Hygroscopic and Soil Surfactant Effects on Turfgrass Drought Tolerance

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Objective:

To observe hygroscopic, humectant, and soil surfactant effects on turfgrass drought tolerance.

Key Results:

- At 50% ETa, Cistern provided the best visual leaf color and visual turfgrass quality ratings on the last five rating dates.
- At 50% ETa, Cistern was the only product to maintain acceptable visual leaf color and visual turfgrass quality for the length of the study.
- The root zone surfactant did not improve visual leaf color or visual turfgrass quality when an irrigation regime is 75% of ETa or less.

Methodology:

Cistern, Moisture Manager and a root zone surfactant and were applied to 'A4' creeping bentgrass putting green plugs, USGA spec profile, in a controlled greenhouse setting and maintained with various water schedules. Those water schedules were designed to replace a percentage of water lost through evapotranspiration. The result was 16 treatments (four chemical treatments x four irrigation regimes). Irrigation was adjusted in timing of application and not in volume, i.e. irrigated every third day compared to every fifth day. See table below. Applications were made at label rates starting on Sept. 3, 2012 and reapplied monthly on October 3, 2012 and November 3, 2012. All products were irrigated with 0.1" of water at application. Turfgrass response to these products was measured by visual leaf color and visual turfgrass quality, and NDVI values measured weekly. Soil moisture content was also measured weekly, and destructive root measurements were made at the conclusion of the study.

Chemical Treatments			Irrigation Regime
	Initial Rate	Re-app. Rate	
Untreated			100% ETa
Cistern	8 oz.	8 oz.	75% ETa
Moisture Manager	9 oz.	3 oz.	50% ETa
Root zone surfactant	6 oz.	6 oz.	25% ETa

Results:

The treatment differences of significance occurred at the irrigation treatment regime that replaced 50% of the evapotranspiration (ETa). While it seemed likely, it is now clear that treatment differences at 100% ETa did not show any differences, and it is also clear that at 25% ETa that the available water is insufficient for sustainable turfgrass. The fact that there were no consistent trends at 75% ETa was surprising. However, the average volumetric water content in the 75% ETa at the start of the study were statistically similar to the 100% ETa treatment, and at the end of the study was statistically similar to the 50% Eta, so given more time, differences in the 75% ETa treatments may have become present.

All differences discussed below occurred at 50% ETa.

Visual Leaf Color and Visual Turfgrass Quality:

From Oct 22 – Nov 20, 2012 (the final five rating dates) at 50% ETa Cistern had higher visual leaf color and visual turfgrass quality ratings than root zone surfactant and the control. In regard to visual turfgrass quality, Moisture Manager was better than root zone surfactant on three of those dates, but only better than the untreated control on one rating date. Cistern was the only treatment to be in the highest statistical group at every rating date and the only treatment that maintained values above the researcher's minimally acceptable value for visual leaf color and visual turfgrass quality, 6 on a scale of 1-9, for the duration of the study.

NDVI Values:

On the final rating date, Nov. 13, 2012 there was statistical separation of NDVI values by treatment at the 50% ETa. In this rating date the NDVI for Cistern and Moisture Manager were statistically similar and significantly higher than the root zone surfactant and the untreated control. As NDVI is a relative estimate of photosynthetic or leaf health, this Nov. 13 result correlates well with the visual ratings

Root Mass-

There was no treatment effect on root biomass.

Future Work:

Suggestions to improve this work moving forward include:

- Using replacement ETa values closer to 50%, e.g. 35% and 65%.
- Utilizing plugs that were experiencing localized dry spots may increase differences.
- Greater treatment differences are more likely if exposed to the natural weather changes occurred outdoors: highs, lows, wind and dew, without receiving additional irrigation or rainfall.