

Prevalence of Soybean Downy Mildew in Iowa

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ABSTRACT

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Downy mildew of soybean, caused by *Peronospora manshurica*, occurred in 50% of 825 Iowa soybean fields examined in 1982, and the disease was found in all sections of the state. Mean disease severity, based on a rating ranging from 1 (slight disease, trace to 25% of leaves showing symptoms) to 4 (very severe disease, 75–100% of leaves showing symptoms), was 2 (moderate disease). Greatest prevalence of downy mildew occurred in an 11-county area in the north central section of the state in which 88.5% of the fields were affected by the disease. Only 5.1% of the fields were affected in the 12-county northwestern section. Downy mildew was observed in 81 of 95 counties (85%) sampled and was present in all counties in the north central, central, and east central sections of the state. There was no correlation between the percentage of fields affected by downy mildew and the mean disease severity in affected fields. Soybean acreage of the nine sections of the state sampled was not correlated with either the percentage of fields affected by downy mildew or disease severity.

Additional key words: *Glycine max*

Downy mildew of soybean (*Glycine max* (L.) Merr.) is caused by *Peronospora manshurica* (Naoum.) Syd. ex Gäm. Although it is a common disease in the United States (2,4), there are very few published reports of the prevalence of the disease in soybean-producing regions. Information on distribution of downy mildew in Iowa in previous years was obtained from observers familiar with the disease, but no systematic survey of the disease had been conducted in the state. Prevalence of downy mildew changed and a survey was needed. The objective of this study was to determine the prevalence of downy mildew in Iowa by sampling a large number of soybean fields.

because of their low soybean production (fewer than 4,050 ha in each county in 1981). Four subsamples, each consisting of 25 adjacent plants each, were taken at random in each field for determination of disease severity. Plants were rated for disease severity on a scale ranging from 1 through 4 as follows: 1 = slight disease, trace to 25% of leaves showing symptoms; 2 = moderate disease, 25–50% of leaves showing symptoms; 3 = severe disease, 50–75% of leaves showing symptoms; and 4 = very severe disease, 75–100% of leaves showing symptoms. In this study, disease prevalence is defined as the percentage of fields with a disease (8).

RESULTS AND DISCUSSION

Downy mildew occurred in 50% of the 825 fields examined, and the disease was found in all sections of the state. Mean disease severity was 2.0 (moderate).

The data were summarized by combining counties into nine geographical sections in Iowa (Fig. 1). The north central and east central sections were the only sections in which more than 75% of the fields were affected by downy mildew. Three sections, the central, south central, and southeastern, had between 50 and 75% of the fields affected. The northwestern and southwestern sections had fewer than 25% of the fields affected by the disease.

In any particular section of the state, there was no correlation between the percentage of fields affected by downy mildew and the mean disease severity in affected fields ($r = 0.00$). The north central section had the highest percentage of fields affected by the disease (88.5%) but had a mean disease severity rating of 2.1, which was only slightly higher than the state mean of 2.0. The southeastern and northwestern sections had the most severe downy mildew (2.8), but only 54.7 and 5.1% of the fields were affected, respectively, the fifth highest, and the lowest.

MATERIALS AND METHODS

Observations and samplings were made between 27 July and 26 August 1982. We sampled 825 randomly selected fields in 95 Iowa counties. The number of fields sampled per county was determined by the soybean acreage in the county in 1981 at the rate of one field per 4,050 ha of soybeans grown in each county. Allamakee, Clayton, Dubuque, and Jackson counties were not sampled

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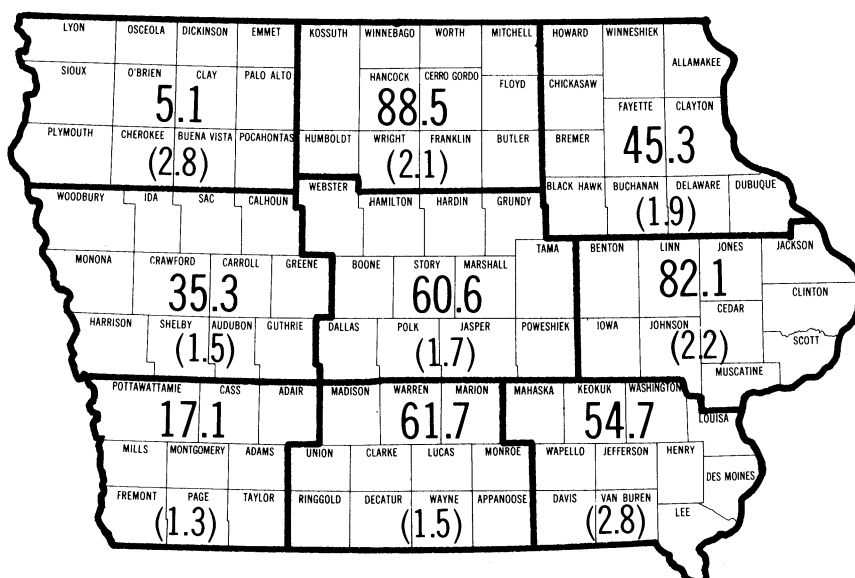


Fig. 1. Percentage of soybean fields affected by downy mildew (upper figures) and mean disease severity in affected fields (lower figures in parentheses) in nine sections of Iowa in 1982. Disease severity was rated as: 1 = slight disease, trace to 25% of leaves showing symptoms; 2 = moderate disease, 25–50% of leaves showing symptoms; 3 = severe disease, 50–75% of leaves showing symptoms; and 4 = very severe disease, 75–100% of leaves showing symptoms.

During periods of cool and humid weather, downy mildew usually increases rapidly in areas where fields of susceptible soybean cultivars are concentrated (5). Because the number of fields sampled in each section was weighted for soybean acreage (one field sampled for each 4,050 ha of soybeans produced), comparisons of the number of fields sampled with both percentage of fields affected and mean disease severity in affected fields was of interest. Soybean acreage of a section (number of fields sampled) was not correlated with either presence of downy mildew (percentage of fields affected) ($r = -0.14$) or severity of the disease ($r = 0.15$).

Downy mildew was observed in 81 of 95 counties (85%) sampled. The disease was present in all counties in the north central, central, and east central sections of the state. It was found in all counties but one in the south central, southeastern, and west central sections; in all but two in the southwestern section; and in all but four counties in the northwestern and northeastern sections.

Results of our study are in general agreement with previous observations of the prevalence of downy mildew in the Midwest. Abney et al (1) observed 126 soybean fields in Indiana in late August

and early September 1978 and reported that 72.2% of the fields were affected by downy mildew. D. W. Chamberlain and R. L. Bernard (*unpublished*) observed 68 soybean fields in the principal soybean-producing counties of Illinois in early August 1960 and reported that 51% of the fields were affected by downy mildew. They also noted that from 1955 through 1960, the prevalence of downy mildew in Illinois ranged from a high of 76% of fields affected in 1955 and 1956 to a low of 33% in 1957. The mean prevalence of the disease for the 6-yr period was 55.8%.

Downy mildew was very common in northern Iowa in the 1950s, when Blackhawk, a highly susceptible cultivar, was widely grown. With the introduction of Harosoy, a resistant cultivar, downy mildew was no longer a problem in northern Iowa, although it was prevalent in the southern portion of the state. Mildew-resistant Corsoy was introduced in 1969, and this cultivar was widely grown in northern Iowa in the 1970s, when downy mildew was a rarity in that area of the state. Our observations in 1982 revealed that the prevalence of the disease in the eastern two-thirds of the area has changed remarkably, with 88.5% of the fields affected in the north central section and 45.3% in the northeastern

section. The reason for this change is unknown. One possibility is development of a new race or races of the fungus (3,4,6,7) pathogenic to current cultivars.

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