Incidence of root rot in pulse crops in southern Alberta, 1978-1983

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Field surveys established that root rot was a common pulse crop disease in southern Alberta from 1978 to 1983. The disease was found in nearly every field examined, and the average percentage of affected plants in the fields was: processing peas 52%, processing beans 21%, dry peas 8%, dry beans 15%, fababeans 8% and lentils 4%.

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Des inventaires aux champs ont établi que la pourriture des racines était une maladie commune chez les cultures de légumineuses dans le sud de l'Alberta de 1978 à 1983. La maladie était présente dans presque tous les champs examinés et le pourcentage moyen des plants affectés était de: 52% pois de transformation, 21% haricots de transformation, 8% pois secs, 15% haricots secs, 8% féveroles et 4% lentilles.

Pulses (edible, pod-bearing legumes) are grown in southern Alberta for processing (peas and beans), dry seed (peas, beans, fababeans and lentils), and forage (fababeans). Dry beans, and especially fababeans and lentils, are relatively new crops that have enjoyed increasing popularity with growers in recent years. This popularity is related to their use in rotation with cereals, to their value as cash crops, and to their ability to fix atmospheric nitrogen, thereby reducing the need for nitrogen fertilizer in succeeding crops. Processing peas, processing beans and dry peas are favoured crops that have supported well-established industries in southern Alberta for two to three decades. Small experimental plantings of soybeans have also been tried in southern Alberta, but this crop has not yet become established on a commercial basis.

In the early 1970's, root diseases were found to cause serious yield losses in peas grown in various areas of Canada (1-3) and North America (6). Accordingly, we have been attempting to establish the incidence of root diseases in southern Alberta pulse fields, and to estimate the resultant crop losses. We report here on the levels of root rot found during field surveys. Forthcoming reports will present crop loss data. Preliminary reports of this work have been given (4, 5, 11).

Materials and methods

Fields were selected for survey with the assistance of contracting company representatives. No attempt was made to randomly select fields; rather, fields with and without a known history of root rot were chosen. Each year, the crops were sampled at harvest maturity (as determined by the contracting companies). Plant samples were taken at sites along a semi-circular transect through each field. In 1978, 1979 and 1980, 10 plants at each of 10 sites along a transect that extended ca. 50 m into the field were dug up and rated for root rot. In 1981, 1982 and 1983, the plants in three-meter lengths of two adjacent rows were dug up at each of five sites equally spaced along a transect that spanned the field. The samples were brought to the laboratory where they were stored at 5°C until being washed and the roots rated for root rot. Roots were scored for severity as 0, 2 or 4, representing healthy, moderately rotted and severely rotted root systems, respectively.

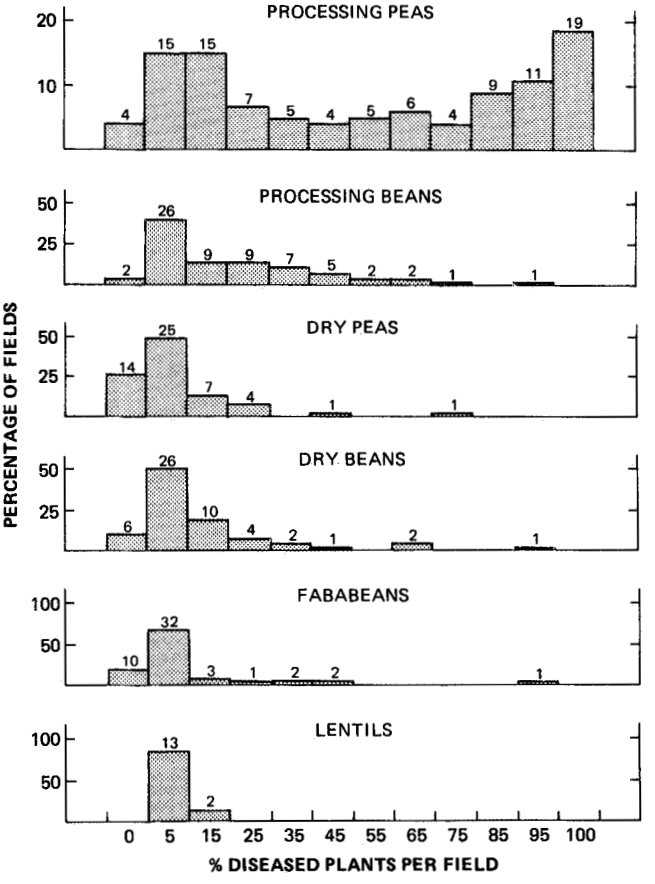

Fig. 1 Mean percentage of diseased plants in pulse fields, 1978-1983. The number of fields in each class is shown above the bar.

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Table 1. Percentages of pulse crop fields with root rot in southern Alberta, 1978-83.

Survey year	Processing types				Dry Types							
	Peas		Beans		Peas		Beans		Fababeans		Lentils	
	%	(n)*	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
1983	100	(20)	100	(11)	–	–	–	–	100	5	–	–
1982	100	(15)	100	(11)	–	–	100	5	80	5	100	5
1981	94	(20)	94	(17)	–	–	–	–	–	–	–	–
1980	100	(10)	100	(10)	100	(10)	100	10	100	5	100	5
1979	100	(16)	100	(15)	95	(20)	86	15	47	15	100	5
1978	84	(21)	–+	–	41	(22)	87	22	95	21	–	–
All years	96	(102)	99	(64)	79	(52)	93	52	84	51	100	15

* n is the number of fields sampled.
+ – indicates crop not surveyed in this year.

Table 2. Incidence and severity of root rot in processing pea and bean fields in southern Alberta, 1978-83.

Survey Year	Peas		Beans	
	Inc.	Sev.	Inc.	Sev.
1983	74±8(20)*	1.8±0.2**	29±5(11)	0.6±1**
1982	52±8(15)	1.2±0.2	29±6(11)	0.6±0.1
1981	51±8(20)	1.2±0.2	6±1(17)	0.1±0
1980	70±12(10)	1.9±0.4	34±9(10)	0.6±0.2
1979	22±6(16)	–§	18±5(15)	–
1978	43±10(21)	–	–	–
All Years	52±5(102)	1.4±0.1	21±3(64)	0.4±0.1

* Mean ± standard error of the percentage of diseased plants, with the number of fields sampled in parentheses.
** Mean ± standard error of the severity of root rot on plants in the fields, scored as healthy = 0, moderate root rot = 2, and severe root rot = 4.
§ Not determined.

Table 3. Percentages of plants with root rot in dry seed pulse fields in southern Alberta, 1978-83.

Survey Year	Peas	Beans	Fababeans	Lentils
1983	–*	–	30±13(5)	–
1982	–	11±4 (5)	32±14(5)	5±2 (5)
1981	–	–	–	–
1980	8±2(10)+	31±9(10)	2±1 (5)	4±1 (5)
1979	13±3(20)	4±1(15)	1±0(15)	3±1 (5)
1978	4±1(22)	12±3(22)	2±1(21)	–
All Years	8±1(52)	15±2(52)	8±1(51)	4±1(15)

* Not surveyed in this year.
+ Mean ± standard error of the percentage of plants with root rot, with the number of fields sampled in parentheses.

Results

Although root rot diseased plants were found in most fields of each pulse crop in each survey year (Table 1), the percentage of plants affected within fields (incidence) varied considerably between crops and between years. The percentages were highest in processing peas, followed by processing beans, dry beans, fababeans, dry peas and lentils (Tables 2 and 3).

The distribution of fields grouped according to the percentage of root rot diseased plants was highly skewed towards the lower percentages for all of the crops surveyed except processing peas (Fig. 1). The distribution for processing peas indicated that fields tended to contain either a low or a high percentage of diseased plants.

Discussion

Our previous surveys of pulses in southern Alberta showed that, although several diseases affected these crops, root rot was the most important (4, 5, 11). Our most recent surveys, reported here, expand the number of observations to include more growing seasons and farms, and confirm that root rot is a widespread disease of pulses in southern Alberta, and of particular importance on the pulses that are grown for processing. Our data also illustrate the considerable variation which exists in the percentage of root rot diseased plants between fields. We are attempting to define the factors responsible for this variation (5, 12) in the hope that they can be used to develop a disease management strategy.

The incidence of root rot was highest in processing pea fields. Our current estimate of 52% (Table 2) is lower that the average of 65% reported in 1970 and 1971 (1), and higher than the average of 33% recorded in 1978 and 1979 (12). Our present findings confirm that root rot is a significant problem in pea production in Alberta. In other provinces, notably British Columbia and Ontario, a similar problem exists (1-3).

Alberta pea growers have practiced a four-year crop rotation since about 1950. Our data suggest that the current crop rotation pattern may not be effective for root rot control. For example, in 1983 we encountered one field, last cropped to peas in 1977, in which 95% of the plants were diseased.

Better methods for root rot control are urgently needed by processing pea growers in Alberta.

Except for fababeans, our estimates of root rot incidence in the other pulses we surveyed is in agreement with previous findings (11) and with similar surveys in Saskatchewan (7-10). The figure for fababeans has increased sharply since 1978. This increase is difficult to explain; it may be related to late season sampling, or it may be an indication that root rot is becoming more severe on those farms that are continuing to grow fababeans. Dry peas probably develop less root rot than processing peas because there is a greater variety and turnover of growers, and dry pea production is not concentrated on a relatively small number of farms, as is the case with processing peas.

The root rot levels in dry and processing beans were moderate, but since we have recorded yield losses of up to 35% due to the disease in some processing bean fields (Swanson *et al.*, unpublished data), these levels are probably significant. Attention needs to be given to root rot control in these two crops.

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