Evaluation of Plant Growth Regulators and Biostimulants for Use in Managing Summer Bentgrass Decline

Bingru Huang and Yan Xu
Rutgers University

Objectives:

1. To investigate whether the application of selected PGRs and biostimulants to a bentgrass putting green would enhance turf quality during summer months.
2. To determine whether these products would help alleviate summer bentgrass decline by delaying leaf senescence and promoting root growth.

Start Date: 2007
Project Duration: two years
Total Funding: $20,000

Summer bentgrass decline is a major concern of superintendents growing creeping bentgrass on putting greens across the country, especially in the southern states and the transition zone. Some golf courses apply various compounds on bentgrass, hoping to improve turf growth during summer months.

Numerous organic products, claimed to have the functions as plant growth regulators or biostimulants, have emerged in recent years. Some organic materials such as seaweed extracts and amino acids are being used as fertilizer supplements in commercial turfgrass management. Among them, seaweed extracts are widely used in various biostimulant product formulations. Many of biostimulants promise better turf quality and stress tolerance.

The use of PGRs has recently been expanded as a means to promote turfgrass performance under stressful conditions. We propose to investigate whether the application of selected PGRs and biostimulants to a bentgrass putting green would enhance turf quality during summer months and to determine whether these products would help alleviate summer bentgrass decline by delaying leaf senescence and promoting root growth.

Summer bentgrass decline is a major concern of superintendents growing creeping bentgrass on putting greens across the country, especially in the southern states and the transitional zone.

The study was conducted in 2007 and 2008. This report summarizes the 2007 results. We tested the following selected products that are extensively used in the golf course maintenance or pure chemicals with great potential to be marketed as stress reducers:

Primo Max (from Syngenta, 0.125 oz. / 1000 sq. ft.): Inhibitor of gibberellic acid synthesis and vertical shoot growth.
TurfVigor (from Novazymes, 15 oz. / 1000 sq. ft.): Combines patented high impact microbial strains, and macro and micronutrients.
CPR (from Emeraled Isle Solutions, 6 oz. / 1000 sq. ft.): a blend of natural sea plant extracts, micronutrients, and a surfactant.
Aminoplex (from Grigg Brothers, 2 oz. /1000 sq. ft.): A proprietary mixture of 15 plant based L-amino and organic acids, complex polysaccharides, and natural hormones.
Proxy and StressGard (from Bayer, 5 oz. + 0.38 oz. / 1000 sq.ft.): Combined treatment with a Type II plant growth regulator that suppresses seedhead of *Poa annua* and white clover while promoting lateral growth of cool-season turf and a fungicide product that provides long-lasting broad-spectrum disease control and improved turf quality.
Aminoethoxyvinylglycine (AVG, from Sigma, 25 uM): an ethylene synthesis inhibitor that suppresses leaf senescence and helped to maintain greener turf for an extended period in a recent growth chamber study when creeping bentgrass was exposed to 35^{o} C.
6-benzylamine (BA, from Fisher, 25 uM): a synthetic cytokinin that demonstrated functions in delaying leaf senescence and improving heat tolerance in creeping bentgrass in controlled-environment conditions.

We also included two control treatments:
Nutrient control (Hoagland's solution): complete nutrient solution including all kinds of macronutrients and micronutrients to sustain plant growth.
Water control: regular ground water.

All chemical treatments were applied following the manufacture recommended rate (carried in 2 gal. of water). We evaluated turf quality, chlorophyll content, photosynthesis rate, leaf area index (indicator of canopy density), green leaf biomass (indicator of canopy color), and root growth.

Summary Points

- TurfVigor- and CPR-treated plots consistently maintained significantly higher turf quality than both nutrient and water control plots during the whole treatment period. Turf quality of Primo Max-treated plots was also higher than that of the nutrient and water control plots starting from mid-August. Other products, such as BA, AVG, and Aminoplex had some positive effects in August.
- Shoot growth and physiological activity of creeping bentgrass was promoted when treated with certain biostimulants or PGRs. The decline of canopy photosynthetic rate was less severe in TurfVigor-, Primo Max-, and BA-treated plots during mid-July and/or early August. Canopy density and color were maintained higher in CPR-, TurfVigor-, and Primo Max-treated plots in July and August.
- The only positive effects on root length and surface area were observed in the Proxy- and StressGard-treated plots in early September, indicating this product may affect the recovery of creeping bentgrass from summer stress.
- Our results suggested that proper use of selected biostimulants and PGRs could promote turf growth and alleviate summer bentgrass decline in warm climates.