Pre-Stress Conditioning

Impact of Using Primo MAXX® Plant Growth Regulator

Pre-Stress Conditioning

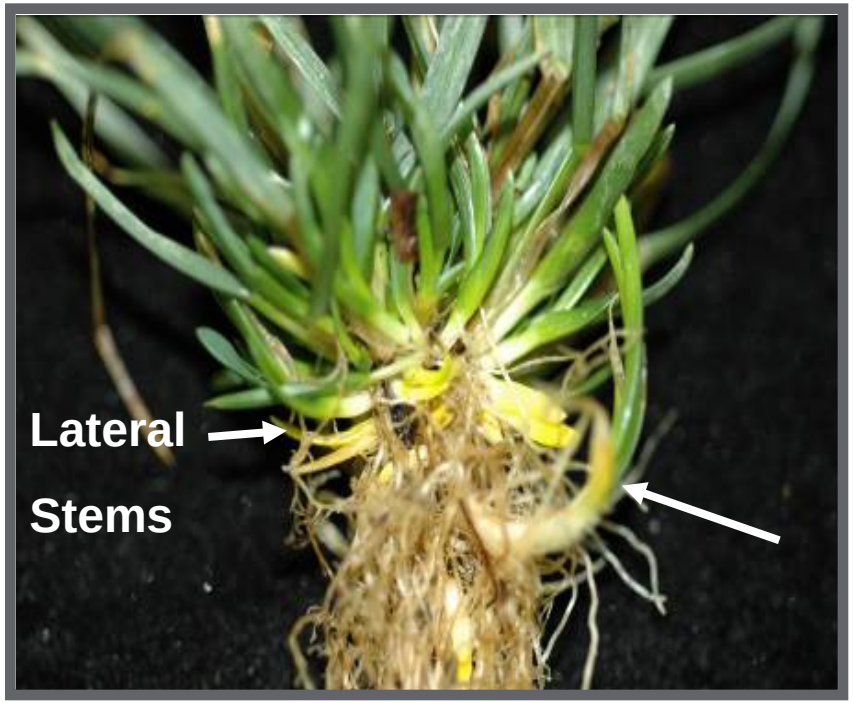
- The purpose of pre-stress conditioning is to prepare turfgrass for extreme conditions before they develop. Extensive research has proven that implementing a program which includes applications of Primo MAXX® plant growth regulator prior to the onset of stresses such as heat, drought, disease, and traffic can strengthen the turf, and therefore enable it to withstand ongoing stresses throughout the season.

Pre-Stress Conditioning

- Impact on turfgrass morphology
  - Lateral growth
  - Root growth
- Impact on turfgrass stress
  - Heat Stress
  - Drought

Lateral Growth

Primo MAXX



Control

Increased Tillering vs. Vertical Growth

Primo MAXX Effect on Kentucky Bluegrass– 3 Weeks After Treatment

Photo from Dr. Bruce Branham – Univ. of Illinois

syngenta

Primo MAXX Effect on Rooting

- Turf treated by Primo MAXX continues to carry on normal plant processes such as photosynthesis and respiration.
- As vertical growth slows, energy is redirected to lateral stems and below ground plant parts.
- Lateral stems and root-mass increase after repeat applications.
- (Top photo) A root frame is used to evaluate rooting strength by measuring force required to pull up the frame.
- Lower photo demonstrates the influence of Primo MAXX on root development under normal fertilization.

Heat Stress

- Heat stress is the primary leading factor to summer bentgrass decline.

(Haung, 2001: Golf Course Management:69:61-64.)

- Factors associated with Heat Stress Injury
  - Inhibition of Photosynthesis
  - Reduction in Water and Nutrient Uptake
  - Hormone Synthesis
  - Root dieback

Improved Drought Tolerance/ Reduced Irrigation Requirement

1. Produces smaller leaves with less surface area for transpiration
2. Improves rooting for access to deeper soil moisture
3. As GA levels are reduced, Abscisic acid (ABA) levels increase which aids stomatal closure
4. Improved water use efficiency
5. Potential savings for cost of water and electricity to run the irrigation system

Drought Responses of Perennial Ryegrass Treated with Plant Growth Regulators Jiang and Fry - KSU

- Scientific paper published in HortScience, Vol. 33(2), April 1998
- Perennial ryegrass was maintained at fairway height and received adequate irrigation until Plant Growth Regulator (PGR) application, thereafter irrigation was withheld.
- Compared Primo MAXX, Ethephon, Mefluidide, and Paclobutrazol
- Primo MAXX was the only PGR that enhanced turf quality during dry down in the Greenhouse, had no deleterious effects on rooting, and suppressed canopy height for up to 2 weeks in the field.

Effects of Primo MAXX on Water Use and Drought Tolerance of Bentgrass Species

Dr. Bingru Huang - Rutgers University - 2006

"Of the water absorbed by turfgrass, about 90% is transpired and only about 3% is used for photosynthesis"

"If transpirational loss can be reduced then it may be possible to maintain turf growth with much less water use"

The objectives of the study were:

1. To determine whether water use would be reduced and drought resistance could be improved by foliar spray of Primo MAXX for creeping bentgrass.
2. To quantify water savings and cost effectiveness with the application of Primo MAXX.
3. To determine the mechanisms how Primo MAXX may reduce water use and improve drought tolerance.

Summary: Enhancement of Creeping Bentgrass Growth Under Drought with Primo MAXX Application and Associated Mechanisms

- Primo MAXX application resulted in higher turf quality, Relative Water Content (RWC), photochemical efficiency, and chlorophyll content, compared to non-treated plants.
- This data suggests that Primo MAXX applications were able to help maintain growth and physiological activities of creeping bentgrass under drought stress.
- This effect was mainly due to the promotion of drought avoidance by reducing water consumption through growth inhibition and/or maintaining water uptake and root growth under drought stress conditions.

Without preconditioning and then subjected to drought/heat stress	Pre-conditioned by deficit irrigation and then subjected to drought/heat stress	Pre-conditioned with Primo MAXX and then subjected to drought/heat stress	Control without drought/heat stress

Effects of Pre-conditioning with Primo MAXX and subsequent heat and drought stress.
"In summary, preconditioning plants with Primo MAXX was beneficial for plant survival of extended period of combined drought and heat stress, as manifested by improved turf quality and shoot growth rate under stress conditions. The effects of Primo MAXX on plant tolerance to combined drought and heat stress could be related to its effect on the promotion of photosynthetic capacity associated with increased chlorophyll content and photochemical efficiency, and on the maintenance of cellular hydration. Our results imply that Primo MAXX applications could be utilized as a preconditioning treatment for turf that seasonally experiences heat and drought stress."

(Effects of Trinexapac-Ethyl Foliar Application on Creeping Bentgrass Responses to Combined Drought and Heat Stress. 2007. McCann and Huang, Crop Science , Vol. 47 (Rutgers University))

Reduced Water Use

- “In summary, our results suggest that the positive effects of Primo MAXX on creeping bentgrass survival in a prolonged period of drought stress were associated with the reduction in water use and increases in osmotic adjustment through solute accumulation, particularly soluble sugars, under the controlled environment conditions.”

(Effects of Trinexapac-ethyl on Drought Responses in Creeping Bentgrass Associated with Water Use and Osmotic Adjustment, J. AMER. SOC. HORT. SCI. 134(5):505–510. 2009. Bian, et al)

Legal – Syngenta Turf and Landscape

Important: Always read and follow label directions before buying and using Syngenta products. The label contains important conditions of sales including limitations of remedy and warranty.