

# Wetting Agents Affect Localized Dry Spot and Moisture Distribution in a Sand-based Putting Green

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**Additional index words:** creeping bentgrass, irrigation, time domain reflectometry

Karcher, D., M. Richardson, J. Landreth and J. McCalla. 2008. Wetting agents affect localized dry spot and moisture distribution in a sand-based putting green. Arkansas Turfgrass Report 2007, Ark. Ag. Exp. Stn. Res. Ser. 557:24-28.



Photo by Doug Karcher

Localized dry spots occurring on a creeping bentgrass green

**Summary.** It is not clear how various wetting agent products affect moisture distribution throughout sand-based putting green rootzones. The objective of this research was to determine how localized dry spot (LDS) incidence, and soil moisture values and uniformity, were affected by the application of five commercially available wetting agents. Wetting agents were applied during the 2007 growing season and evaluated under conditions of frequent, moderate, and infrequent irrigation application. All of the wetting agents tested in this study significantly reduced LDS

formation compared to the untreated control. In addition, none of the wetting agents significantly increased soil moisture values during periods of frequent or moderate irrigation. The wetting agent products Cascade Plus, One Putt, and Revolution were the most consistent in improving rootzone moisture uniformity. These results suggest that specific wetting agents can be used to manage LDS without adversely affecting rootzone moisture distribution.

**Abbreviations:** LDS, localized dry spot

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Previous research on wetting agent efficacy on sand-based putting greens has focused mainly on evaluating visual dry spot symptoms or root-zone hydrophobicity (water droplet penetration times). However, many turf managers are also concerned with how various wetting agent products affect moisture distribution throughout the rootzone. It is believed by many that some products move water rapidly through the rootzone while others retain considerable moisture near the surface; but there has been little published data to substantiate such claims. The objective of this research was to determine the effects of several wetting agent treatments on the distribution of moisture throughout the upper eight inches of a sand-based putting green rootzone.

### Materials and Methods

This experiment was conducted from mid-May through mid-August in 2007 on a creeping bentgrass (*Agrostis stolonifera* cv. SR 1020) putting green built according to United States Golf Association specifications. The green was mowed at a 0.125-in. height six days/week and otherwise maintained under typical golf course conditions.

Wetting agent treatments consisted of five commercially available wetting agent products plus an untreated control (Table 1). Treatments were applied according to manufacturer's label instructions and irrigated with 0.25 inch of water following application. Treatments were applied monthly from 15 May through 15 July, except for Cascade Plus, which was applied only on 15 May and 22 May. Each treatment was applied to four replicate plots, measuring 4 by 8 ft each. Irrigation was applied judiciously, moderately, and sparingly following the May, June, and July treatment applications, respectively, to compare the wetting agents under a range of irrigation management regimes.

Treatments were evaluated for localized dry spot (LDS) incidence and soil moisture characteristics. Localized dry spot incidence was rated weekly as a visual estimate of the percentage within each plot affected with LDS. Volumetric soil moisture was evaluated twice monthly by taking

32 measurements on a 1 by 1-ft. grid at three sampling depths (3, 5, and 8 inches) within each plot with time domain reflectometry probes. From the moisture data, average rootzone moisture and soil moisture variance (measured by standard deviation) were calculated for each wetting agent at each sampling depth.

### Results and Discussion

*LDS incidence.* Wetting agent treatment significantly affected LDS formation on 7 June and from mid-July through the end of the trial (Fig. 1). When irrigation was applied judiciously in May, there was little LDS formation, regardless of wetting agent treatment. On dates when there were significant differences in LDS formation among treatments, the control had the most LDS, except on 7 June when turf treated with Dispatch had slightly more LDS than untreated turf. Untreated turf had LDS incidence of approximately 50% during the last four evaluation dates, while all turf treated with a wetting agent had less than 25% LDS incidence during the same period.

Among wetting agent treatments, One Putt, Revolution, and Soaker Plus consistently had the least LDS formation throughout the trial. Cascade Plus was among the top-performing wetting agent treatments throughout most of the study; however, LDS incidence increased for this treatment during the last two weeks of the study. This may have been the result of Cascade Plus being applied only in May, whereas all other treatments were applied in May, June, and July. These results suggest that a repeat application of Cascade Plus may be beneficial during the summer in Arkansas. Dispatch was the most inconsistent wetting agent treatment with regard to LDS formation, as turf treated with Dispatch had significantly more LDS compared to turf treated with other wetting agents on three evaluation dates.

*Soil moisture values.* On average, soil moisture was very similar among treatments at the 5- and 8-inch sampling depths (Fig. 2). At these depths, untreated turf had a slightly drier rootzone than turf treated with wetting agent. At the

3-inch sampling depth, there were significant differences in soil moisture among treatments in July and August when the area was irrigated sparingly. At that time, the untreated control had lower soil moisture values than wetting agent treatments. Under conditions of judicious irrigation in May, none of the wetting agent treatments resulted in soil moisture values that were significantly higher than the control.

*Soil moisture variation.* On average, moisture values were less uniform closer to the surface of the putting green (Fig. 3). However, there were significant differences among treatments at all three depths during the study. Except for the final evaluation date, untreated turf had the least uniform soil moisture. Towards the end of the study, the control treatment improved with regard to moisture uniformity mainly because those plots had become uniformly very dry, as indicated by a high incidence of LDS (Fig. 1). Among wetting agent treatments, Cascade Plus, One Putt, and

Revolution were the most consistent in reducing variation in soil moisture throughout the rootzone.

## Conclusions

The wetting agents tested in this study provided good control of LDS without significantly increasing or decreasing soil moisture values. When coupled with deep, infrequent irrigation practices, these products could be used in a putting green management program to minimize LDS occurrence and provide a firm and moderately dry surface between irrigation events. Since there are several other wetting agents currently available besides those tested in this trial, and because new products are introduced regularly, similar studies will be conducted regularly in the future at the University of Arkansas to provide turf managers with up-to-date information on how LDS and rootzone moisture are affected by wetting agents.

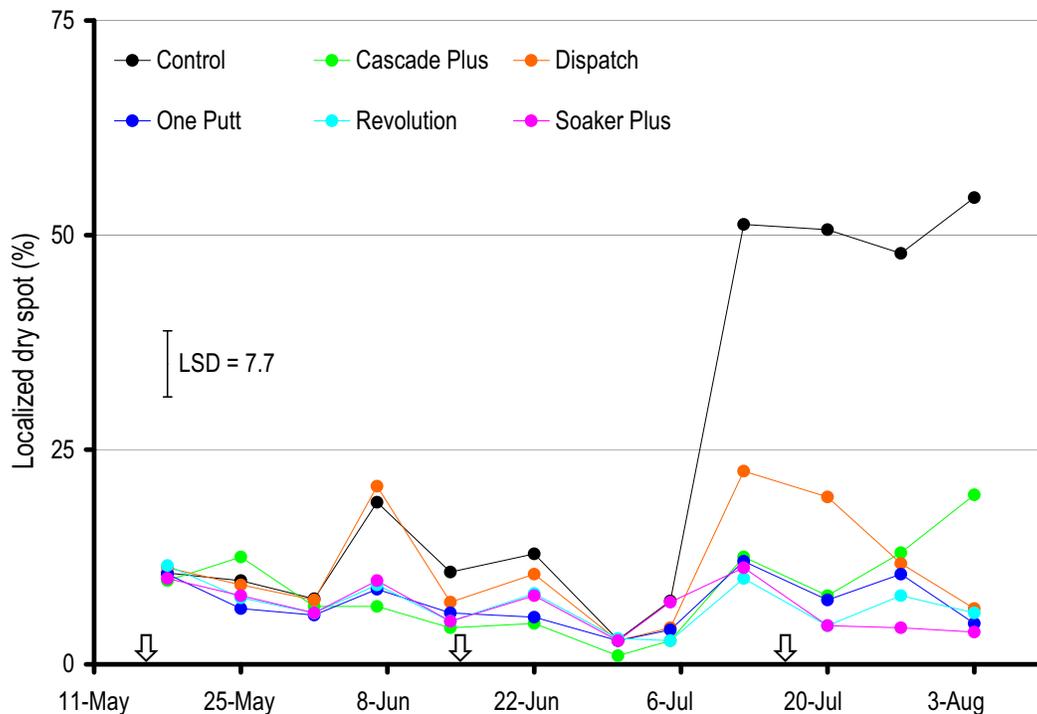


Fig. 1. Localized dry spot incidence as affected by wetting agent treatment. Arrows along the x axis indicate treatment dates for all products, except for Cascade Plus which was applied only on 15 May and 22 May. Error bar represents Fisher's least significant difference value ( $\alpha = 0.05$ ) for comparing wetting agent treatments within dates.

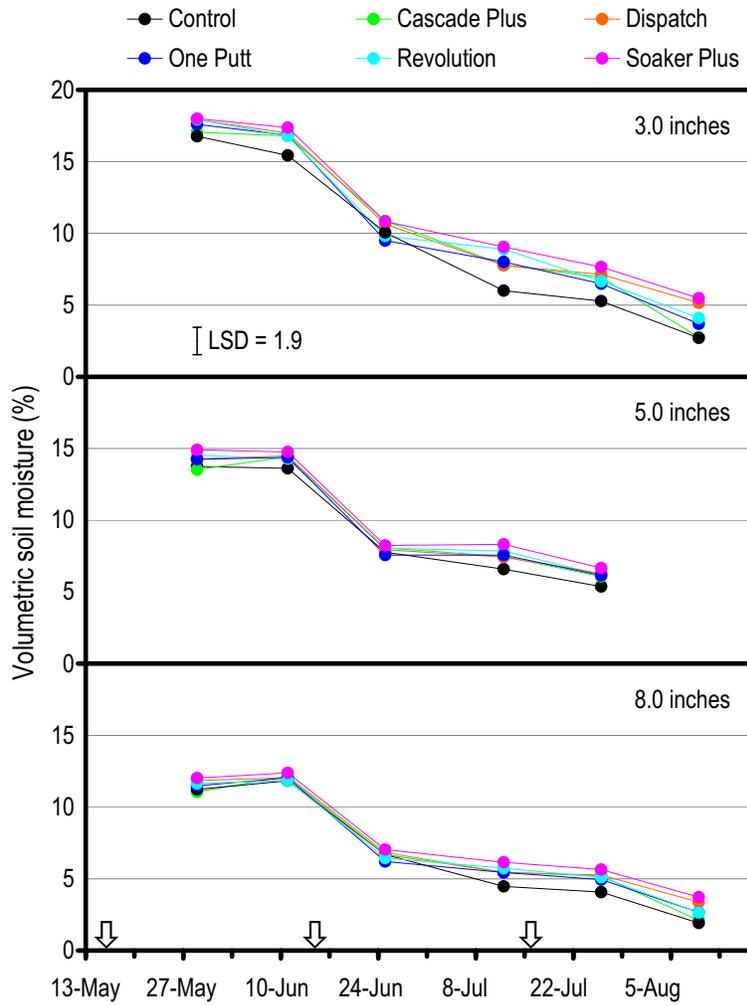
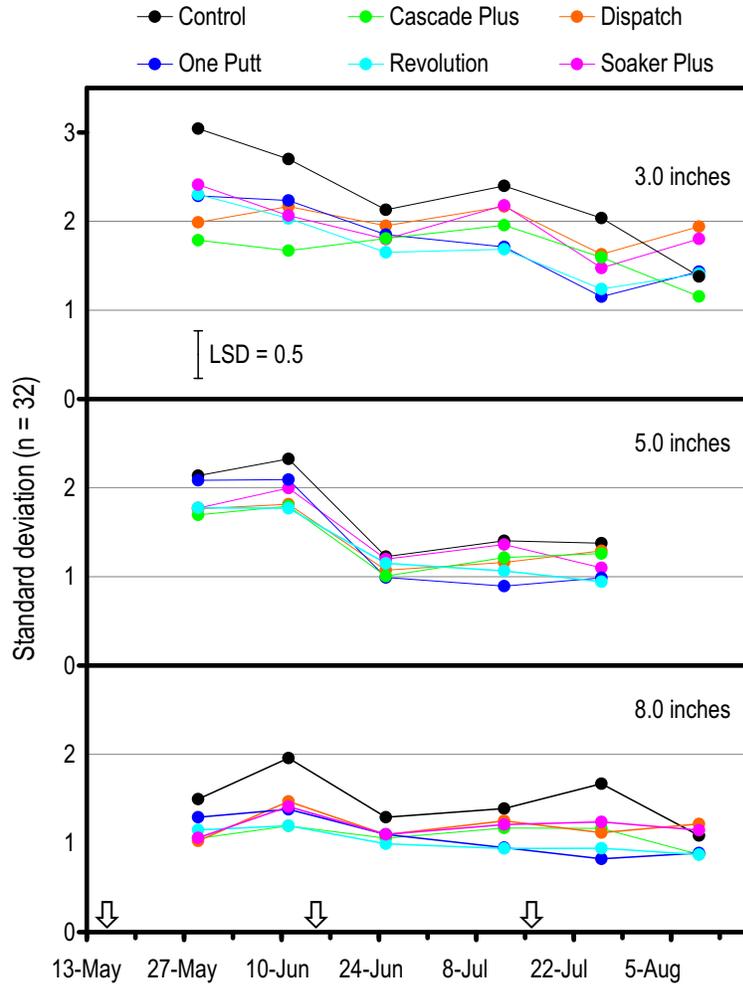


Fig. 2. Volumetric soil moisture as affected by wetting agent treatment and sampling depth. Arrows along the x axis indicate treatment dates for all products, except for Cascade Plus which was applied only on 15 May and 22 May. Error bar represents Fisher's least significant difference value ( $\alpha = 0.05$ ) for comparing wetting agent treatments within depths and dates.



**Fig. 3. Soil moisture variation as affected by wetting agent treatment and sampling depth. High standard deviation values correspond to less uniform soil moisture conditions. Arrows along the x axis indicate treatment dates for all products, except for Cascade Plus which was applied only on 15 May and 22 May. Error bar represents Fisher’s least significant difference value ( $\alpha = 0.05$ ) for comparing wetting agent treatments within depths and dates.**

**Table 1. Wetting agent treatment information**

Product	Rate	Application dates
Control		
Cascade Plus	8 oz / 1000 ft <sup>2</sup>	15 May and 22 May
Dispatch	12 oz / 1000 ft <sup>2</sup>	15 May, 15 June, and 15 July
One Putt	8 oz / 1000 ft <sup>2</sup>	15 May, 15 June, and 15 July
Revolution	6 oz / 1000 ft <sup>2</sup>	15 May, 15 June, and 15 July
Soaker Plus	6 oz / 1000 ft <sup>2</sup>	15 May, 15 June, and 15 July