Explaining Bentgrass Summer Decline

A few years ago, golf course superintendents experienced an unusual phenomenon. It was typical for *Poa annua* (annual bluegrass) to suffer during the summer, however, many superintendents noted that their bentgrasses (even a few of the new cultivars) were declining. University researchers immediately interested in this problem noted several pathogens associated with bentgrass as it began to decline. It followed then that fungicides were being recommended as the cure for "Summer Bentgrass Decline."

Researchers at Kansas State University tested the response of two bentgrass cultivars (Penncross and Crenshaw) from a physiological perspective (photosynthesis, growth, quality, etc.) rather than a pathological (disease) perspective. The experiment was conducted in a controlled environment room; the two cultivars were maintained on a sand-based medium. Plots experienced high temperature (95 ℉ day/77 ℉ night) and/or low aeration (accomplished by flooding the plugs). In other words, plots were grown at optimum temperature (95 ℉ day/77 ℉ night) and poor soil aeration, high temperature and poor soil aeration, high temperature and optimum aeration, and optimum temperature and optimum aeration (control plot). Photosynthesis was measured to evaluate the plant's ability to produce energy for growth at these extreme conditions. Results indicated that both Crenshaw and Penncross produced less energy under high temperature. Respiration (how the plant burns energy) was significantly higher for Penncross than for Crenshaw. This suggests that while most cultivars will produce less energy under high temperature, some may more effectively manage the energy already available. This could be responsible for severe root decline noted for Penncross under high temperature in a previous study. In that study, Crenshaw was able to maintain a greater live root mass as compared to Penncross.

For turf managers in northern climates, this is important research for areas with poor air movement, poor drainage and experiencing summer heat stress. Still, the well documented dollar spot susceptibility of Crenshaw may limit more northern adaptation. It is worth noting that the solution to "Summer Bentgrass Decline" is not fungicides, but rather species adaptation and improved growing conditions.

From: Huang, B., X. Liu and J.D. Fry. 1998. Shoot physiological responses of two bentgrass cultivars to high temperature and poor soil aeration. Crop Science 38: 1219-1224.

Do Humic Substances (Humates) Help?

There has been an increasing influx of "new" technologies from microbial inoculants to hormones. Recently, a significant amount of interest has been directed toward the use of humates for improving turfgrass management systems. Humic substances (humic or fulvic acids) are defined as " a category of naturally occurring, biogenic, heterogeneous organic substances that generally can be categorized as being yellow to black in color, of high molecular weight and refractory". The benefits of these types of materials have been reported in agricultural crop production. Primarily, the benefits have been associated with enhanced rooting and nutrient uptake.

Researchers at North Carolina State University compared the effect of foliar applied humic substances or sand-incorporated humate on Crenshaw creeping bentgrass. In addition, a solution culture experiment was conducted to more precisely monitor nutrient uptake in response to applications of humic acid. Rooting was increased on average 26% in top 5 inches in the plots in pots that incorporated humic substances as compared to untreated plots. In fact granular humate incorporated into the sand increased root mass by 29% as compared to untreated, Sustane or peat derived humic acid. In general, foliar applied humic acid had no effect on rooting.

Nutrient uptake studies demonstrated the ability of the incorporated humic substances to enhance nutrient uptake in sand culture, but was less obvious in solution culture. Nitrogen, Calcium, Magnesium and Iron uptake was not influence by the humic substances, however, phosphorus (P) and potassium (K) tissue levels indicated a significant increase in uptake. Interestingly, uptake of sulfur (S) was reduced by the humic substances as compared to the untreated plot.

The researchers concluded that there are significant benefits of having humic substances available in the root zone. The known benefits of organic matter were clear. In contrast, there was no effect of foliar applied humic substances and the lack of increased uptake in solution culture suggest that there is no benefit to humic substance use when the plant is supplied with an adequate amount of nutrients.

From: Cooper, R.J., C. Liu, and D.S. Fisher. 1998. Influence of humic substances on rooting and nutrient content of creeping bentgrass. Crop Science 38:1639-1644.

Scanning the Journals

A review of current journal articles

This suggests that while most cultivars will produce less energy under high temperature, some may more effectively manage the energy already available. This could be responsible for severe root decline noted for Penncross under high temperature.

There was no effect of foliar applied humic substances and the lack of increased uptake in solution culture suggest that there is no benefit to humic substance use when the plant is supplied with an adequate amount of nutrients.