Within Field Spread of Goss's Wilt

RFR-A1246

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Introduction

Goss's bacterial wilt and leaf blight, caused by *Clavibacter michiganensis* subsp. *nebraskensis* (Cmn) has re-emerged as an important disease of corn in Iowa. This disease was first reported in Nebraska in 1969 and in Iowa in the early 1970s. The disease has been managed very effectively with the release of Cmn-tolerant hybrids in the 1980s. In 2008, Goss's was reported in eight counties in Iowa. It had been over 25 years since the disease had been reported. In 2011, the disease was present in every county in Iowa apart from the most southern two tiers of counties. There are limited data regarding the corn-Goss's pathosystem. The objective of this trial was to monitor the spread of Goss's within a field from a point source of inoculum.

Materials and Methods

The experiment was a randomized complete block design with three treatments: a non-inoculated control treatment, artificial inoculation of plants with a suspension of Cmn, and Cmn-infested corn residue There were four replications of each treatment for a total of 12 plots. A Cmn-susceptible hybrid was planted and each plot was 29 ft long (approximately 50 plants) and 8, 30-in. rows wide and was surrounded by a 10-ft border on all sides of a resistant hybrid. The experiment was planted on June 8 and inoculated 17 days later. The middle four plants in each plot were inoculated using tongs or by placing Cmn-infested residue around the base of the plants. Goss's severity on all plants in each plot was assessed approximately every two weeks after inoculation. Ordinary runs analysis was used to determine the spatial pattern of infected plants in each plot over time. A run is defined as a series of like events, in this case, being a series of infected or no infected plants. The number of observed runs was compared with the number of expected runs, the *z* score was calculated and if it was less than -1.64, the null hypothesis of randomness was rejected in favor of clustering.

Results and Discussions

Goss's leaf blight was present in all treatments at the end of the growing season. Significant differences in percentage of incidence were observed between treatments ($P < 0.0001$). Final incidence of Goss's leaf blight in the Cmn-inoculated treatment was 17 percent, compared with 8 percent in the Cmn-infested residue and 1 percent in the non-inoculated control.

The spatial pattern of Cmn-infected quadrats was clustered in both Cmn-inoculated and residue treatments, but random in the control plots at the end of the growing season (Table 1). The clustered spatial pattern of infected quadrats strongly indicates that Cmn spread was from plant-to-plant. Thus Cmn-infected plants were a significant source of inoculum and contributed to infection of adjacent plants.

This trial will be repeated in 2013

Acknowledgements

Nick Howell, ISU Horticulture Station.

Table 1. Ordinary runs and black white joins analysis of z-score values for analysis of spatial patterns of Cmn infected quadrats within rows and between rows in corn plots planted at the ISU Horticulture Farm, Ames Iowa, at the end of the growing season.

		Ordinary runs			
		Within rows	Between rows	Black white joins	
Plot	Incidence (%)	Z-score[a]	Z-score[a]	Z-score[a]	Pattern
1	0.5	3.02	3.03	0.86	Random
2	8.75	-7.97**	-4.22**	-6.77**	Clustered
3	32.25	-11.49**	-1.18	-8.94**	Clustered
4	9.75	-7.97**	-1.68*	-5.68**	Clustered
5	0.25	7.16	7.16	--	Random
6	12.25	-9.23**	-4.56**	8.92**	Clustered
7	6.25	-6.19**	-3.61**	-5.41**	Clustered
8	9.25	-14.58**	-10.39**	-14.83**	Clustered
9	2.5	-1.05**	1.05	0.91	Random
10	12.5	-11.71**	-8.50**	-12.37**	Clustered
11	5.25	-2.69**	-2.69**	-2.14*	Clustered
12	0.25	7.16	7.16	--	Random

[a]Z-score less than -1.65 ($P < 0.05$ (*) and $P < 0.01$ (**) indicates a non-random spatial pattern (i.e., clustered).