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

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**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. It is characterized by thinning turf canopy, leaf senescence, and root dieback. Incorporation of management practices such as use of natural products or plant growth regulators (PGRs) that may promote shoot and root growth would favor creeping bentgrass survival in the summer.

Some organic materials such as seaweed extracts are common ingredients in many biostimulant products. They are rich in organic and mineral compounds and often exhibit activity of plant hormones such as cytokinins and auxin. Some biostimulant products also claim to increase soil microbial density and activity by incorporating microbial inoculums, which in turn enhances turfgrass quality through increased organic matter decomposition and nutrient availability.

We proposed to investigate whether foliar application of selected PGRs and biostimulants would alleviate decline in creeping bentgrass growth during summer months and to examine their effects on leaf senescence and root growth. The study was conducted in two consecutive summers (2007 and 2008) on a 4-year-old 'Penncross' bentgrass green built to USGA greens specifications at Hort Farm II, Rutgers University, North Brunswick, NJ. This report summarizes data of two years.

*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 following selected products that are extensively used in the golf course maintenance or pure chemicals with great potential to be marketed as stress reducers were tested: **Primo Max** (from Syngenta, 0.125 oz/1,000 sq ft): Inhibitor of gibberellic acid synthesis and vertical shoot growth. **TurfVigor** (from Novazymes, 15 oz/1,000 sq ft): Combines patented high impact microbial strains, and macro and micronutrients. **CPR** (from Emeraled Isle Solutions, 6 oz/1,000 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. **Aminoethoxyvinylglycine** (**AVG**, from Sigma, 25 uM): an ethylene synthesis inhibitor that suppressed 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° 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.

Two control treatments were included for comparison. **Nutrient control** (full strength Hoagland's solution): complete nutrient solution including all kinds of macronutrients and micronutrients to sustain plant growth. **Water control**: plants were sprayed with 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. Root growth was examined by measuring total root surface area and root biomass.

## Summary Points

- Turf quality of TurfVigor- and CPR-treated plots were consistently higher than that in the water and nutrient control plots during the whole treatment period (late June to mid-September) in both years. Nutrient control plots were not statistically different from the water control plots for most parameters. The promoting effects of Primo on turf quality started from mid-August in 2007 and early July in 2008. Aminoplex, AVG, and BA had positive effects only in August 2007, and July and August 2008.
- Shoot growth of creeping bentgrass was promoted and leaf senescence was mitigated when treated with several products. TurfVigor and Primo promoted all physiological parameters on most sampling dates in both years. CPR consistently reduced decline in turf density and increased leaf chlorophyll content but did not affect photosynthetic rate. BA had positive effects on chlorophyll content and photosynthetic rates in July of both years. AVG promoted turf density and Aminoplex promoted photosynthetic rate on a few sampling dates in 2008.
- Root growth of creeping bentgrass was not consistently affected by any of the product during the whole treatment period. Root surface area was significantly increased in TurfVigor-treated plots in mid-August 2007 and mid-September 2008. Root biomass was significantly increased by TurfVigor and Primo treatments on a few sampling dates in 2007; in 2008, TurfVigor, CPR, Aminoplex, and AVG treatments all had positive effects on a few sampling dates.
- Our results suggested that proper use of selected biostimulants and PGRs could promote turf growth and alleviate summer bentgrass decline in warm climates.