PREDICTION OF WHITE MOLD IN WHITE BEAN AND SNAP BEAN

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We are exploring the effects of crop, environmental and pathogen factors on the development of white mold [Sclerotinia sclerotiorum] in beans in Ontario.

1. Survey of commercial fields of white beans. In 1988, we monitored 32 fields in wide rows (rows 75 cm apart) and 18 fields in narrow rows (rows 18-36 cm apart). Fields were visited once a week from the second week of June to the fourth week of August. White mold was insignificant in commercial fields of white beans in 1988. The disease occurred in 3 out of 32 wide row fields and in none of the narrow row fields. The average disease incidence in infected fields was 0.8% and the maximum disease observed was 1.2%. Rainfall was very low during the three weeks before bloom, ranging from 0.1 mm to 1.4 mm per week in healthy fields and from 0.3 mm to 3 mm per week in diseased fields. Apothecia of the fungus were observed in only one field. These results contrast markedly with the results of our 1984 survey where 21.5 mm of rain fell during the week before bloom, apothecia were abundant in the fields and final disease incidence was 27.8%. We conclude that little white mold occurred in 1988 because conditions in the weeks before bloom were too dry to support the production of enough apothecia to cause significant disease. The importance of moisture to the development of the disease was shown also in the fact that diseased fields received three times as much rain (32 mm) as healthy fields (11.8 mm) during the first week of bloom.

Considerable rain fell during the second, third and fourth weeks after the start of bloom, ranging from 18.2 mm to 27.6 mm per week. Similar levels of rain fell during the late bloom period in the white mold year of 1984. These results are consistent with our view that high rainfall leads to white mold only if it results in (a) the production of apothecia that release spores during the flowering period and (b) periods of surface wetness during bloom that are long enough to permit germination of the spores and infection of the plant.

The cultivars used in the survey fields were Ex Rico types (46%), Stinger (26%), Midland (8%), Crestwood (7%), OAC Seaforth (5%), Wesland (5%), Seafarer (3%), Bunsi (2%) and T8202 (2%). Ex Rico types (Ex Rico 23 and OAC Rico) occurred in 78% of narrow row fields and 44% of wide row fields.

2. Research in a white mold nursery. The effects of planting date and apothecia within the plot on the development of white mold in snap bean, cv. Strike, were studied at the Arkell Research Station, University of Guelph. A field naturally infested with Sclerotinia sclerotiorum was divided into 48 plots, each containing 9 rows 50 cm apart and 4 m long and surrounded by a single row of corn as a wind break. Four replicates of 4 planting date treatments (6, 13, 20 and 27 July) were arranged in a 4x4 Latin Square. Each replicate was subdivided into "recommended" and "predicted" spray treatments and an unsprayed check. In the recommended spray treatment, benomyl (1.1 kg/ha as Benlate 50W) was applied at 30-50% bloom regardless of other conditions. In the predicted spray treatment, benomyl was applied during bloom as soon as apothecia were detected in any plot of the particular planting date. Recommended and predicted sprays for the 4 planting dates were applied 22

and 29 July, 5 and 8 August, 15 and 15 August and 26 and 26 August, respectively.

The incidence of diseased pods at harvest dates 21 and 28 September and 5 and 19 October were 31%, 48%, 79% and 60% in unsprayed plots, 22%, 28%, 12% and 16% in recommended spray plots and 4%, 11%, 17% and 22% in predicted spray plots. Predicted sprays were more effective than recommended sprays in earlier plantings, in which predicted sprays were applied later and at the time of emergence of apothecia, and were equally effective in later plantings, in which predicted and recommended sprays were applied at the same time. In unsprayed plots, disease incidence was significantly ($P = 0.05$) correlated with the number of apothecia ($r = 0.70$). We conclude that white mold was caused largely by apothecia within the plot and that chemical control of the disease can be especially effective if timed according to the presence of apothecia and flowers in the crop.

Conclusion. The results of the survey of commercial white bean fields and the study of snap bean in an experimental plot support the white mold prediction system that we have been developing over several years (1-6). The disease is generally serious only if apothecia of the fungus occur in the field during or shortly before flowering. Apothecia occur only if soil moisture is sufficiently high for about two weeks. In Ontario, the usual source of moisture in white bean fields is rain. Thus, monitoring rainfall and apothecia in the field from about four weeks before bloom through to late bloom will provide adequate information on which to assess the chance of severe white mold. The research in the white mold nursery showed that chemical sprays, if required, can be very effective in reducing the disease.

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