

SMS Surfactant Trials, 2010

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Methods: Four direct comparisons were made on a sand based creeping bentgrass tee at Bellewood Golf Club located in Pottstown, PA. The turfgrass was comprised of mature PennTrio creeping bentgrass. This area has inadequate irrigation coverage and is prone to severe localized drying. As most, soils, however, it is not uniform.

Treatments application dates are noted in individual tables. Treatments were applied using a CO₂ pressurized sprayer at 38 psi and calibrated to deliver 88 gallons of water per acre. All treatments were immediately watered into the turfgrass using 0.25 inches of water from a hose with a meter. No treatment induced injury or phytotoxicity was observed.

Weather for the trial period was marked by prolonged dry periods with above average temperatures. The plots were irrigated to replace approximately 50% of evapotranspiration and severe drought was observed in the trial area.

Plots were visually rated for color, quality and % LDS. Turfgrass color on 0-10 scale where 5= color of untreated turf and 10= optimal color. Turfgrass quality on 0-10 scale where 7= color of untreated turf and 10= optimal quality. Percent localized dry spot (%LDS) was rated on a 0 to 100 scale where 0= none and 100= entire plot area symptomatic of dry spot. NDVI was measured using Spectrum Technologies Turf color meter. Water drop penetration test was performed at 0 (soil interface), 1, 2, 3, 4, 5, and 6 cm depth. Three cores per plot were used. The cores were allowed to air dry for 10-12 days prior to drop test. Droplets that did not penetrate the core for 10 minutes (600 seconds) were recorded as >600 seconds. Percent Volumetric Water (%VWC) were collected from each plot using a Spectrum Technologies TDR moisture meter. Five measurements per plot were be taken weekly at both 1.5 and 3.0 inches depth. Data were subject to ANOVA and separated using Tukey's test (p=0.05).

Comparison of SMS400 at 6 fl oz/M and Revolution at 6 fl oz/M. Data for this trial are shown in tables 1-9. There were few differences observed among treated and untreated plots in this trial. Generally treated plots had quicker penetration in the water penetration test. On 10 and 18 August, treated plots had significantly less localized dry spots when compared to the untreated control. Plots treated with Revolution had the least localized dry spots on 10 and 18 August (Table 24). At the 3 inch depth on 1 September, both treatments increase water content when compared to the untreated control.

Table 1. Comparison of SMS 400 at 6 fl oz and Revolution: Water drop penetration test: 29 July 2010

| Rating Date | | | | 29 July 2010 (Initial) | | | | | | | |
|-------------------|----------------|-------------------------------|-----------|---|--------|---------|--------|--------|--------|--------|--|
| Rating Type | | | | Seconds to penetrate soil at various depth*** | | | | | | | |
| Depth | | | | 0 cm | 1 cm | 2 cm | 3 cm | 4 cm | 5 cm | 6 cm | |
| Trt No. | Treatment Name | Rate per 1000 ft ² | Appl Code | | | | | | | | |
| 1 | Untreated | | | 101.0 a | 58.3 a | 43.3 ab | 16.0 a | 3.7 a | 2.3 a | 1.3 a | |
| 2 | SMS 400 | 6.0 fl oz | A | 80.7 a | 46.0 a | 17.7 b | 14.7 a | 25.0 a | 4.0 a | 1.0 a | |
| 3 | Revolution | 6.0 fl oz | A | 77.3 a | 62.0 a | 45.3 a | 8.7 a | 2.7 a | 2.0 a | 2.7 a | |
| Treatment Prob(F) | | | | 0.2510 | 0.7956 | 0.0387 | 0.6251 | 0.4477 | 0.2336 | 0.3460 | |

* Treatments were applied on 29 July (A) 2010

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Water drop penetration test at 0 (soil interface), 1, 2, 3, 4, 5, and 6 cm depth. Three cores per plot were used. The cores were allowed to air dry for 10-12 days prior to drop test. Droplets that did not penetrate the core for 10 minutes (600 seconds) were recorded as >600 seconds.

Table 2. Continued: 4 August 2010

| Rating Date | | | | 4 August | | | | | | | |
|-------------------|----------------|-------------------------------|-----------|---|--------|--------|--------|--------|--------|--------|--|
| Rating Type | | | | Seconds to penetrate soil at various depth*** | | | | | | | |
| Depth | | | | 0 cm | 1 cm | 2 cm | 3 cm | 4 cm | 5 cm | 6 cm | |
| Trt No. | Treatment Name | Rate per 1000 ft ² | Appl Code | | | | | | | | |
| 1 | Untreated | | | 31.0 a | 8.0 a | 7.7 a | 7.8 a | 2.2 a | 2.0 a | 2.0 a | |
| 2 | SMS 400 | 6.0 fl oz | A | 32.7 a | 13.2 a | 9.0 a | 3.8 a | 2.3 a | 1.7 a | 1.8 a | |
| 3 | Revolution | 6.0 fl oz | A | 23.3 a | 9.3 a | 3.5 a | 2.0 a | 1.5 a | 1.3 a | 1.3 a | |
| Treatment Prob(F) | | | | 0.3946 | 0.4839 | 0.5702 | 0.5301 | 0.5487 | 0.6400 | 0.6449 | |

* Treatments were applied on 29 July (A) 2010

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Water drop penetration test at 0 (soil interface), 1, 2, 3, 4, 5, and 6 cm depth. Three cores per plot were used. The cores were allowed to air dry for 10-12 days prior to drop test. Droplets that did not penetrate the core for 10 minutes (600 seconds) were recorded as >600 seconds.

Table 3. Continued: 10 August 2010

| Rating Date | | | | 4 August | | | | | | |
|-------------------|----------------|-------------------------------|-----------|---|--------|--------|--------|--------|--------|--------|
| Rating Type | | | | Seconds to penetrate soil at various depth*** | | | | | | |
| Depth | | | | 0 cm | 1 cm | 2 cm | 3 cm | 4 cm | 5 cm | 6 cm |
| Trt No. | Treatment Name | Rate per 1000 ft ² | Appl Code | | | | | | | |
| 1 | Untreated | | | 98.2 a | 84.5 a | 62.7 a | 45.2 a | 58.2 a | 53.0 a | 24.7 a |
| 2 | SMS 400 | 6.0 fl oz | A | 36.0 a | 19.0 b | 11.8 a | 28.2 a | 27.7 a | 22.3 a | 9.0 a |
| 3 | Revolution | 6.0 fl oz | A | 90.0 a | 38.3 b | 50.0 a | 30.5 a | 51.7 a | 94.2 a | 64.7 a |
| Treatment Prob(F) | | | | 0.0841 | 0.0136 | 0.3199 | 0.1900 | 0.2420 | 0.0837 | 0.6469 |

* Treatments were applied on 29 July (A) 2010

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Water drop penetration test at 0 (soil interface), 1, 2, 3, 4, 5, and 6 cm depth. Three cores per plot were used. The cores were allowed to air dry for 10-12 days prior to drop test. Droplets that did not penetrate the core for 10 minutes (600 seconds) were recorded as >600 seconds.

Table 4. Continued: 18 August 2010

| Rating Date | | | | 18 August | | | | | | |
|-------------------|----------------|-------------------------------|-----------|---|----------|----------|----------|----------|---------|---------|
| Rating Type | | | | Seconds to penetrate soil at various depth*** | | | | | | |
| Depth | | | | 0 cm | 1 cm | 2 cm | 3 cm | 4 cm | 5 cm | 6 cm |
| Trt No. | Treatment Name | Rate per 1000 ft ² | Appl Code | | | | | | | |
| 1 | Untreated | | | 180.97 a | 110.42 a | 108.52 a | 110.02 a | 102.92 a | 66.19 a | 52.26 a |
| 2 | SMS 400 | 6.0 fl oz | A | 83.45 a | 34.45 a | 12.42 b | 38.76 ab | 47.85 a | 38.42 a | 23.76 a |
| 3 | Revolution | 6.0 fl oz | A | 89.19 a | 63.11 a | 31.80 b | 20.11 b | 28.92 a | 25.61 a | 19.85 a |
| Treatment Prob(F) | | | | 0.0941 | 0.1480 | 0.0219 | 0.0474 | 0.0816 | 0.1052 | 0.3959 |

* Treatments were applied on 29 July (A)

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Water drop penetration test at 0 (soil interface), 1, 2, 3, 4, 5, and 6 cm depth. Three cores per plot were used. The cores were allowed to air dry for 10-12 days prior to drop test. Droplets that did not penetrate the core for 10 minutes (600 seconds) were recorded as >600 seconds.

Table 5. Continued: 11 September 2010

| Rating Date | | | | 11 September | | | | | | |
|-------------------|----------------|--------------------|----------|---|---------|---------|----------|---------|---------|-------|
| Rating Type | | | | Seconds to penetrate soil at various depth*** | | | | | | |
| Depth | | | | 0 cm | 1 cm | 2 cm | 3 cm | 4 cm | 5 cm | 6 cm* |
| Trt No. | Treatment Name | Rate per 1000 Code | Appl ft2 | | | | | | | |
| 1 | Untreated | | | 55.78 b | 31.90 a | 22.90 a | 32.16 ab | 22.78 a | 14.07 a | |
| 2 | SMS 400 | 6.0 fl oz | A | 50.38 b | 20.23 a | 15.09 a | 15.97 b | 33.02 a | 26.14 a | |
| 3 | Revolution | 6.0 fl oz | A | 107.54 a | 34.61 a | 33.54 a | 42.47 a | 27.16 a | 20.38 a | |
| Treatment Prob(F) | | | | 0.0249 | 0.3346 | 0.1137 | 0.0375 | 0.5618 | 0.4982 | |

* Treatments were applied on 29 July (A)

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Water drop penetration test at 0 (soil interface), 1, 2, 3, 4, 5, and 6 cm depth. Three cores per plot were used. The cores were allowed to air dry for 10-12 days prior to drop test. Droplets that did not penetrate the core for 10 minutes (600 seconds) were recorded as >600 seconds.

* Data missing, soil samples all feel apart at 6 cm level

Table 6. Turfgrass Quality as impacted by various surfactant.

| Rating Date | | | | Jul-29 | Aug-3 | Aug-10 | Aug-18 | Sep-11 |
|-------------------|------------|--------------------|----------|-----------------------------|--------|--------|--------|--------|
| Rating Type | | | | Turfgrass Quality (0-10)*** | | | | |
| Trt No. | Treatment* | Rate Per 1000 Code | Appl ft2 | | | | | |
| 1 | Untreated | | | 8.0 a | 6.7 b | 5.33 a | 5.67 a | 5.00 a |
| 2 | SMS 400 | 6.0 fl oz | A | 8.0 a | 8.0 a | 6.3 a | 6.17 a | 5.7 a |
| 3 | Revolution | 6.0 fl oz | A | 8.0 a | 8.0 a | 7.0 a | 7.0 a | 7.0 a |
| Treatment Prob(F) | | | | 1.0000 | 0.0123 | 0.1800 | 0.4257 | 0.373 |

* Treatments were applied on 29 July (A)

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Turfgrass quality on 0-10 scale where 7= acceptable threshold for quality and 10= optimal quality.

Table 7. Percent localized drought spot as impacted by surfactant.

| Rating Date | | Jul-29 | Aug-3 | Aug-10 | Aug-18 | Sep-11 | | |
|-------------------|------------|----------------|-------|--------|--------|---------|---------|--------|
| Rating Type | | Percent LDS*** | | | | | | |
| Trt | Treatment* | Rate | Appl | | | | | |
| No. | Name | Per 1000 ft2 | Code | | | | | |
| 1 | Untreated | | | 0.0 a | 8.3 a | 33.3 a | 43.3 a | 47.0 a |
| 2 | SMS 400 | 6.0 fl oz | A | 2.0 a | 0.0 b | 16.0 ab | 19.5 ab | 30.0 a |
| 3 | Revolution | 6.0 fl oz | A | 4.3 a | 0.0 b | 6.0 a | 7.33 b | 17.7 a |
| Treatment Prob(F) | | | | 0.2027 | 0.0112 | 0.0331 | 0.0336 | 0.1621 |

* Treatments were applied on 29 July (A)

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Percent localized dry spot (%LSD) was rated on a 0-100 scale where 0= none and 100= entire plot area symptomatic of dry spot.

Table 8. Turfgrass color as impacted by various surfactant treatments.

| Rating Date | | Jul-29 | Aug-3 | Aug-10 | Aug-18 | Sep-11 | | |
|-------------------|------------|---------------------------|-------|--------|--------|--------|-------|-------|
| Rating Type | | Turfgrass Color (0-10)*** | | | | | | |
| Trt | Treatment* | Rate | Appl | | | | | |
| No. | Name | per 1000 ft2 | Code | | | | | |
| 1 | Untreated | | | 5.0 a | 5.0 a | 5.0 a | 5.0 a | 5.0 a |
| 2 | SMS 400 | 6.0 fl oz | A | 5.0 a | 5.0 a | 5.0 a | 5.0 a | 5.0 a |
| 3 | Revolution | 6.0 fl oz | A | 5.0 a | 5.0 a | 5.0 a | 5.0 a | 5.0 a |
| Treatment Prob(F) | | | | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

* Treatments were applied on 29 July (A)

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Turfgrass color on 0=10 scale where 7= color of untreated turf and 10= optimal color.

Table 9. NDVI as impacted by various surfactant treatments.

| Rating Date | | Aug-3 | Aug-10 | Aug-17 | Aug-25 | Sep-1 | Sep-11 | | |
|-------------------|------------|------------|--------|----------|----------|----------|----------|----------|----------|
| Rating Type | | NDVI*** | | | | | | | |
| Trt | Treatment* | Rate | Appl | | | | | | |
| No. | Name | per1000ft2 | Code | | | | | | |
| 1 | Untreated | | | 0.6655 a | 0.6933 a | 0.6539 a | 0.6311 a | 0.5254 a | 0.5864 a |
| 2 | SMS 400 | 6.0 fl oz | A | 0.6198 a | 0.6831 a | 0.6514 a | 0.6205 a | 0.5978 a | 0.6201 a |
| 3 | Revolution | 6.0 fl oz | A | 0.6723 a | 0.7141 a | 0.6532 a | 0.6475 a | 0.5973 a | 0.6328 a |
| Treatment Prob(F) | | | | 0.6485 | 0.3387 | 0.9821 | 0.1363 | 0.0194 | 0.2245 |

* Treatments were applied on 29 July (A)

** Means followed by same letter do not significantly differ (P=.05, Tukey's HSD).

*** Turfgrass color on 0=10 scale where 7= color of untreated turf and 10= optimal color.