



Autonomous Overnight Mowing Events for Fairway Dollar Spot Suppression

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Objective

To determine the efficacy of different mow event timings using an autonomous robotic mower for controlling dollar spot caused by the fungus *Clarireedia jacksonii* on a golf course fairway.

Materials and Methods

The study was conducted at the O. J. Noer Turfgrass Research and Education Facility on a mixed stand of 'Penncross' creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass (*Poa annua*) maintained at 0.5 inches. Individual plots measured 10 feet by 12.5 feet and were arranged in a randomized complete block design with four replications. The robotic mower was a Kress KR236 (Positec Group; Charlotte, NC) fitted with a fairway mowing kit. The only mowing that these plots received was from the robotic mower, and the goal was to remove dew at different times and evaluate their effects on dollar spot development. Treatment timings ranged from 12 AM-9 PM and are outlined in Table 1. All treatments were initiated on May 14, 2026 and plots were mowed 7 days per week. Number of dollar spot foci per plot, percent dollar spot infection, and turfgrass quality (1-9, 9 being excellent, 6 acceptable, and 1 bare soil) were visually assessed every 2 weeks. Dew was also collected from plots by placing pre-weighed filter paper on the dew covered plots at 7 AM and placing a constant weight on top. The paper then soaked up any dew present on leaves and the papers were weighed again, and the difference of their pre-weights was subtracted giving a 'dew mass' measurement. This dew measurement was taken once in July and once in August. Turf quality, disease severity (dollar spot counts and % infection), and dew mass were subjected to an analysis of variance and means separated using Fisher's LSD ($P = 0.05$). Results of disease severity (dollar spot counts and % infection), turfgrass quality ratings, and dew mass can be found in tables 1, 2, 3 and 4 respectively. Area under the disease progress curves (AUDPC), area under the turf quality curve (AUTQC) and area under the dew mass curve (AUDMC) were calculated using the trapezoidal method. These calculations summarize the whole season disease severity, disease percentage, turf quality, and dew mass, and are included in tables 1, 2, 3, and 4 respectively.

Results and Discussion

Dollar spot pressure was very high starting in mid-July with nontreated controls averaging 144 infection centers per plot on the peak disease rating date of Aug 12. The 9 am treatment served as our non-treated control because there was no overnight dew disruption. All treatments significantly reduced dollar spot severity in comparison to the non-treated control. The 12am and

3am treatments separated themselves on Aug 26 by fitting to the best performing statistical tier. Only the 12am treatment was of acceptable turf quality on Aug 26.

The dew mass measurements showed the most dew accumulating on the 9 am treatment which is expected since there was no dew knockdown by an overnight mowing event. Then a steady decrease in dew mass as the treatments moved from 9pm to 6am was observed. This indicates that dew formation occurs throughout the night, as the earlier treatments (9pm and 12am) had several hours for dew to reform on the leaves by the time dew was measured at 7 AM. But the later treatments (3 AM and 6 AM) had less time for dew to reform after the mowing event. While interesting, this dew mass measurement at 7 am does not appear to be highly correlated to disease development. In particular, the 9 PM treatment has similar dew mass measurements to the 9 AM treatment, but 9 PM usually had significantly less dollar spot severity and higher turf quality ratings.

The first year of this study shows that overnight dew removal using autonomous mowers is a promising avenue of research as there seems to be a critical window of dew removal that correlates to the highest disease suppression. Further research will be completed and expanded upon in future growing seasons.

Table 1: Mean number of dollar spots per treatment at fairway height at the OJ Noer Turfgrass Research Facility in Madison, WI during 2026.

Ref #	Treatment	Dollar Spot Severity Jul 29 th	Dollar Spot Severity Aug 12 th	Dollar Spot Severity Aug 26 th	Dollar Spot Severity AUDPC
1	9 AM Mow (Non-treated control)	26.0a	144.0a	141.8a	3438.8a
2	9 PM Mow	3.3a	51.0b	62.5b	1200.5b
3	12 AM Mow	0.8a	6.0b	14.8c	197.8b
4	3 AM Mow	0.8a	12.8b	27.0bc	395.5b
5	6 AM Mow	4.0a	31.3b	56.3b	901.3b
NA	LSD P=.05	26.35	72.96	40.63	1507.6

Table Notes by Column Name

- **Dollar Spot Severity** - was rated as number of dollar spot infection centers per plot. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD).
- **AUDPC** - Area under the disease progress curve was calculated using the trapezoidal method.

Table 2: Mean dollar spot percentage per treatment at fairway height at the OJ Noer Turfgrass Research Facility in Madison, WI during 2026.

Ref #	Treatment	Dollar Spot Percent Jul 29 th	Dollar Spot Percent Aug 12 th	Dollar Spot Percent Aug 26 th	Dollar Spot Percent AUDPC
1	9 AM Mow (Non-treated control)	0.9a	9.0a	14.5a	244.1a
2	9 PM Mow	0.2b	1.6a	2.6b	43.8b
3	12 AM Mow	0.0b	0.3a	0.4b	7.9b
4	3 AM Mow	0.1b	0.6a	0.5b	16.6b
5	6 AM Mow	0.3b	1.4a	1.3b	39.4b
NA	LSD P=.05	0.54	6.87	7.70	157.65

Table Notes by Column Name

- **Dollar Spot Percent** - was rated as percentage of plot area affected. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD).
- **AUDPC** - Area under the disease progress curve was calculated using the trapezoidal method.

Table 3: Mean turfgrass quality per treatment at fairway height at the OJ Noer Turfgrass Research Facility in Madison, WI during 2026.

Ref #	Treatment	Turfgrass Quality Jul 29 th	Turfgrass Quality Aug 12 th	Turfgrass Quality Aug 26 th	Turfgrass Quality AUTQC
1	9 AM Mow (Non-treated control)	5.5c	4.3b	4.3c	495.3c
2	9 PM Mow	6.3b	5.3a	5.0bc	535.5abc
3	12 AM Mow	7.0a	6.0a	6.0a	563.5a
4	3 AM Mow	6.5ab	6.0a	5.8ab	544.3ab
5	6 AM Mow	6.3b	5.5a	5.5ab	521.5bc
NA	LSD P=.05	0.7	0.76	0.88	40.98

Table Notes by Column Name

- **Turfgrass Quality** - was rated visually on a 1 – 9 scale with 6 being acceptable. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD).
- **AUTQC** - Area under the turf quality curve was calculated using the trapezoidal method.

Table 4: Mean dew mass per treatment at fairway height at the OJ Noer Turfgrass Research Facility in Madison, WI during 2026. Measurements were taken at 7am.

Ref #	Treatment	Dew Mass Jul 29 th	Dew Mass Aug 26 th	Dew Mass AUDMC
1	9 AM Mow (Non-treated control)	0.75a	0.15b	12.60a
2	9 PM Mow	0.65a	0.20ab	11.90ab
3	12 AM Mow	0.38b	0.30a	9.45b
4	3 AM Mow	0.20bc	0.10bc	4.20c
5	6 AM Mow	0.05c	0.00c	0.70d
NA	LSD P=.05	0.18	0.12	2.93

Table Notes by Column Name

- **Dew Mass** - was the difference of filter paper weight before and after placement in the plot, measured in grams of dew per plot. Means followed by the same letter do not significantly differ (P=.05, Fisher's LSD).
- **AUDMC** - Area under the dew mass curve was calculated using the trapezoidal method.