Can Certain Fungicides and PGRs Improve Turfgrass Water Use Efficiency?

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Objectives:

It is well known that several fungicides, insecticides, and growth regulators can increase plant vigor and tolerance to abiotic stresses in addition to their primary function. The purpose of this study was to determine if these products can improve turfgrass tolerance to drought imposed by deficit irrigation. Other products, purported to reduce water use, appear likely to contain elevated amounts of nutrients (e.g., nitrogen) that can mask drought symptoms. The purpose of adding a nitrogen (N) treatment in this experiment was to determine the effects of excessive nitrogen on turfgrass stress tolerance, water use efficiency, and rooting.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam

Experimental Design: Randomized split block with 3 replications; main plots are chemical treatments and sub-plots are irrigation treatments

Plot Size: 6' by 6'

Species/Cultivars: Bermudagrass „Princess 77'

Fertility: 1 lb N/1000 ft^2 6 times annually

Application Information: CO_2 Bicycle sprayer
TeeJet 8003VS nozzles
19" nozzle spacing
22" boom height
Speed 1 mph
Output: 80 GPA
Pressure: 42 psi @ tank
Calibration: 946 ml/nozzle/minute

Application Timing: Initial application of all chemicals and fertilizer was made on August 18th, 2010

Irrigation Regimes: Prior to initiation of the study, the plot area was irrigated at 60% ETo/DU. Following initial application of chemicals and fertilizer, plots were then hand watered at either 50 or 70% ET_o three times weekly (MWF) according to the CIMIS ETo from the previous week.

Data Collection: Baseline and every two or four weeks: turf quality; percent soil volumetric water content using TDR probe; "greenness" measured by NDVI; photosynthesis and respiration using

LiCor 7500 infrared gas analyzer; ET; Water Use Efficiency (WUE); clipping yield; rooting at conclusion of experiment.

Treatments:

Trt	Product(s)	Rate	Frequency
1.	Untreated Control		
2.	Revolution	6 oz/1000 ft^2	Two monthly
3.	Insignia Revolution	0.9 oz/1000 ft^2 6 oz/1000 ft^2	Two monthly
4.	Heritage TL Revolution	2 oz/1000 ft^2 6 oz/1000 ft^2	Two monthly
5.	Honor Revolution	0.7 oz/1000 ft^2 6 oz/1000 ft^2	Two monthly
6.	Signature	8 oz/1000 ft^2	Four bi-weekly
7.	Primo Maxx	0.25 oz/1000 ft^2	Four bi-weekly
8.	Methylene Urea (40-0-0)	4 lbs N/1000 ft^2	Once

Preliminary Results:

- ✓ There were no statistically significant differences among treatments to date (Figs. 1-4), due in part to natural variation within the plot area.
- ✓ There was greater soil water retention in treatments containing Revolution surfactant (Fig. 3).
- ✓ Nitrogen increased clipping yield (Fig. 4), but excess growth appears to be depleting soil water in deficit irrigation treatment (Fig. 3).

Acknowledgments: Special thanks to BASF, Bayer, Syngenta, and Aquatrols for their support of this study.

Plot Map:

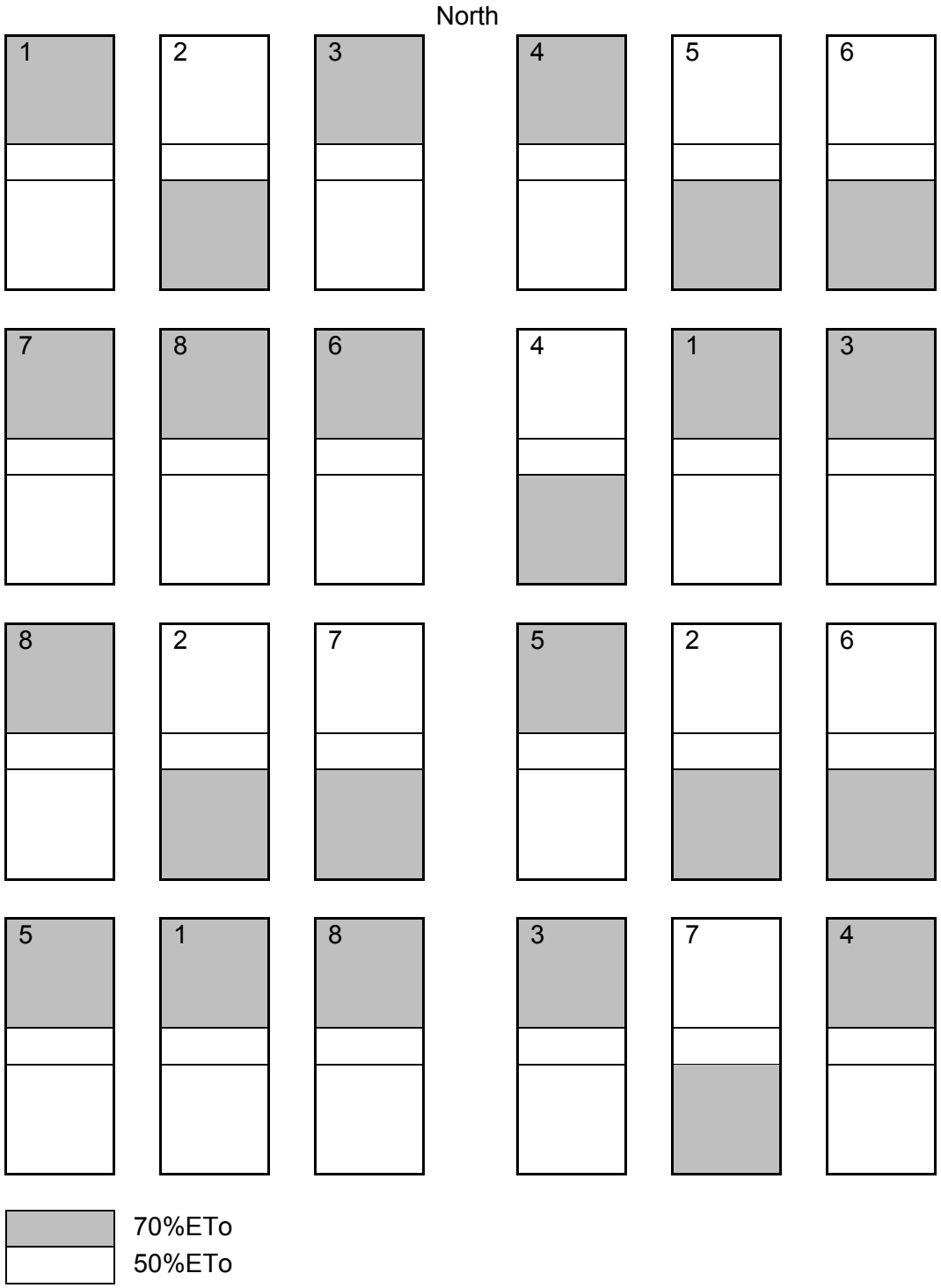

Figure 1. Bermudagrass turf quality (1-9, 9 = best) following initial chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.

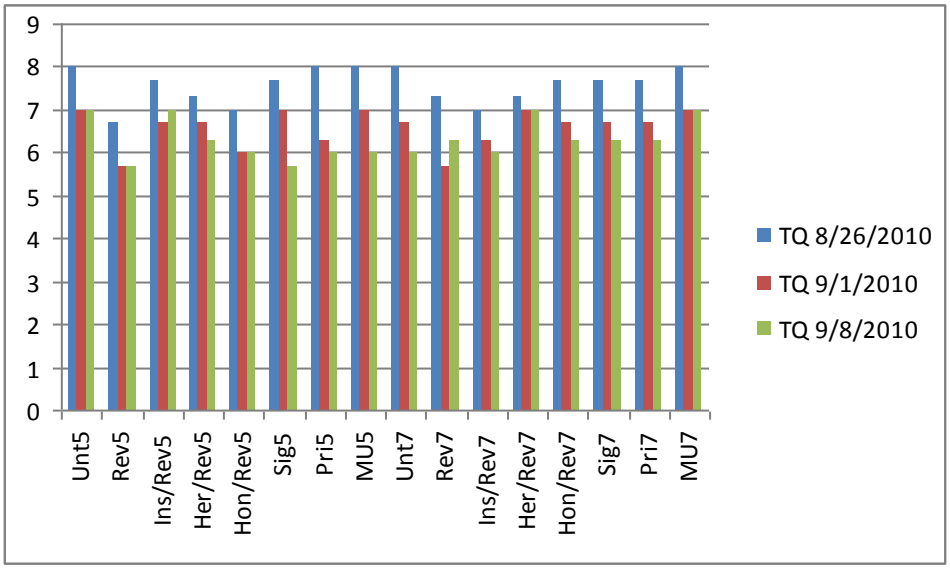

Figure 2. Normalized Difference Vegetative Index (NDVI) measurements prior to and following chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.

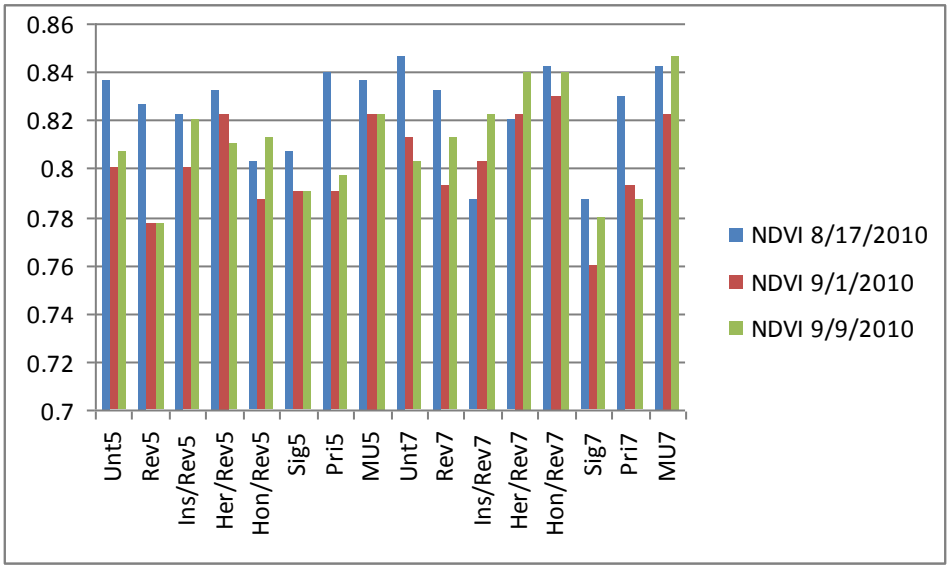

Figure 3. Percent soil volumetric water content measured by time domain reflectometry (TDR) prior to and following initial chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.

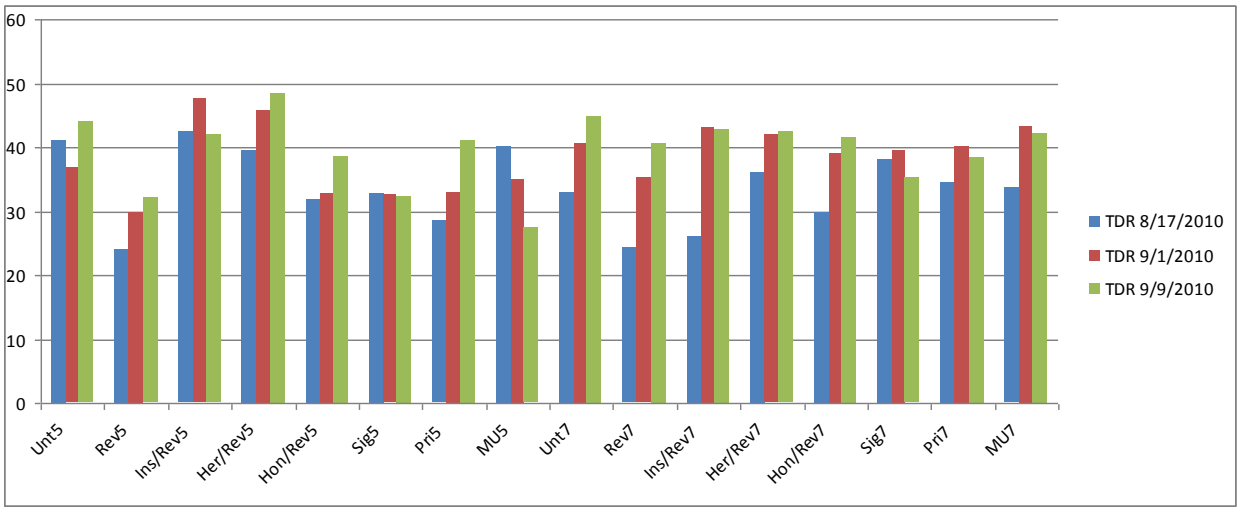

Figure 4. Bermudagrass clipping dry weight harvested on 8/31/2010 following initial chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.