

Penncross Bentgrass and Soil Water Repellency as Affected by KALO Wetting Agents

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Objective:

To evaluate the effectiveness of experimental wetting agents against standard wetting agents for reducing soil water repellency and improving turfgrass quality and health.

Methods:

Experimental and standard wetting agents were applied to a mature stand of ‘Penncross’ creeping bentgrass growing on a USGA sandbased putting green at the Horticulture Research Station, Ames, Iowa according to the schedule in table 1 and 2.

Table 1. Wetting agent treatments applied to a USGA creeping bentgrass putting green in 2005.

| Treatments | Rate (oz) / 1000 sqft | Frequency (days after initial application) |
|-----------------------------|-----------------------|---|
| 1 Untreated | 0 | |
| 2 KA-3022 | 10 | Initial application (18 July) |
| | 5 | 14, 28, 42, 56, 70 DAI |
| 3 KA-3023 | 10 | Initial application (18 July) |
| | 5 | 14, 28, 42, 56, 70 DAI |
| 4 Tournament ready* Kalo | 8 | Initial application (18 July) |
| | 2 | 14, 28, 42, 56, 70 DAI |
| 5 Revolution Aquatrol** | 6 | Initial application (18 July) |
| | 6 | 28, 56 |

* Tournament Ready © Soil Surfactant – KALO, Inc.

** Revolution™ - Aquatrols Corporation

Table 2. Schedule of chemical application and data recording.

| Chemical application | | Data recording | |
|-----------------------------|------------|-----------------------|------------|
| Date | DAI | Date | DAI |
| 18-Jul | 0 | 19-Jul | 1 |
| N/A | | 21-Jul | 3 |
| N/A | | 25-Jul | 7 |
| 1-Aug | 14 | 3-Aug | 16 |
| 15-Aug | 28 | 18-Aug | 31 |
| 31-Aug | 42 | 6-Sep | 48 |
| 15-Sep | 56 | 20-Sep | 61 |
| 3-Oct | 70 | 10-Oct | 77 |

The green was mowed at 0.15 inches, fertilized with 4 lbs N/1000 sq.ft./yr, and watered to prevent severe wilt, except for a 7 day dry down period beginning 1 Sep 2005. The experimental design was a randomized complete block with 5 treatments and 5 replications. Individual plots were 3ft by 3ft. The following measurements were evaluated:

Turfgrass Quality – Turfgrass visual quality was evaluated on a scale of 1-9, 9 best, 6 lowest acceptable level, 1 poorest. Turf quality is a combination of color, density, uniformity, texture and any other turfgrass stresses that influence turf appearance.

Turf Color – Turf color is based on a visual rating scale of 1-9, 9 best, 6 lowest acceptable level, 1 no green color.

Phytotoxicity – Turf phytotoxicity was rated on a scale of 1-9, 9 green turf with no damage, 7 acceptable damage, 1 brown or discolored turf

Dew Formation – Dew formation was rated on a scale of 1-9, 9 = no dew and 1 = heavy dew.

Drought Stress – The intent of this study was to evaluate the performance of wetting agents on our research green that usually shows symptoms of localized dry spot during the summer. Under the irrigated conditions of the study localized dry spot did not develop this year. A non-irrigated period from 1-7 Sept 2005 did not develop visual signs of wilt in the test area.

Results:

Wetting agent treatments had no influence on turfgrass quality, density, pests, stress, and phytotoxicity under the conditions of this study. Data for these parameters measured through out the summer are summarized in table 3.

Table 3. Visual characteristics in USGA green under application of several wetting agents.

| Date | Quality† | Density‡ | Pests § | Stress¶ | Phytotoxicity,# |
|--------|----------|----------|---------|---------|-----------------|
| 19 Jul | 8.0 | 8.5 | N/A | 8.0 | 9.0 |
| 21 Jul | 8.0 | 8.5 | N/A | 8.0 | 9.0 |
| 25 Jul | 8.5 | 8.5 | N/A | 8.0 | 9.0 |
| 3 Aug | 8.5 | 8.5 | N/A | 8.0 | 9.0 |
| 18 Aug | 8.5 | 8.5 | N/A | 8.0 | 9.0 |
| 6 Sep | 8.5 | 8.5 | N/A | 8.5 | 9.0 |
| 20 Sep | 8.5 | 8.5 | N/A | 9.0 | 9.0 |
| 10 Oct | 8.5 | 9.0 | N/A | 9.0 | 9.0 |

† scale 1-9; 1 poorest, 6 lowest acceptable level, 9 best.

‡ scale 1-9; 1 lowest density, 9 highest density.

§ presence and type.

¶ scale 1-9; 1 completely wilt, 9 100% green and no signs of stress.

scale 1-9; 1 discolored turf, 7 acceptable damage, 9 no damage.

Turfgrass color differences were observed in August (Table 4). KA 3022 and KA 3023 displayed a lighter green turf color than the non-treated control on 3 and 18 Aug, approximately 3 days after wetting agent application. The light green color was above the lowest acceptable color rating of 6. These were rated as turfgrass color differences instead of turf phytotoxicity because there was no plant tissue necrosis. The color difference did not persist but would be noticeable by a golf course superintendent. The standards Tournament Ready® and Revolution™ were similar and showed no discoloration. Both standards had better color than the KA 3022 and KA 3023. There were no color differences between the experimentals KA 3022 and KA 3023, however KA 3022 may have more potential for discoloration as noted by its lower color rating of 6.7 on 18 August compared to the color rating of 8.1 for the non-treated control.

Table 4. Visual color observed in a USGA green treated with various wetting agents.

| Treatment | 19 Jul | 21 Jul | 25 Jul | 3 Aug | 18 Aug | 6 Sep | 20 Sep | 10 Oct |
|---------------------|---------|--------|--------|-------|--------|-------|--------|--------|
| | Color † | | | | | | | |
| Control | 8.0 | 8.0 | 8.0 | 8.0 | 8.1 | 8.4 | 8.5 | 8.5 |
| KA3022 | 8.0 | 8.0 | 7.8 | 6.7 | 7.3 | 8.1 | 8.0 | 8.5 |
| KA3023 | 8.0 | 8.0 | 7.8 | 7.0 | 7.6 | 8.1 | 8.0 | 8.5 |
| Tour.Ready | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.2 | 8.5 | 8.5 |
| Revolution | 8.0 | 8.0 | 8.0 | 8.0 | 7.9 | 8.3 | 8.5 | 8.5 |
| LSD _{0.05} | NS | NS | NS | 0.65 | 0.5 | NS | 0.01 | NS |

† scale 1-9, 1 no green, 6 lowest acceptable green color, 9 darkest green.

Less dew formation is desirable on golf course putting greens because it results in more water transport from the plant surface and into the thatch and soil, reduced leaf wetness and lower disease potential, cleaner mowing, and less interruption with ball roll. All wetting agents treatments reduced dew formation compared to the non-treated control. On 3 Aug, 6 Sep, and 10 Oct KA3022, KA 3023, and Tournament Ready had less dew than Revolution.

Table 5. Dew formation observed at 7:00 on a USGA green treated with various wetting agents.

| Treatment | 19 Jul | 21 Jul | 25 Jul | 3 Aug | 18 Aug | 6 Sep | 20 Sep | 10 Oct |
|---------------------------|----------------|--------|--------|-------|--------|-------|--------|--------|
| | Dew formation† | | | | | | | |
| Control | 3.0 | N/A | 4.0 | 3.6 | 4.0 | 3.4 | 3.0 | 4.0 |
| KA3022 | 7.0 | N/A | 5.8 | 5.8 | 6.0 | 5.3 | 4.0 | 5.0 |
| KA3023 | 7.0 | N/A | 6.2 | 5.6 | 6.0 | 5.1 | 5.0 | 5.0 |
| Tour .Ready | 7.0 | N/A | 5.8 | 5.4 | 6.0 | 5.4 | 4.0 | 5.0 |
| Revolution | 7.0 | N/A | 5.6 | 4.4 | 6.0 | 4.2 | 6.0 | 4.4 |
| LSD_{0.05} | 0.01 | N/A | 0.93 | 0.72 | 0.01 | 0.38 | 0.01 | 0.35 |

†1~9, 1 heavy dew, 9 no dew formation.

Application of wetting agents to hydrophobic soil provides a more uniform dispersal of water in the thatch and soil profile. Under the conditions of this study there was no increase in soil moisture caused by the wetting agents compared to the non-treated control plots. The lack of soil moisture differences is not surprising since there was also a lack of visual localized dry spot symptoms at our study site in 2005.

Table 6. Gravimetric moisture obtained from samples collected in a USGA green treated with various wetting agents.

| Treatment | Soil Moisture 8 Sep |
|---------------------------|------------------------|
| | % † |
| Control | 22.80 |
| KA3022 | 22.81 |
| KA3023 | 23.62 |
| T.Ready | 22.02 |
| Revolution | 23.65 |
| LSD_{0.05} | NS |

†gravametric soil moisture, dry weight basis.