IDENTIFYING AND RELIEVING SOIL WATER REPELLENCY IN TURFGRASS SYSTEMS

Dr. John L. Cisar, University of Florida, Fort Lauderdale Research and Education Center (FLREC), Fort Lauderdale, FL 33314

INTRODUCTION:

Soil water repellency is a challenging water management issue for turfgrass managers. Identifying the extent and subsequent approach to alleviation of soil water repellency through practical surfactant application is often the most prudent approach. Surfactant application delivery via irrigation systems is an intriguing method for routine management of soil water repellency. The objective of this experiment was to determine the efficacy of several surfactants when applied through an irrigation system.

MATERIALS AND METHODS:

On May 24, 2000 the treatments listed below were applied and then re-applied on 7/7, 8/2, and 10/25 using the FLREC's chemigation plots. The research plots were allowed to recover the month of September due to the combined effects of dry down stress and management. Treatments were applied to 4 replications of 4m x 4m bermudagrass plots that can be individually controlled to deliver precise volumes of irrigation mixed with treatment solutions. The experiment consisted of four dry-down periods after treatments were applied and irrigated following irrigation protocol (5/24-6/19, 7/7-7/21, 8/2-8/18 and 10/25-11/15). In between dry-down periods plots were maintained with 1.0lb N/1000ft^2 of 16-4-8 and treated by herbicides. Turfgrass quality (scale of 1-10 with 10=dark green turf, 1=dead/brown turf and 6=minimally acceptable turf), percent localized dry spots (LDS), and soil moisture measurements were taken prior to initiation and for the duration of the study. Soil cores were removed from plots prior to application and through the experiment. Water drop penetration tests were performed on soil cores. All data was subject to statistical analysis and significant means were identified.

TREATMENTS:

1. ACA 1761 @ 2 oz/1000ft^2 with 1/16" irrigation
2. ACA 1761 @ 2 oz/1000ft^2 with 1/8" irrigation
3. InfilTRx @ 0.75 oz/1000ft^2 with 1/8" irrigation
4. BreakThru @ 0.75 oz/1000ft^2 with 1/8" irrigation
5. Control

RESULTS AND DISCUSSION:

The experiment bracketed a period of seasonal and atypical dry weather that allowed for several observation periods favorable for evaluating treatment effects. As a result, significant treatment effects were noted for many of the parameters tested over the experiment (Tables 1–8). Turfgrass quality was improved by surfactant treatment during the typical dry season in May and during unusual droughts in August and late October, and fewer differences were observed during a normal wet season in July (Table 1). Individual treatments received similar ratings with few consistent differences (Table 1). Infiltrx had among the highest ratings on most dates as did 1761applied with 1/16th inch of water (Table 1).

Soil moisture content was significantly affected by treatment on three measurement dates (Table 2). Early on, controls had greater moisture content and later on during a severe dry period in November, the control had significantly lower moisture (Table 2). Since the controls were of lesser quality even in May, this suggests that early on the control could not efficiently take advantage of the moisture in the soil. Later on the treated plots were improved perhaps by the ability to retrieve water more effectively over several stress periods (Table 2).

There were more localized dry spots in the control on Nov. 15 2000 (Table 3). Infiltrx did well on most dates (Table 4). The 1761 1/8th inch irrigation treatment, on some dates, had somewhat more dry spotting (although inconsistent). Water drop penetration time (WDPT) differences were obtained at the surface level (Tables 5 and 8). Generally, treatments had lower WDPT than the control (Tables 5 and 8).

In conclusion, the use of irrigation applied surfactants provided better turf quality during typical and atypical dry periods in south Florida in year 2000.

Table 1. Turfgrass quality ratings for Aquatrols injection study initiated on May 24, 2000.

	Date								
Source	5/24[1]	6/7	6/19	7/7[1]	7/21	8/2[1]	8/16	10/25[1]	11/15
BreakTh	7.5ab	7.1	7.4a	5.6	7.1ab	6.8	7.0ab	7.7a	7.8ab
Infiltrx	7.6a	7.0	6.9bc	6.3	7.6a	7.1	7.3a	7.5a	7.4b
1761 1/8"	7.5ab	6.8	6.6c	5.8	6.6b	6.9	7.1ab	7.6a	7.9ab
1761 1/16"	7.8a	7.0	7.1ab	6.0	6.9ab	6.9	6.7b	7.6a	8.1a
Control	7.3b	7.0	6.7c	5.1	6.5b	7.0	7.0ab	6.9b	6.9c
Signif.	+	ns	*	ns	+	ns	+	*	**

+, ns, *, and ** = P<0.10, P>0.10, P<0.05, and P<0.01 respectively.

[1]Treatments applied on these days.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Table 2. Theta probe readings (moisture content of soil) for Aquatrols injection study initiated on May 24, 2000.

	Date								
Source	5/24[1]	6/12	6/16	7/7[1]	7/21	8/2[1]	8/16	10/25[1]	11/15
BreakTh	.337	.243b	.140	.200	.177	.179b	.244	.241	.077a
Infiltrx	.340	.247b	.141	.224	.201	.204ab	.264	.222	.073ab
1761 1/8"	.327	.270a	.140	.206	.175	.209a	.265	.252	.072ab
1761 1/16"	.351	.281a	.143	.231	.190	.214a	.287	.258	.078a
Control	.354	.276a	.154	.230	.199	.213a	.262	.248	.046b
Signif.	ns	**	ns	ns	ns	+	ns	ns	+

+, ns, and ** = P<0.10, P>0.10, and P<0.01 respectively.

[1]Treatments applied on these days.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Table 3. Percent LDS for Aquatrols injection study initiated on May 24, 2000.

	Date			
Source	6/19	7/18	8/16	11/15
Break-Thru	21.3b	81.3a	17.5b	1.3b
Infiltrx	28.8ab	56.3b	22.5b	5.0b
1761 at 1/8" irrig.	41.3a	82.5a	45.0ab	1.3b
1761 at 1/16" irrig.	23.7ab	70.0ab	38.8ab	0.0b
Control	36.3ab	86.3a	58.8a	13.8a
Significance	+	+	+	**

+ and ** = P<0.10 and P<0.01

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Table 4. Water Drop Penetration Time (WDPT) in seconds for Aquatrols injection study soil cores taken on May 24, 2000 (Pre-treatment).

	Depth (cm)						
Source	0	1	2	3	4	5	6
Break-thru	52	13ab	7	0.3	0	0	0
Infiltrx	56.3	21a	9.3	0.5	0.3	0	0
1761 1/8"	64.5	17.5a	8	1.3	0	0	0
1761 1/16	43.5	7.3b	3.5	0	0	0	0
Control	56.7	12.7ab	6	0.8	0.3	0	0
Signif.	ns	+	ns	ns	ns	ns	ns

ns and + = P>0.10 and P<0.05

Means with the same letter within a column are not significantly different according to Duncan's Mulitple Range Test.

Table 5. Water Drop Penetration Time (WDPT) in seconds for Aquatrols injection study soil cores taken on June 13, 2000.

	Depth (cm)						
Source	0	1	2	3	4	5	6
Break-thru	6.3b	1.3	1.3	0.5	0.5	0.3	0.3
Infiltrx	7.0ab	3.3	1.5	1.0	0	0	0.3
1761 1/8"	4.0b	6.0	0.8	0.5	0.5	0.5	0
1761 1/16	2.8b	1.8	0.8	0.5	0.5	0	0
Control	13.8a	1.3	0.8	0.5	0.3	0	0
Signif.	*	ns	ns	ns	ns	ns	ns

* and ns = P<0.05 and P>0.10

Means with the same letter within a column are not significantly different according to Duncan's Mulitple Range Test.

Table 6. Water Drop Penetration Time (WDPT) in seconds for Aquatrols injection study soil cores taken on August 2, 2000.

	Depth (cm)						
Source	0	1	2	3	4	5	6
Break-thru	11.8	5.8	2.8	1.3	0.5	0.3	0.3
Infiltrx	10.8	4.8	3.3	0.5	0.3	0	0
1761 1/8"	11.3	4.3	1.8	0.8	0.3	0	0
1761 1/16	9.3	5.0	2.8	1.0	0.8	0	0
Control	6.8	3.8	2.8	0.5	0	0	0
Signif.	ns	ns	ns	ns	ns	ns	ns

ns = P>0.10

Means with the same letter within a column are not significantly different according to Duncan's Mulitple Range Test.

Table 7. Water Drop Penetration Time (WDPT) in seconds for Aquatrols injection study soil cores taken on August 16, 2000.

	Depth (cm)						
Source	0	1	2	3	4	5	6
Break-thru	7.8	1.5	0.8	0.5	0	0	0
Infiltrx	8.5	3.0	1.8	0.5	0	0	0
1761 1/8"	9.3	2.3	0.8	0.3	0	0	0
1761 1/16	5.0	1.5	0.5	0.3	0.3	0	0
Control	10.5	2.0	0.8	0.3	0	0	0
Signif.	ns	ns	ns	ns	ns	ns	ns

ns = P>0.10

Means with the same letter within a column are not significantly different according to Duncan's Mulitple Range Test.

Table 8. Water Drop Penetration Time (WDPT) in seconds for Aquatrols injection study soil cores taken on November 1, 2000.

	Depth (cm)						
Source	0	1	2	3	4	5	6
Break-thru	5.0b	2	0.3	0	0	0	0
Infiltrx	3.3b	0.8	0	0	0	0	0
1761 1/8"	5.5b	1.5	0.5	0	0	0	0
1761 1/16	7.8ab	1.8	0.8	0.3	0	0	0
Control	12.0a	1.3	0.3	0	0	0	0
Signif.	*	ns	ns	ns	ns	ns	ns

ns = P>0.10

Means with the same letter within a column are not significantly different according to Duncan's Mulitple Range Test.