Conidial Sampling of *Drechslera poae* from Kentucky Bluegrass to Determine Role of Mowing in Spore Dispersal

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ABSTRACT

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Rotorod, Kramer-Collins, and live-plant spore traps were used to determine the seasonal periodicity of dispersal of *Drechslera poae* conidia. Conidial dispersal was first detected in the spring at the beginning of grass growth or about the time of first mowing. Spore collection reached a maximum in mid-May and by late June had almost ceased. More conidia were detected on days when the turf stand was mowed than on those when the grass was not disturbed. Conidial collection was greatly reduced at heights above 7 cm.

Helminthosporium leaf spot caused by *Drechslera poae* (Baudyš) Shoemaker (= *Helminthosporium poae* Baudyš, *D. vagans* Drechsler) is a widespread and destructive disease of Kentucky bluegrass (*Poa pratensis* L.) in Pennsylvania and other northeastern states. Helminthosporium leaf spot is usually most severe during spring and early summer. The disease has been described as having two phases, an initial leaf-spotting phase in April and May followed by a foliage and tiller death phase (melting out) in early summer (3,7). It is generally believed that the latter results from the numerous infections that occur during the leaf-spotting phase. Control of both the leaf-spotting and melting-out phases is accomplished by controlling the first phase.

The research reported herein utilized aerial spore sampling to determine the seasonal periodicity of *D. poae* spore dispersal on Kentucky bluegrass and to discover whether mowing plays a role in the dispersal of *D. poae* conidia and therefore affects disease severity.

MATERIALS AND METHODS

Experiments were conducted within the northeastern regional Kentucky bluegrass evaluation plots located at the Valentine Turfgrass Research Center, University Park, PA. This stand was mowed two to three times each week to a height of 1.25 cm beginning 19 April. No additional irrigation, early season nitrogen, or fungicide was applied to the experimental area. Rotorod, Kramer-Collins, and live-plant spore traps were placed in the experimental area beginning 31 March 1979 after winter-accumulated snow had melted. Spore trapping continued through the summer until 31 August.

Rotorod spore samplers (1) (Ted Brown Associates, Los Altos Hills, CA 94022) were placed at sampling heights of 7, 100, and 300 cm. Retracting, plastic, "I"-type rods were coated lightly with silicone grease. The rods were set to operate 1 min every 15 min (96 min/day) and sampled a nominal volume of 4,358 L of air per day (1). They were changed daily at about 0800 hr. The exposed plastic rods were placed in a plastic adapter slide, and a drop of water was placed on the collection surface. The slides were then covered with a cover slip and examined microscopically for the number of *D. poae* conidia.

A Kramer-Collins 24-hr spore sampler (5,6) (GR Electric Manufacturing Co., Manhattan, KS 66502) was also used to determine the periodicity of *D. poae* conidia. The sampling height of the intake orifice was approximately 20 cm above the soil line. The sampler was programed to operate for 2 min every 15 min, depositing one band of spores per hour. The Kramer-Collins spore trap sampled a volume of 4,378 L of air per day for estimation purposes, the same volume as the Rotorod sampler. Standard glass microscope slides coated with silicone grease were replaced each day at about 0800 hr and examined microscopically for the presence of *D. poae* conidia. The total number of conidia per hourly band was recorded.

Kentucky bluegrass, *P. pratensis* cv. Delta, was seeded at the equivalent rate of 0.5 g/m^2 (3 lb/1,000 ft^2) into 5.5-cm-diameter (89-ml volume) plastic pots

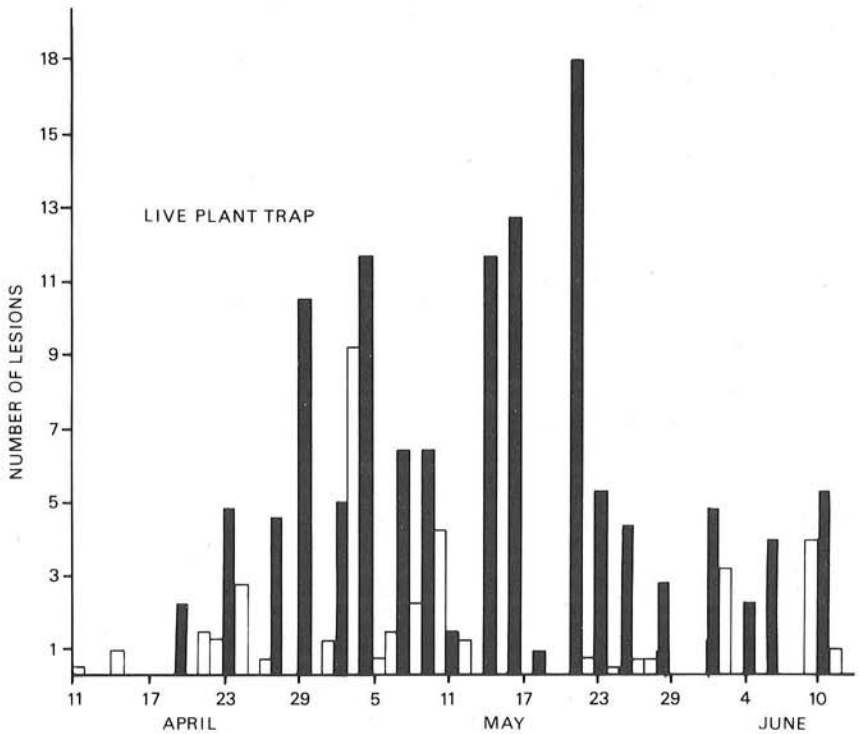

Fig. 1. Number of lesions on live plant traps (*Poa pratensis* 'Delta') exposed for 24-hr periods. Data are means of the numbers of lesions on three live plant traps. Date of first mowing was 19 April. Black bars are data from mowing days.

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containing a 1:1:1 (v/v) mix of steam-sterilized soil, sand, and peat. Four weeks after seedling emergence and growth, the pot of grass (ie, live plant trap) was considered ready for use. The traps were placed on the existing turf (approximately 7 cm height) and held in place by a nail pushed through the center of each pot into the existing sod. Three traps were placed on the turf at 0800 hr each day and removed 24 hr later. The exposed plants were sprayed by an atomizer with distilled water, and a plastic bag was secured over each pot for 48 hr. The plants were then placed in a growth chamber at a constant temperature of 22 C, together with unexposed, potted plants that served as controls. The number of lesions typical of those caused by *D. poae* were counted 6–7 days later. Isolations routinely made from these lesions consistently yielded *D. poae*.

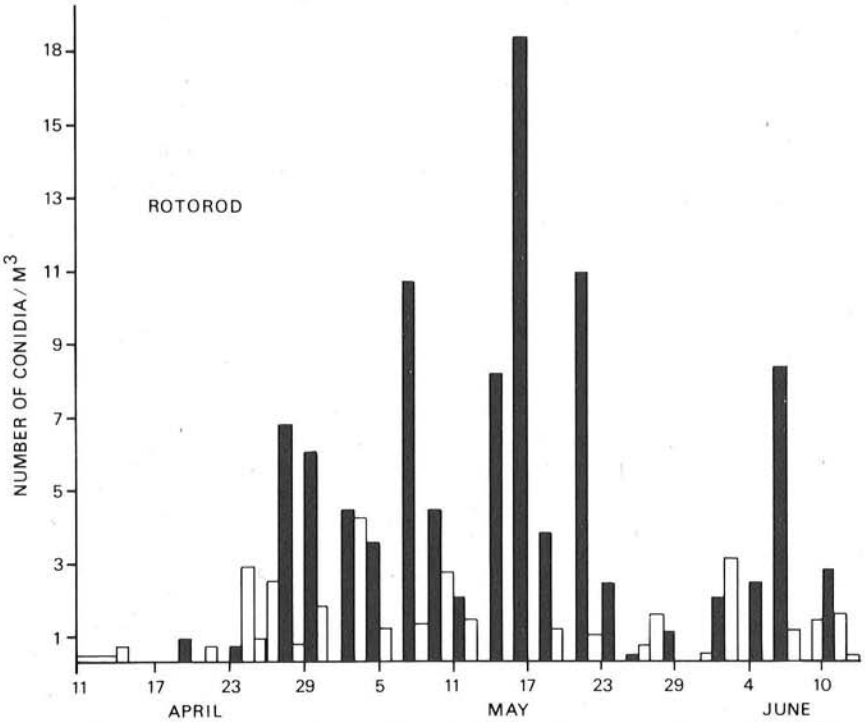

Fig. 2. Daily counts of *Drechslera poae* conidia caught using a Rotorod sampler at a height of 7 cm. First mowing was on 19 April. Black bars are data from mowing days.

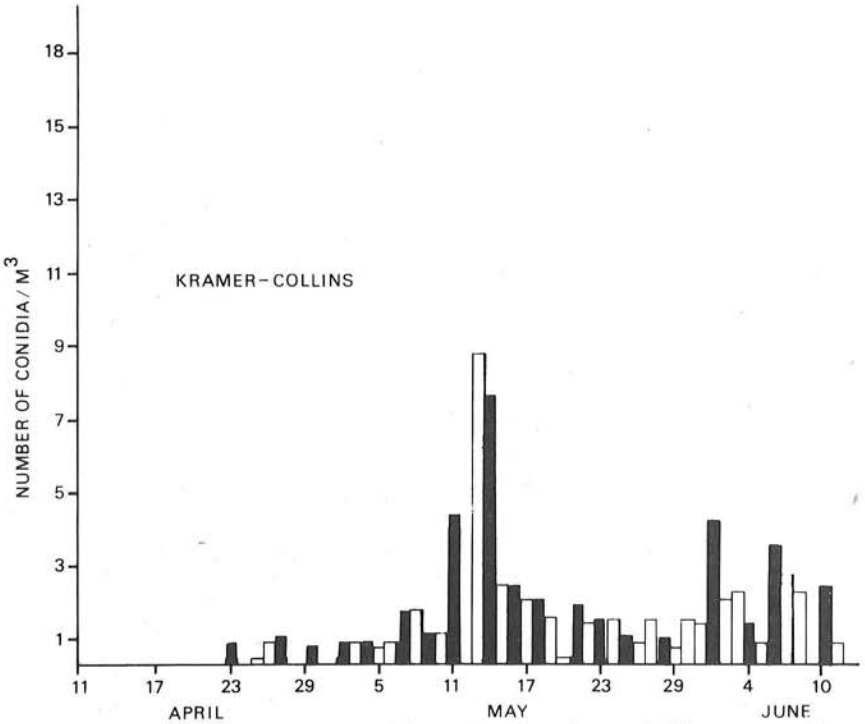

Fig. 3. Daily counts of *Drechslera poae* conidia caught using a Kramer Collins spore sampler at a height of 20 cm. Date of the first mowing was 19 April. Black bars are data from mowing days.

RESULTS

Conidial trapping. Some conidia of *D. poae* were collected on 11 April using the live plant trap and the Rotorod sampler operated at the 7-cm height (Figs. 1 and 2). No conidia were collected by the Rotorod sampler at 100 and 300 cm on this date. At this time in the season the grass was just beginning to green, but significant leaf elongation had not occurred. The numbers of conidia trapped increased rapidly after the first mowing (19 April) and remained high into early June. By mid-June, the numbers had decreased sharply. During July and August, the average collection was less than three conidia per cubic meter of air. Mowing days did not differ significantly from nonmowing days. During the entire sampling period of April to August, very few conidia were trapped at the 100-cm and 300-cm sampling heights. Mowing did not influence conidial collection at these heights.

The sampling height of the Kramer-Collins collector was higher (20 cm) than that of the Rotorod (7 cm), and far fewer conidia were detected (Fig. 3). The first *D. poae* conidia were trapped after the date of the first mowing. As with the other traps, daily counts showed peak conidial levels occurring in mid-May.

Correlations between trapping techniques. Comparisons of daily spore trap counts among trap types showed that there was very little correlation of the Kramer-Collins conidia counts with either the Rotorod ($r = 0.293$) or the live plant traps ($r = 0.306$). There was, however, a significant correlation ($P \leq 0.01$) between the Rotorod and the live plant counts ($r = 0.752$), with the y intercept very close to zero (0.7 spores per cubic meter).

Effect of mowing upon dispersal. Inspection of the Rotorod and live-plant trap data (Figs. 1 and 2) showed a relationship between mowing and conidial dispersal, particularly during May, when few spores were collected on days when mowing was not done.

Disease development. The leaf-spotting phase appeared in late April and continued into late May. The melting-out phase appeared in mid-June and continued throughout the rest of the month.

DISCUSSION

Data from all three spore traps were in general agreement as to the seasonal periodicity of *D. poae* on Kentucky bluegrass (Figs. 1–3). Spore dispersal began with leaf elongation (first mowing), and peak conidial release occurred in mid-May. Very few conidia were trapped from mid-June through the end of August.

Recommendations to control Helminthosporium disease include fungicide applications when grass first greens and

continuing through the leaf-spotting phase (2,7). Fungicides are not recommended after the melting-out phase has appeared. The results of the present experiments support these recommendations. The incidence of leaf spot symptoms in our plots coincided with the late-April through late-May conidial collection results. Applications of protectant fungicides during this period would prevent infection by dispersed spores. It is generally agreed that protectant fungicide applications in June and July are of little use in suppressing the melting-out phase of the disease. Our results suggest that spore release and dispersal are greatly reduced during the latter period and may play no role in disease development. Mowing obviously causes dislodgment of conidia (Figs. 1 and 2). On the other hand, mowing is an essential management practice if conventional turfgrass heights are to be maintained.

Fewer conidia were trapped by the Rotorods operated at the 100- and 300-cm heights and by the Kramer-Collins trap at 20 cm than by the Rotorods and live plant traps at 7 cm. Dispersal of conidia seemed limited largely to heights of less than 20 cm. This suggests relatively short dispersal distances, a strong dispersal gradient [low b value in Gregory's equation $Y = aD^{-b}$ (4)], and intense focal disease development. Intense foci should be observable in unmowed grass; however, frequent mowing should disperse conidia and diminish disease gradients to the extent that stands would be nearly uniformly affected. Our general observations confirmed the concept that foci seldom occur in mowed turfgrass areas but are present in undisturbed bluegrass areas, such as soil conservation plantings.

In summary, the research reported here indicated that the spore dispersal pattern of *D. poae* coincided with the commonly observed cycle of disease development. Mowing appeared to be a major mechanism of spore dispersal.

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