

# Removing Dew to Get More from Your Fungicide Program

**D**ollar spot is Enemy #1 with respect to fungicide use on golf course fairways in the northern United States. Although dollar spot is usually easy to control, fungicide products are expensive, resistance problems are becoming widespread, and some labels restrict applications during the growing season.

In recent years, dollar spot research has focused on finding ways to improve fungicide performance with improved spray technology, formulation additives and cultural practices. In 2009, we initiated a study to examine dew removal and mowing and how they influence fungicide performance for dollar spot control on fairways.

We began the study by surveying 71 golf course superintendents from Pennsylvania and surrounding states. Survey results show 62 percent of superintendents mow 3-4 days per week, and 37 percent remove dew from fairways. Of the 37 percent removing dew from fairways, few remove dew daily; and most remove dew on weekends or when dew is exceptionally heavy. The other 63 percent of survey respondents do not remove dew, other than by mowing. Seven of the 71 superintendents surveyed can no longer afford to treat fairways with fungicides.

The fact that most superintendents in our survey do not remove dew from fairways regularly indicates they do not see a significant advantage in doing so, or other constraints prevent them from doing so. Given the benefits dew removal has demonstrated in research on non-fungicide-treated turf, we wanted to see if control of dollar spot can be improved by removing dew or altering mowing frequency on fungicide-treated turf.

In 2009 and 2010, we examined the effects of dew removal vs. no dew removal, and mowing frequency (2, 4 and 6 days per week) on the performance of three commonly used fungicides for dollar spot control: propiconazole, iprodione and chlorothalonil.

The study was conducted on fairway turf composed mostly of 'Penneagle' creeping bentgrass. The experiment was carried out in late summer 2009, late spring 2010 and late summer 2010.

In each of the test periods, dew was removed daily between 7 a.m. and 8 a.m. by driving a Toro ReelMaster 5400-D across the dew removal treatment plots prior to mowing, with mowing units lowered and resting on the turf but reels disengaged. We needed to use this method to ensure a fair comparison with the effects of mowing on dollar spot suppression.

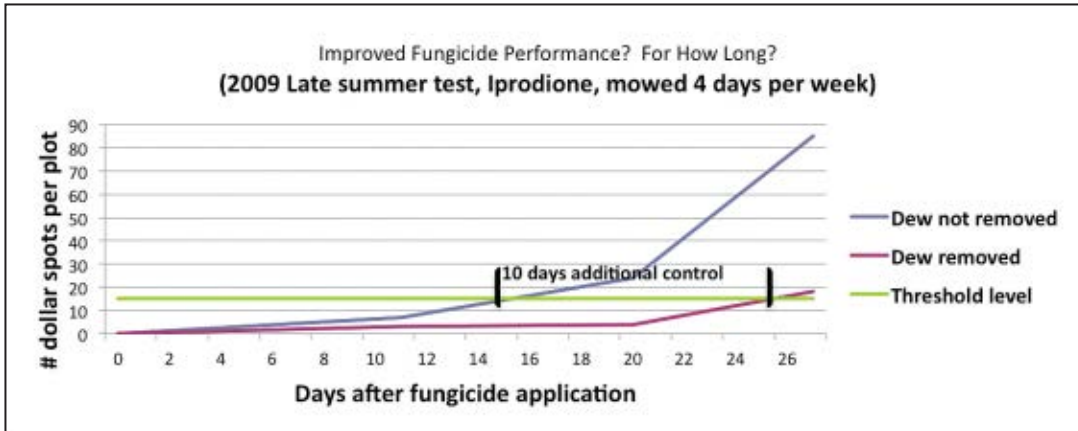
Fungicide treatments were applied once at the initiation of each of the three tests. Treatments included chlorothalonil (Daconil Ultrex 82.5 WDG,) applied at 3.25 oz/1,000 ft<sup>2</sup>; propiconazole (ProPensity 1.3 ME) applied at 1.5 oz/1,000 ft<sup>2</sup>; iprodione (Chipco 26 GT) applied at 3.0 oz/1,000 ft<sup>2</sup>; and a non-treated control. Fungicide treatments were applied on August 21, 2009, May 28, 2010 and August 24, 2010, before dollar spot was active.

## Experiment results

Results showed that daily dew removal and increasing mowing frequency from 2 to 6 days per week in late summer resulted in a reduction of dollar spot and improvement in the performance of chlorothalonil, propiconazole and iprodione fungicides. The advantages of dew removal and mowing were more noticeable in late summer than late spring, perhaps because of lower average daily dew volumes on turf foliage during late spring (2.3 gallons/1,000 ft<sup>2</sup> per day) compared to the average daily dew volumes during the late summer test periods of 2009 (3.9 gallons/1,000 ft<sup>2</sup> per day) and 2010 (4.4 gallons/1,000 ft<sup>2</sup> per day). The higher dew volumes in late summer may have increased dollar spot severity by extending the leaf wetness period, thus, accentuating

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*Lines show dollar spot severity trends as influenced by dew removal during late summer of 2009 in University Park, PA.*

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differences between dew removal and no-dew removal treatments for fungicide-treated turf.

Daily dew removal in late summer reduced dollar spot regardless of mowing frequency or fungicide product. When the fairway was mowed 4 days per week in late summer, and dew was removed daily, dollar spot was reduced 51 percent for chlorothalonil, 59 percent for propiconazole, and 78 percent for iprodione compared to plots that were mowed 4 days per week, but in which dew was not removed (other than by mowing). When turf was mowed 2 days per week and dew was removed daily during the same period, dollar spot was reduced by 55 percent for chlorothalonil, 47 percent for propiconazole and 62 percent for iprodione. Although these reductions were calculated using dollar spot that may have exceeded threshold levels used by many golf course superintendents, they illustrate the beneficial effects of dew removal on reducing dollar spot in fungicide-treated turf.

Increasing mowing frequency from 2 to 6 days per week improved dollar spot control with all three fungicides; however, there was no meaningful difference in control between mowing 2 and 4 days per week, and 4 and 6 days per week. From a disease management perspective, removing dew appears to be more cost effective than increasing mowing frequency. On a positive note, no detrimental effects on fungicide efficacy were associated with increasing mowing frequency.

To justify dew removal on fairways, golf course managers would like to know how many additional days of dollar spot control

can be obtained when a fungicide is used in conjunction with daily dew removal. Unfortunately, we can't accurately predict this. The additional days needed to reach a specified threshold level for a fungicide treatment on turf subjected to dew removal varies with mowing frequency, fungicide product, season and other factors influencing disease outbreaks. In our experiment, when turf was mowed 4 days per week during late summer of 2009, iprodione-treated plots receiving daily dew removal provided 10 additional days to reach our chosen threshold of 15 spots per plot when compared to iprodione-treated plots not receiving daily dew removal. During the same period on turf mowed 2 days per week, iprodione treatments receiving daily dew removal provided 6 additional days to reach the threshold. By comparison, propiconazole provided 9 additional days to reach the threshold under the 4 days per week mowing frequency treatment, but only one additional day under the 2 days per week mowing frequency treatment. The chlorothalonil 2 and 4 days per week mowing frequency treatments provided very few additional days of acceptable dollar spot suppression in 2009, perhaps due to the short duration of control with this contact-type fungicide.

The 2009 and 2010 late summer test periods produced different dollar spot disease epidemics. Thus, the number of days needed to reach the 15 spot per plot threshold varied between the two years. During late summer of 2009, propiconazole plots subjected to daily dew removal and mowing 2 days per week provided one additional day to reach the threshold compared to propiconazole

plots in which dew was not removed. However, in 2010, the same propiconazole treatment provided five additional days to reach the threshold. The discrepancy between 2009 and 2010 may have been due to an increased rate of dollar spot development early in the 2009 test, limiting the beneficial effects of repeated dew removal episodes.

## Factors to consider in dew removal programs

Disease suppression is only one reason to remove dew from fairways. In fact, it's likely most superintendents use this practice more for improving playing conditions (reduction in surface wetness) and dispersal of grass clippings and earthworm castings, than for disease suppression.

Working with a local superintendent who practices dew removal, we estimated it takes two low-wage (\$8.50/hour) summer employees approximately 1 hour to remove dew from 18 fairways with a weighted hose attached to two golf carts. Assuming this is done four times per week (on non-mow days) for 8 weeks in late summer, the labor cost is \$544 and fuel cost is about \$48. Figuring the price of a weighted hose at about \$900, then the approximate cost of dew removal is \$1,500.

If you can't afford to remove dew all season or daily, think about doing it strategically on misty days in late summer when dew hangs onto grass blades for most of the morning and when heavy dew covers leaf surfaces on calm, cloudy days. There is no guarantee this practice will pay for itself through a reduction in fungicide use, but it's likely you will have less dollar spot and improved playing conditions.

The threshold level used for dollar spot fungicide applications will probably be a factor in the success of dew removal programs. A high threshold will likely show stronger differences in disease development between areas where dew is removed and where it is not removed, and it may allow a greater number of days between fungicide applications. However, damage may be unacceptable to golfers, and may result in an increase in pathogen levels, which necessitate greater fungicide use later in the season. Lower threshold levels would likely provide fewer

days of dollar spot suppression when fungicides are used in conjunction with dew removal. However, disease epidemics would be less damaging, and subsequent fungicide applications may require lower rates because of reduced pathogen levels.

The benefits of reduced dollar spot and improved fungicide performance associated with dew removal will also depend on the thoroughness of the dew removal method. The reduction in dollar spot from dew removal in our study may have been partially influenced by the removal method. Use of reel mower units with reels disengaged provides effective removal of leaf moisture and is probably more effective at suppressing dollar spot than the more common method of dragging a hose over dew-covered turf. Other researchers reported that removal of dew by rolling or mowing was significantly better at displacing leaf moisture compared to a surfactant, dragging a hose or syringing. However, all dew removal methods significantly reduce dollar spot compared to situations where dew is not removed.

## Is dew removal worth the effort?

Whether the cost of dew removal programs can offset savings associated with fewer fungicide applications depends on the fungicide, mowing frequency, nature of the disease epidemic, threshold level and possibly the dew removal method. Although results of this study do not provide enough information to establish a definite economic benefit from dew removal practices, they do suggest that dollar spot severity can be reduced when daily dew removal is practiced on fungicide-treated turf. Results also confirm findings of previous studies that no detrimental effects on fungicide efficacy are associated with increasing mowing frequency.

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