Incidence of Phytophthora root-rot of soybeans in Essex County, Ontario in 1979

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Thirty-six soybean fields in Essex County, Ontario were surveyed in 1979 to determine the incidence of root-rot caused by *Phytophthora megasperma* var. *sojae* Hildeb. *(Pms)*. The average incidence of dead plants varied from 0-1.7% in fields and from 0-4.4% in headlands. Races 3, 4, 5, 7 and 9 composed 23, 2, 4, 50 and 21% respectively of the *Pms* isolates obtained during the survey. Races 1, 2, 6 and 8 were not isolated.

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Nous avons examine 36 champs de soja dans le comté d'Essex (Ontario), en 1979, afin d'y determiner le taux d'infestation par le mildiou du pied *Phytophthora megasperma* var. *sojae* Hildeb. La mortalite moyenne variait de 0 a 1,7 % dans le milieu des champs et de 0 à 4.4 % dans les tournieres. Les races 3, 4, 5, 7 et 9 constituaient respectivement 23, 2, 4, 50 et 21 % des prelevements du pathogene. Les races 1, 2, 6 et 8 etaient absentes.

Introduction

Root-rot of soybean caused by *Phytophthora megasperma* var. *sojae* Hildeb. *(Pms)* has been an endemic disease in southwestern Ontario since 1954 (4). The prevalence of the disease was restricted from 1965 to 1973 by cultivation of soybean cultivars resistant to *Pms* race 1. Since 1973, several new races of the pathogen have been identified which attack these cultivars (3). The presence of these races has prompted the development of tolerant soybean cultivars which exhibit low plant losses in the presence of *Pms* under conditions favourable to disease development. At present, such tolerant cultivars constitute the majority of soybeans grown in Ontario, particularly in Essex County. During the summer of 1979 a survey of soybean fields was conducted to estimate the effectiveness of tolerant cultivars in reducing the incidence of root-rot. Isolates of *Pms* obtained during the survey were identified to determine if race composition has changed since the last survey conducted during the years 1973-76 (1).

Materials and methods

Thirty-six sites on clay or clay-loam soil were chosen at random. An attempt was made to obtain equal numbers of fields with soybeans considered tolerant (T) moderately tolerant (MT) and moderately susceptible (MS) to *Pms* root-rot. Tolerance rating was based on relative plant losses in the tolerance test area at Woodslee, Ontario. Each field was surveyed in early July and again in early August. In each field, counts were made of the number of dead plants per 200 m of row in 20 rows either 5 or 10 rows apart. In addition, dead plants were counted in 4 headland rows in each field. Length of headland rows surveyed varied from 50 m to 75 m. Growers at each survey site were asked to complete a questionnaire concerning cultural practices.

Isolates of *Pms* were obtained from dying plants at each site or from infected soybean plants (cv. Harosoy) grown in potted soil collected from each survey field. Isolations were made from plant tissue by plating segments of surface sterilized stems on Difco corn meal agar (CMA) amended with 100 μg/ml pimaricin (1). Race determinations were made by inoculating 8 differential varieties: Harosoy, Sanga, Harosoy 63, Mack, Altona, PI 103.091, PI 171.442 and Tracy (5). Isolates of *Pms* were cultured 10-14 days on 1.0% CMA at 25 C prior to inoculating 10 plants of each differential. Inoculum was loaded into 10 cc syringes and expelled through a 1 mm hole in the tip of the plastic guard of each syringe over slits made in the upper hypocotyl of test plants. Inoculated plants were covered with plastic bags for 24 h. Plants were maintained at 20-25 C and classified as susceptible (dead) or resistant (no infection) 5-6 days after inoculation.

Results and discussion

The majority of soybean fields were found to be planted with tolerant varieties. As a result, the cultivars Harcor, Dawn, Premier and Hodgson (T) composed 24 of 36 sites surveyed. Six fields were planted with Amsoy 71 and Wells (MT) and only one field was planted with Harosoy 63 (MS).

The average planting date of the fields surveyed was May 19, the earliest on May 12 and the latest on June 20. The average row width was 59 cm. Five of the fields were broadcast seeded. Fertilizer, generally in the form of 8-32-16 ($N:P_2O_5:K_2O$) was applied in 15 fields at an average rate of 160 kg/ha. All fields except two were

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fall-ploughed and spring-disked and all fields except two were tile-drained with an average tile spacing of 11.4 m. The soil type of most fields was Brookston clay loam. The average seeding rate was 84 kg/ha; minimum and maximum seeding rates were 56 and 112 kg/ha respectively.

The average incidence of plants killed by *Pms* root-rot was found to be low (Table 1). Variation in the incidence of root-rot was noted among sample fields, regardless of cultivar tolerance rating, fertilizer application, crop rotations or other cultural practices. In general, a decrease was observed in the percentage of dead plants/ha between the July and August surveys. This suggests that plants killed early in the growing season were not detected by survey personnel after the crop canopy had closed. Percentage of dead plants in headlands was higher than in fields regardless of survey date but differences were not significant. The incidence of root-rot varied from 0-1.7% in fields and from 0-4.4% in headlands.

Table 1. Incidence of Phytophthora root-rot of soybeans in Essex county in 1979

Number of fields sampled	% dead plants/ha*			
	July		August	
	Field	Headland	Field	Headland
36	0.2	0.5	0.07	0.2

"Based on an estimated average plant stand of 300,000 plants/ha.

Application of fertilizer appeared to favour development of root-rot. For example, the average number of dead Harcor plants in twelve unfertilized fields and seven fertilized fields was 341 and 1011 plants/ha respectively. In headlands of the same fields the average numbers of dead plants per hectare were 436 and 1941 respectively. However, differences were not significant when compared by t-test analysis. An increase in root-rot caused by *Pms* following applications of urea and ammonium nitrate was reported recently ***(2).***

Average plant losses were less in T and MT cultivars than in the MS cultivar surveyed at one location; however, the low incidence of root-rot in all cultivars and unequal sample number prevented an accurate assessment of the effectiveness of tolerant cultivars in reducing root-rot under field conditions. In general, the disease was not economically significant in Essex county in 1979. Economic losses may have occurred in some fields in which dead plants were found in localized areas but such areas were not observed in the present survey.

Table 2. Composition of *Pms* races isolated in Essex county in 1973-76 and 1979

Year	Number of isolates	Race (% of isolates)								
		1	2	3	4	5	6	7	8	9
1973-76"	45	0	0	11	7	2		80""		
1979	52	0	0	23	2	4	0	5	0	0 21

* Buzzell, R. I. *et al* (1).
"*Total of races 6-9.

The composition of *Pms* races in Essex county changed only slightly during the past three years (Table 2). Twenty-three percent of 52 isolates characterized in the 1979 survey were race 3 compared to 11% during the period 1973-76 (1). The percentage composition of races 4, 5 and 6-9 was similar to that found in the earlier survey. In the present survey, races 6, 7, 8 and 9 composed 0, 50, 0 and 21% of the total number of the 52 isolates. The frequency of these races in Essex county was not determined previously.

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