested in other studies, the N:K ratio seemed to be critical. For example, maximum cold hardiness measured as LT_{50} (lethal temperature at which 50% of the plant population is killed) occurred when N rates were one to three pounds and applied with five to eight pounds of K. This would be the first peer-reviewed report of K enhancing cold tolerance in turf.

Interestingly, the researchers also reported increased incidence of gray snow mold and freeze stress injury when K rates were high and N rates equally high. While this is not conclusive and more work is needed to assess this response on annual bluegrass, this is important work for improving our understanding of winter injury.

From: Webster, D.E. Webster and J.S. Ebdon. 2005. Effects of nitrogen and potassium fertilization on perennial ryegrass cold tolerance during acclimation in late winter and early spring. HortScience 40.

Long-Term Leaching Issues

The effect of turfgrass management on water quality is an important concern for the turfgrass industry. Millions of dollars have been invested to improve our understanding of the fate of nitrogen applied to turf. However, the majority of these studies are conducted on turf from one to seven years old and rarely for longer than a few years, leaving one to wonder: does leaching of N change over time as the turf matures?

Michigan State University researchers, led by Professor Kevin Frank, investigated N leaching from a ten year old stand of Kentucky bluegrass fertilized at two or five pounds per one thousand square feet. The higher rate N (5 lb rate) was supplied in one pound increments while the low rate (2 lb rate) was in half pound increments.

The EPA Health Advisory Limit (HAL) for N concentration in water is 10ppm. Leachate collected 3.5 feet below the surface under the low rate was always below 5ppm. However, the leachate collected below the high rate N was always above 10ppm and often greater than 20ppm.

This information is very disconcerting but not entirely unexpected. Cornell University researchers in the late 1960's and 1970's suggested that turf accumulates N in organic matter. In fact, there is information from the early 1980's that indicate a 25 year old stand of turf has enough N stored in organic matter to support annual growth.

As a result of this work and the organic N theory we will likely need to adjust our N recommendations based on the age of the lawn. As lawns age not only will they require less N but may leach more if not managed properly.

From: Frank, K.W., K.M. O'Reilly, J.R. Crum and R.N. Calhoun. 2006. The fate of nitrogen applied to a mature Kentucky bluegrass turf. Crop Science, 46:209-215.

Scanning the Journals

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