Yield of soybean cultivars differing in susceptibility to *Phytophthora megasperma* f. sp. *glycinea* on minimum tillage ridges

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Soybeans (*Glycine max* (L.) Merr.) were grown with reduced tillage on flat and ridged plots on poorly drained soil for two consecutive years. In the second year, yield was significantly less on the ridge plots. Cultivars differed significantly in plant loss and yield with flat and ridge tillage depending on level of susceptibility to root rot caused by *Phytophthora megasperma* f. sp. *glycinea.*

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Les feves de soya (*Glycine max* (L.) Merr.) ont ete cultivees avec un labour reduit sur des parcelles sans relief et sur des parcelles en billon dans un sol draine pauvrement durant deux annees consecutives. Lors de la deuxieme année, le rendement fut significativement moindre sur les parcelles en billon. La perte de rendement et de plants fut significative pour differents cultivars selon le type de labour (*i.e.* a plat ou en billon) et selon le niveau de susceptibilite de la pourriture des racines causee par *Phytophtora megasperma* f. sp. *glycinea.*

Introduction

Soybean (*Glycine max* (L.) Merr.) cultivars recommended for southwestern Ontario differ in tolerance and resistance to *Phytophthora megasperma* f. sp. *glycinea* Kuan and Erwin (P.m.g.) (Buzzell and Anderson, 1982). Compaction of fine textured soils influences the incidence of disease (Fulton *et al.*, 1961; Kittle and Grey, 1979). Recent trends in energy and soil conservation have resulted in the development of new cultivation and planting systems involving minimum tillage that may influence soil conditions. One system involves planting row crops on permanent ridges. The purpose of this study was to determine the effect of flat and ridge minimum tillage on emergence, plant loss and yield of soybean cultivars that differ in tolerance to root rot.

Materials and methods

Experiments were conducted on Brookston clay loam soil with a history of moderate to severe root rot at the Whelan Research Farm at Woodslee, Ontario. Four soybean cultivars/lines differing in susceptibility to root rot were planted in 8-row plots, 5 m in length in a split-plot design with 4 replicates. The main plot treatments consisted of 4 soybean cultivars/lines as follows: 0x20-8, Harcor, Kentland and Corsoy 79. These are very susceptible, moderately tolerant, tolerant and resistant to prevalent races of P.m.g., respectively (Buzzell and Anderson, 1982). The 4 row sub-plots received minimum tillage with a triple "K" cultivator in spring or minimum tillage ridges built in spring with a Hiniker Econ-0-Till planter (Model 7430) just prior to planting. Fertilizer (8-32-16) was applied broadcast at 540 kg/ha prior to tillage. Seeds were planted in both sub-plots with the Hiniker planter at the rate of 30 seed/m at a depth of 5 cm. Chloramben was applied pre-emergence at 4 kg a.i./ha to control weeds. In 1984, the experiment was planted 11 May, emergence counts were made 19 June and final stand counts were made 27 August. In 1985, tillage methods were similar to 1984. Treatments were planted directly over previous plots in the same randomized pattern. In 1985, the experiment was planted 15 May; plots were sprinkle irrigated with 2.5 cm of water to assist emergence. Emergence counts were made 5 July and final stand counts were made 7 October. Percent plant loss was determined from the difference between all plants that emerged and the number of plants that produced seed at the time of final stand counts. Significant differences were determined at P = 0.05.

Results and discussion

In 1984, emergence of Corsoy 79, Kentland and OX20-8 did not differ significantly between flat and ridged planting. Emergence of Harcor in flat plots (15 plants/m) was significantly less than in ridge plots (19 plants/m). The overall mean emergence of all four cultivars was less in flat plots (19 plants/m) than in ridge plots (21 plants/m) (Table 1). Plant loss during the growing season and yield of the four cultivars did not differ significantly between flat and ridge plots, however, significant differences in plant loss and yield occurred among cultivars (Table 1).

In 1985 an interval of dry weather after planting delayed seedling emergence on both flat and ridge plots. As in 1984, emergence of Corsoy 79, Kentland and 0x20-8 did not differ significantly between flat and ridge plots (Table 1). Emergence of Harcor was significantly higher on flat plots (19 plants/m) than ridge plots (15 plants/m). Yield of Harcor was significantly greater on flat plots (2122 kg/ha) than on ridge plots (985 kg/ha). Although yields of Corsoy 79, Kentland and 0x20-8 did not differ significantly

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Table 1. Plant loss and yield of 4 soybean cultivars differing in susceptibility to Phytophthora root rot grown under conditions of flat and ridged minimum tillage.

Cultivar	Susceptibility**	Emergence (plants/m)				Plant loss (%)				Yield (kg/ha)			
		1984		1985		1984		1985		1984		1985	
		Flat	Ridge	Flat	Ridge	Flat	Ridge	Flat	Ridge	Flat	Ridge	Flat	Ridge
0x20-8	VS	**18a**	**19^{a}**	**18^{a}**	**19^{a}**	**82a**	**93a**	**91^{a}**	**95a**	**576^{a}**	**88^{a}**	**265^{a}**	**77^{a}**
Harcor	MT	**15^{a}**	**19^{a*}**	**19^{ab}**	**15^{a*}**	**11^{b}**	**8^{b}**	**16^{ab}**	**17^{b}**	**2791^{b}**	**2687^{b}**	**2122^{b}**	**985^{a*}**
Kentland	T	**24^{b}**	**25b**	**27^{bc}**	**27b**	**5^{b}**	**9^{b}**	**10^{b}**	**14b**	**3077^{b}**	**3116^{b}**	**2243^{b}**	**1995^{b}**
Corsoy 79	**R**	**18^{a}**	**20^{a}**	**32C**	**30^{b}**	**1^{b}**	**1^{c}**	**4^{c}**	**7^{c}**	**3318^{b}**	**2732^{b}**	**3632^{c}**	**2936^{c}**
$\bar{x}$		**19**	**21***	**24**	**23**	**25**	**28**	**30**	**33**	**2441**	**2156**	**2066**	**1498***

Means within column followed by the same letter do not differ significantly according to Duncan's Multiple Range Test, P=**0.05.**
* Indicates ridge treatment differs significantly from flat treatment within the same year (P = **0.05)**.
** **VS** = very susceptible, MT = moderately susceptible, T = tolerant, R = resistant.

between ridge and flat planting, the overall mean yield of all cultivars was significantly greater on flat plots (2066 kg/ha) compared to ridge plots **(1498** kg/ha).

Plant **loss** and yield differences reflected differences in tolerance and/or resistance to P.m.g. root rot among cultivars regardless of tillage system. Increased plant **loss** and decreased yield of all entries except the resistant cultivar in the second year of the experiment may also be related to increased compaction (Kittle and Gray, **1979)** or increased soil inoculum as a result of monoculture of soybean cultivars (Anderson, **1986).**

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