Increasing Precision of Plant Growth Regulator Use

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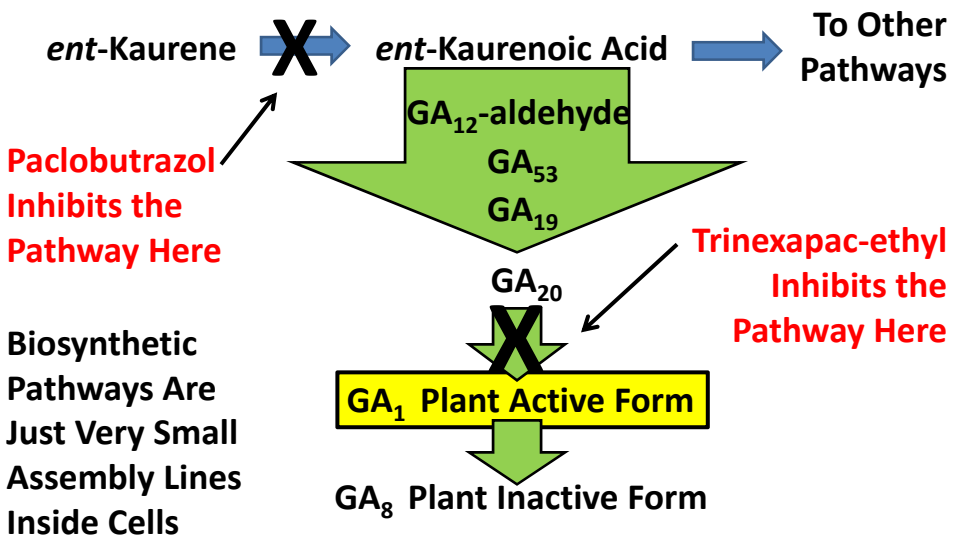
What is a Plant Growth Regulator

- A natural or synthetic compound that alters plant growth rate
  - Plant Hormones
  - Plant Growth Regulators/Herbicides
  - Biostimulants
- Class A to F
  - Class A and B inhibit synthesis of plant growth hormone Gibberellin (GA)
    - Trinexapac-ethyl (Primo Maxx, Governor)
    - Paclobutrazol (Trimmit)

How does GA enhance growth?

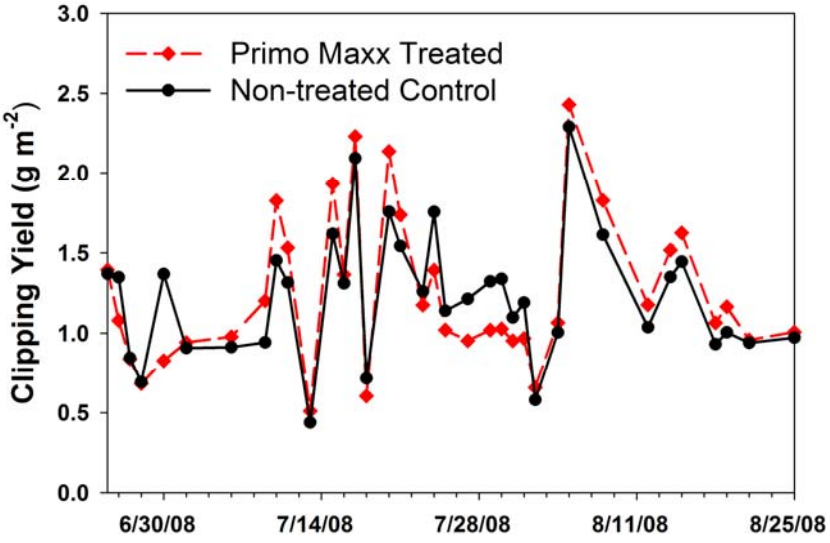
- Cells Expand Similarly to Blowing Up a Balloon
- Cells expand/elongate when the slinky stretches out under the pressure of the balloon inside
- GA lets the slinky (cell wall) stretch faster which enhances cell elongation

How do PGRs Inhibit GA Syntheses?



The Big Problem With PGR Use

Its Hard To Know If They Are Working



Labels Aren't Very Helpful

Example: Primo Maxx

The rates presented in the **Application Rate Table** provide approximately 50% growth inhibition over a 4-week period with little or no discoloration of turf growing under favorable conditions.

Excessive turf growth, which may occur with high fertilization or during spring flushes, may require higher rates of Primo MAXX. Under these conditions, Primo MAXX rates may need to be increased up to 50% to provide an adequate length of control.

For extended growth suppression up to 8 weeks, when temporary discoloration can be tolerated, a maximum of twice the recommended Primo MAXX rate from the **Application Rate Table** may be applied.

Rate Can Be Legally Increased 100%

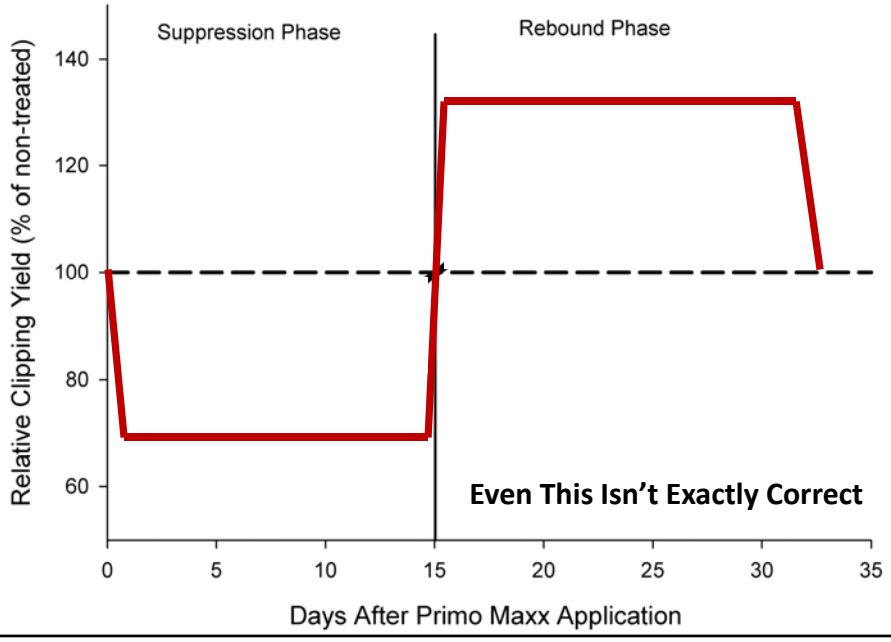
Application Timing

Apply Primo MAXX to actively-growing turf. If turf is going into dormancy because of high or low temperatures or lack of moisture, apply a lower rate of Primo MAXX.

Repeat applications of Primo MAXX may be made as soon as the turf resumes growth or more suppression is desired, but do not apply more than 7.0 fl. oz./1,000 sq. ft. per year.

Primo Maxx Can Be Re-applied as Often as Desired

The Research Says….

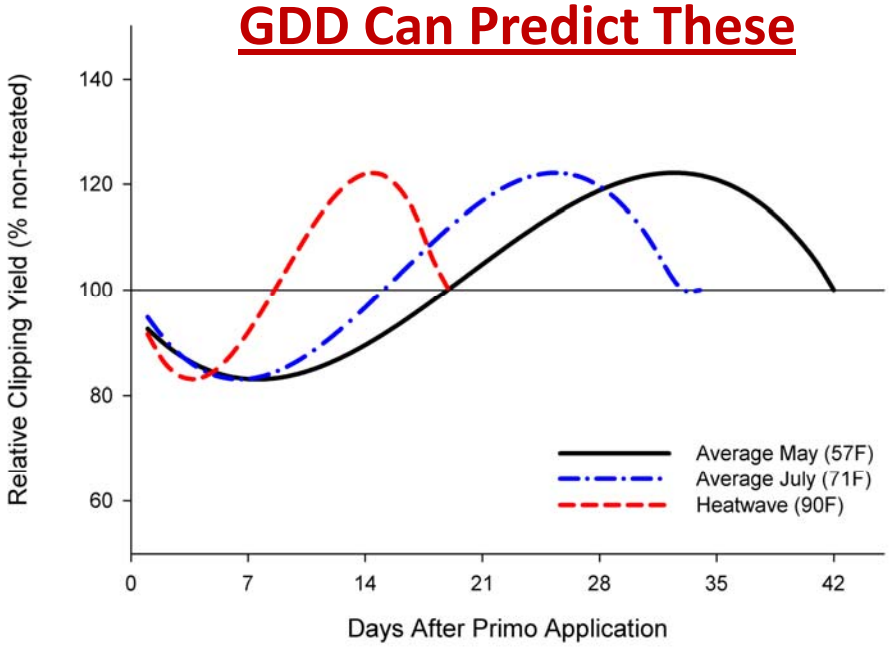


PGR Metabolism

- **Decreased Efficacy During Summer**
  - **Lickfelt el al. (2005)**
  - **Beasley and Branham (2007)**
- **TE Metabolism Directly Related to Air Temperature (Beasley and Branham, 2005)**
  - **6.4 Day Half Life at 64°F (18°C)**
  - **3.1 Day Half Life at 86°F (30°C)**

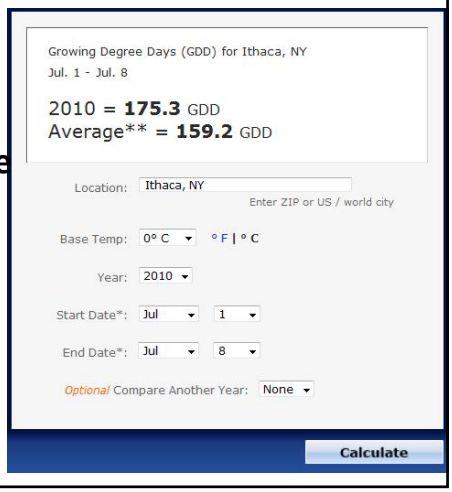
Doubling Temperature (°C) Doubles TE Breakdown

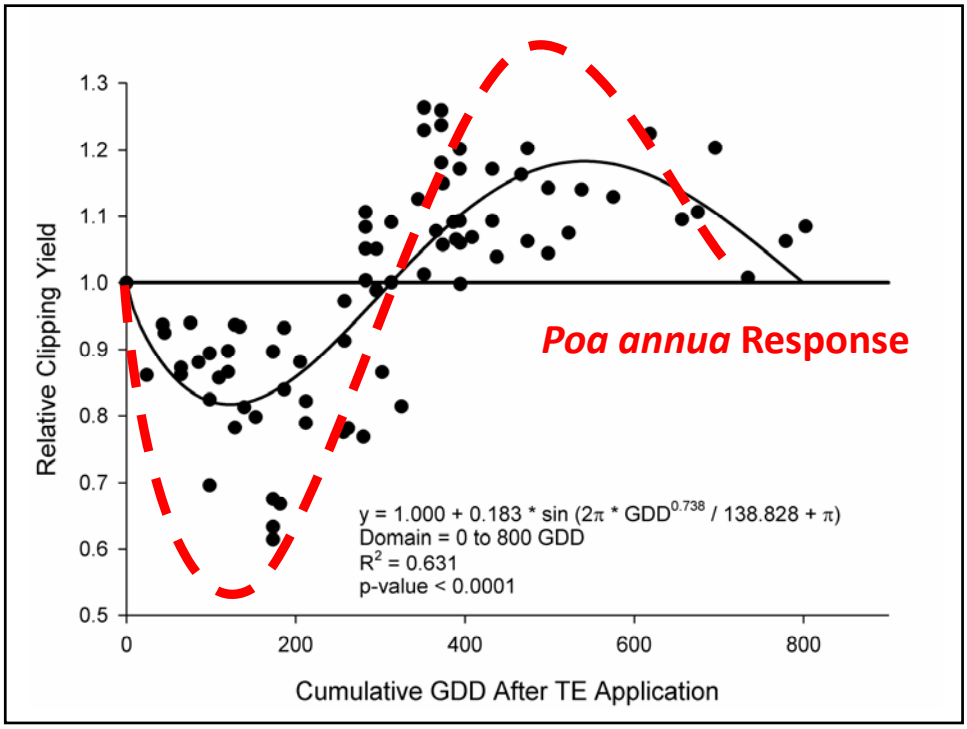
GDD Can Predict These

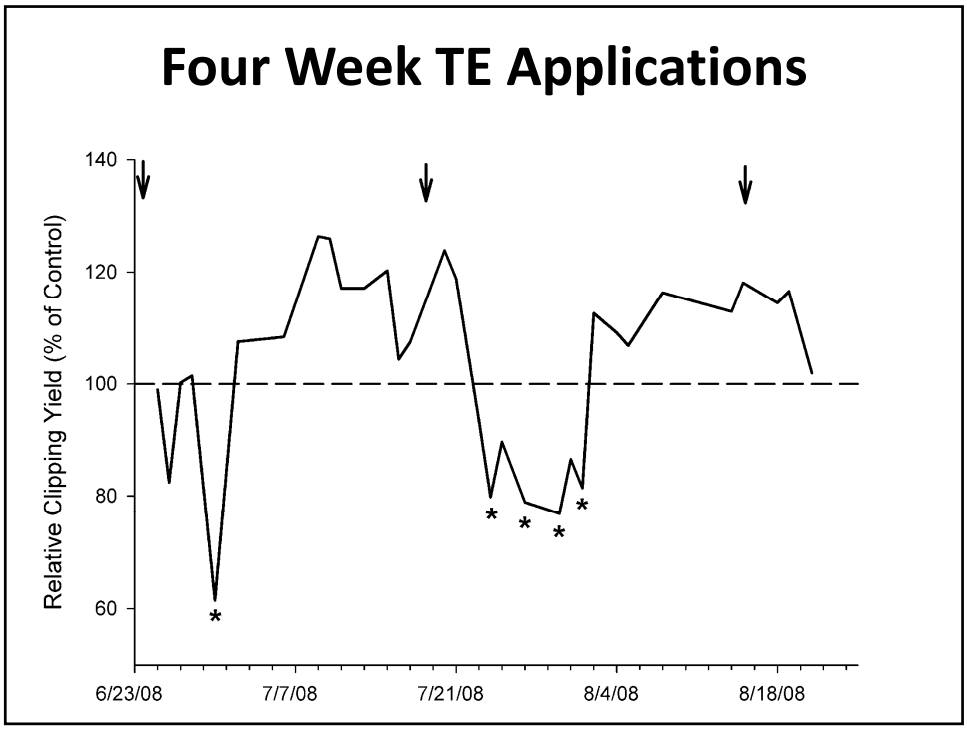


TE Growing Degree Days System

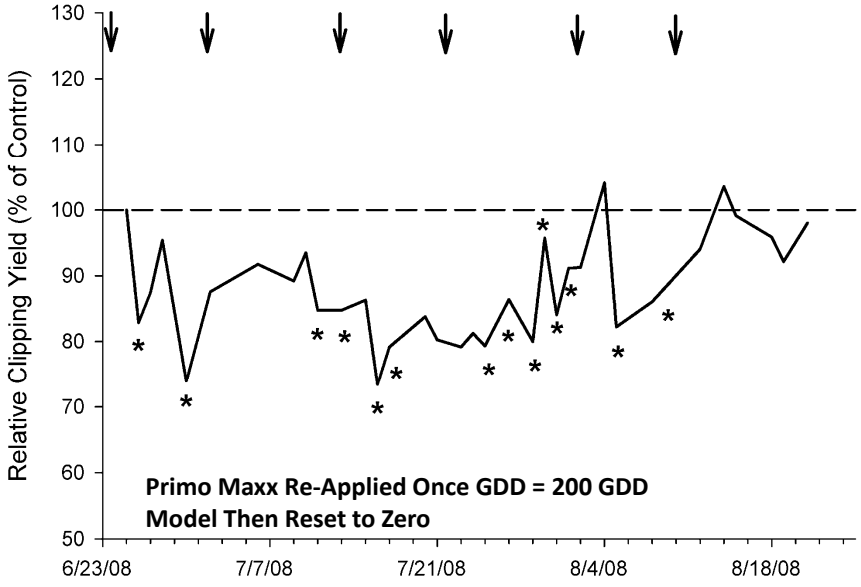
- **Air Temperature Predicts TE Re-application intervals**
- **Calculating GDD**
  - **By Hand:**
    - **Get Yesterday's Average Temperature**
    - **Convert to Celsius**
    - **Add Temperatures**
  - **Use Weather.com**
    - **EASY!!!**



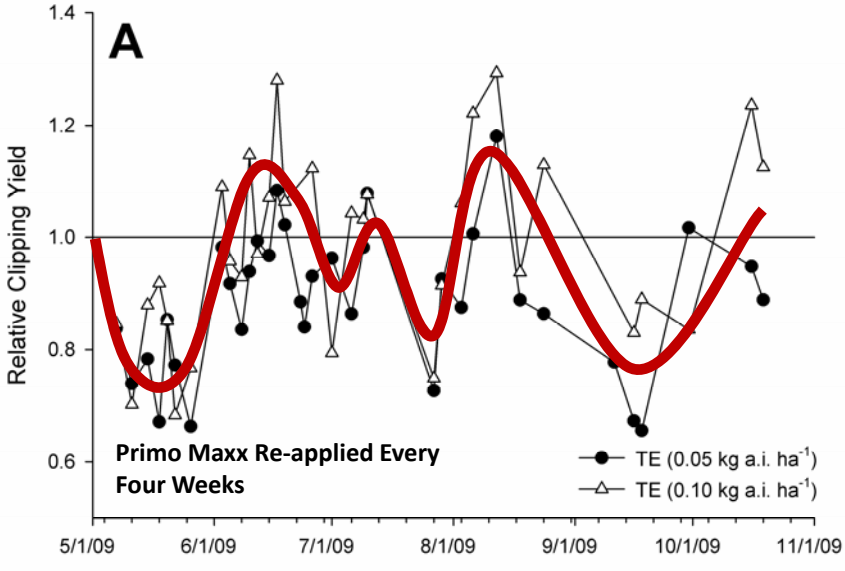

Relative Clipping Yield
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0
200
400
600
800
Cumulative GDD After TE Application
Poa annua Response
y = 1.000 + 0.183 * sin (2π * GDD^0.738 / 138.828 + π)
Domain = 0 to 800 GDD
R² = 0.631
p-value < 0.0001


Four Week TE Applications
Relative Clipping Yield (% of Control)
140
120
100
80
60
6/23/08
7/7/08
7/21/08
8/4/08
8/18/08

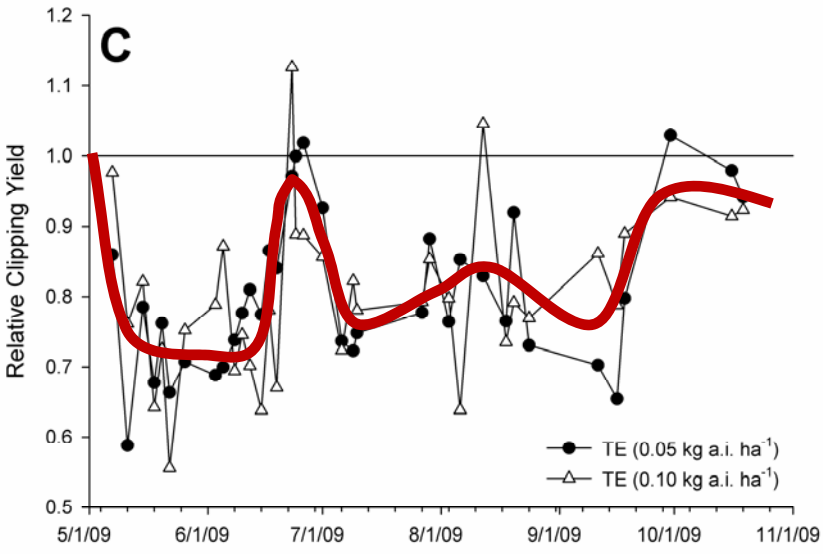
200 GDD TE Applications



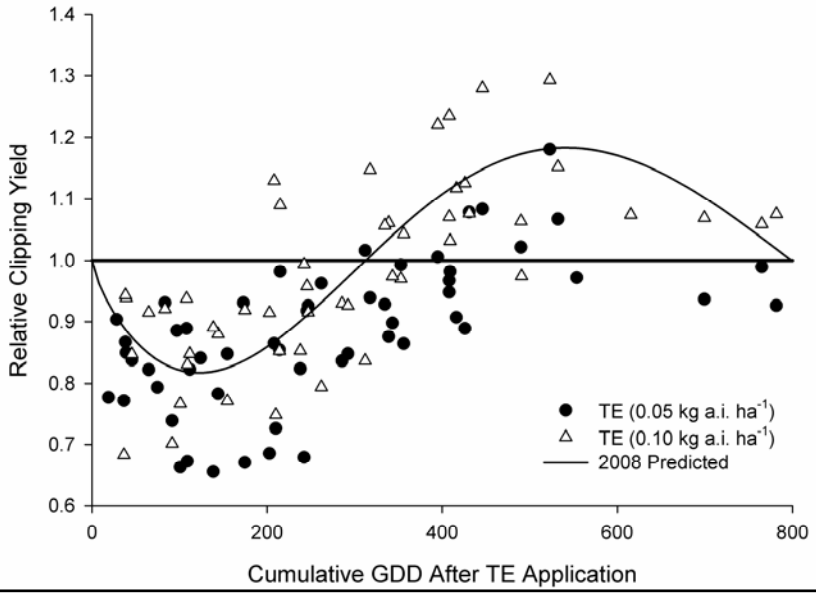
What About Application Rate?



200 GDD TE At 1x and 2x Rates



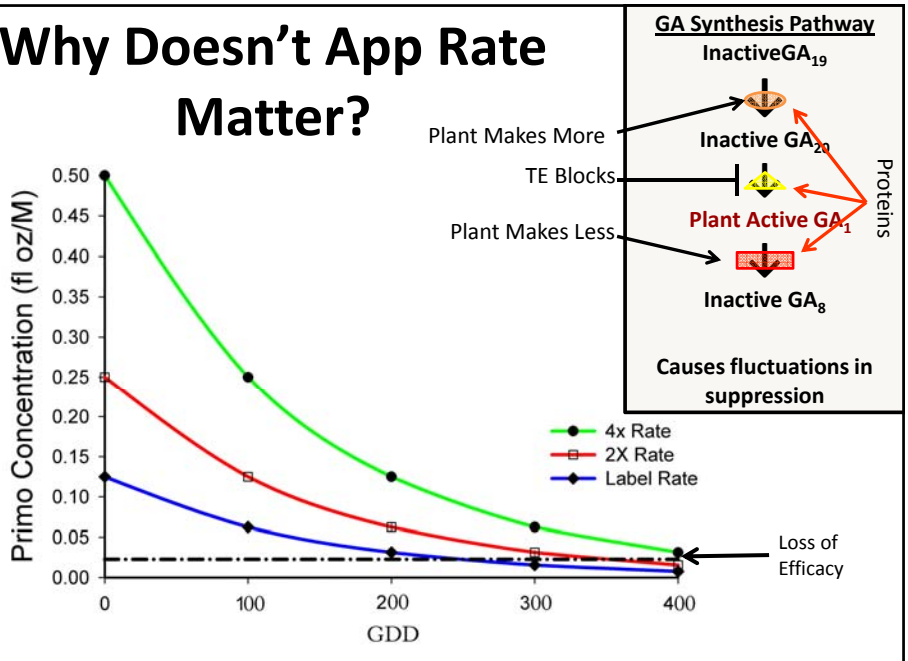
Same Curve As Previous Year



Use GDD To Increase TE Precision

- Calendar Based PGR Applications Inefficient
- Re-apply TE (Primo Maxx) Every 200 GDD
  - BASE TEMP: 0°C
  - Reset to 0 When TE is Re-applied
  - Maintains Yield Suppression Phase Regardless of Temperature
- Application Rate Not Important
  - Double labeled rate (0.25 fl oz/M) same duration and amount of growth suppression

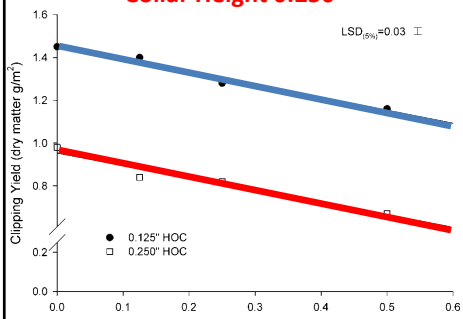
Why Doesn't App Rate Matter?



The Mowing Height Effect

Actual Clipping Yield

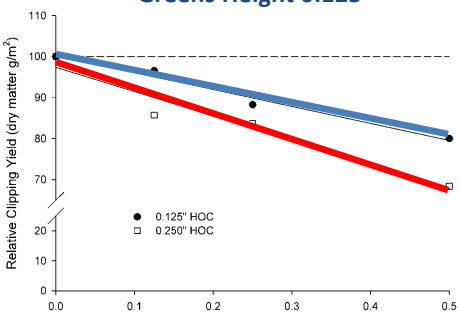
Collar Height 0.250”



Collar Height Grass Grows 50% Slower Than Greens Height Grass

Relative Clipping Yield

Greens Height 0.125”



More Relative Yield Suppression on Collar Height Grass Than Greens

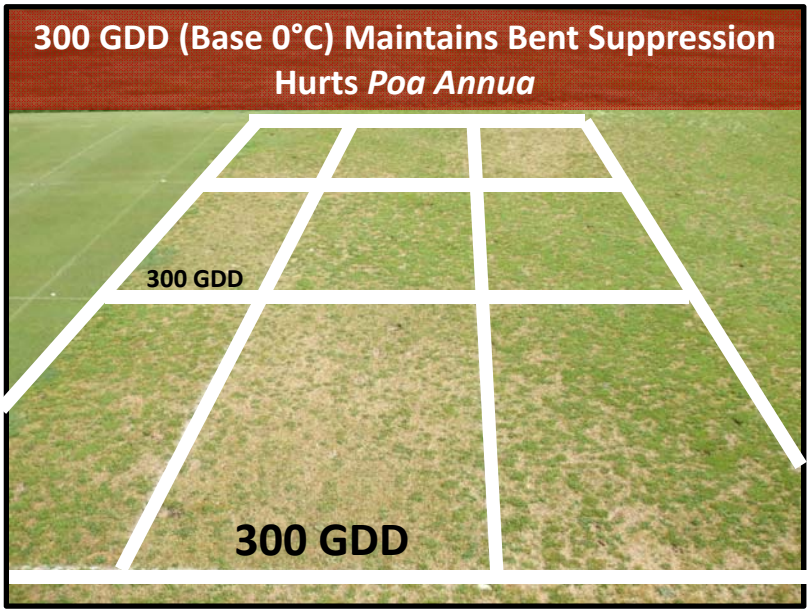
Implications for Summer Collar Decline

- PGRs More Effective on Higher Turfgrass
- Less Growth = Less Recuperative Potential
- Avoid Spraying PGRs on Wear Stressed Collars

Potential Solution

- Light N Applications to Increase Growth Rate
  - Relative Growth Suppression Unaffected, However
- Last Resort: Spray affected areas with product containing GA to cancel out PGR
  - Floratine Astron®

GDDs and Trimmit on Greens



Conclusions

- Applying PGRs on Calendar Schedules is Ineffective
- Use GDDs (Base 0°C) to Maintain Suppression
  - Specific to Bentgrass (Greens Mainly)
  - 200 GDD Primo Maxx
  - 300 GDD Trimmit

weather.com/outlook/agriculture

- Application Interval More Important than Rate
- Higher Mown Turf More Sensitive to PGR Application – Summer Collar Decline

My Other Masters Research

- How Primo Maxx Reduces Putting Green N Requirements
- How Primo Maxx Suppresses *Poa annua*
- Mixing Primo and Trimmit on Putting Greens
- Application of Primo Maxx and Governor to Six Common Lawn/Athletic Field Grasses
- Determination of Putting Green Soil Test P Requirements
  - The Role of Primo Maxx on P Requirements

Contact Me

- Presenting Those Topics at the Golf Industry Show on Monday Feb. 7 2011 in Dr. Ervin's Seminar

  Plant Growth Regulator For Fine Turf

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