Ascochyta blight in lentil crops and seed samples in Saskatchewan in 1988

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Ascochyta blight caused by Ascochyta fabaef. sp. lentiswas found in 22 of 118 lentil crops surveyed in 1988 in Saskatchewan. Over half of the crops were grown from seed containing at least a trace of the pathogen and three seed samples contained at least 5% infection. Weather conditions were very unfavorable for disease development and crop growth in most areas of the province. Samples of harvested seed were obtained from 77 of the crops and only 31 (40%) showed any infection. However, the highest level was 55%. There was evidence in about 20 crops that the main source of infection was inoculum which had moved into the field from residues of a 1987 lentil crop in an adjacent field. However, movement into the field was limited.

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Dans une enquête qui a eu lieu en 1988 en Saskatchewan, I'ascochytose (Ascochyta fabaef. sp. lentis) a ete notée dans 22 cultures de lentilles sur 118. Pour plus de la moitie de ces cultures, on a utilise une semence contenant au moins des traces du champignon pathogene. Cependant, trois echantillons contenaient au moins 5 % de graines infectees. Dans la plupart des regions de la province, les conditions de temperature et de pluviometrie n'ont pas ete tres favorables ni pour le developpement de l'ascochytose, ni pour la croissance de la culture. Des echantillons de graines provenant de 77 cultures ont ete recoltes et analyses. Seulement 31 (40 %) echantillons etaient infectes. Neanmoins, le taux d'infection le plus élevé a ete 55 %. Il semble que, pour environ 20 cultures, la principale source d'infection a ete l'inoculum provenant des restes de culture de lentilles des champs adjacents, cultivees en 1987. Cependant, l'expansion du champignon pathogene dans le champ était faible.

Introduction

Lentils have been grown in Saskatchewan since 1970 and production peaked in 1987 at over 200,000 ha in the province. The most serious disease of the crop is ascochyta blight, which was first reported in Canada in 1978 (7). Under epidemic conditions the disease has major effects on both seed quality and yield, causing losses of more than 70% of potential income (2). Ascochyta blight is caused by ***Ascochyra fabae*** f. sp. ***lentis*** Gossen et al., a pathogen that is specific to lentil and does not affect other pulse crops in western Canada (4).

The pathogen is spread by rain splash and is both seed-borne and stubble-borne. The percentage of infected seeds that give rise to infected seedlings is generally low but infested crop residue is a highly effective source of inoculum and may result in severe epidemics (3). Recommendations for disease control include not seeding lentil crops on lentil stubble and avoiding the use of infected seed ***(5).*** The use of these two control measures is effective in controlling ascochyta blight under experimental conditions (R.A.A. Morrall, unpublished data). However, in 1987, there were reports of growers suffering major epidemics after planting disease-free seed in fields that had not been cropped to lentils for four years. Accordingly, a survey was undertaken in 1988 with the principal objective of trying to identify sources of inoculum in crops infested with ascochyta blight.

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Methods

One hundred and eighteen commercial crops in nine Saskatchewan crop districts (Fig. 1) were sampled. Attempts were made to obtain information for each field from growers on cropping history for the previous four years, the crops planted in adjacent fields in 1987, agronomic practices and cultivar. In most cases the growers also supplied a sample of the seed that had been planted in the field. These seeds were plated on 20% V8 juice agar to test for ascochyta infection (6). Between 100 and 400 seeds were picked at random from each sample, surface disinfected for 10 min in 0.6% NaOCl, plated and incubated at room temperature for about 10 days before colonies of ***Ascochyra*** were counted. If no ***Ascochyta*** was detected in the randomly picked seeds, isolations were made from selected discolored seeds in the sample. If only the selected seeds yielded ***Ascochyra*** colonies, the infection level was recorded as a trace.

Most of the crops were seeded between late April and early May. Field inspections were carried out from June until harvest time in August. Two visits during the growing season were planned to obtain some idea of changes of disease with time. However, second visits were made only in areas with moderate or good crops; drought-stricken areas were not revisited. During each visit the following data, based on visual estimation while walking through part of the crop, were recorded: crop density and height, growth stage, presence of ascochyta blight and presence of other diseases. In fields where lentils had been planted in an adjacent field in 1987, particular attention was paid to differences between the edge of the crop next to the lentil residues and the rest of the crop. Microscopic examination and isolations were done on specimens whenever there was uncertainty about disease symptoms.

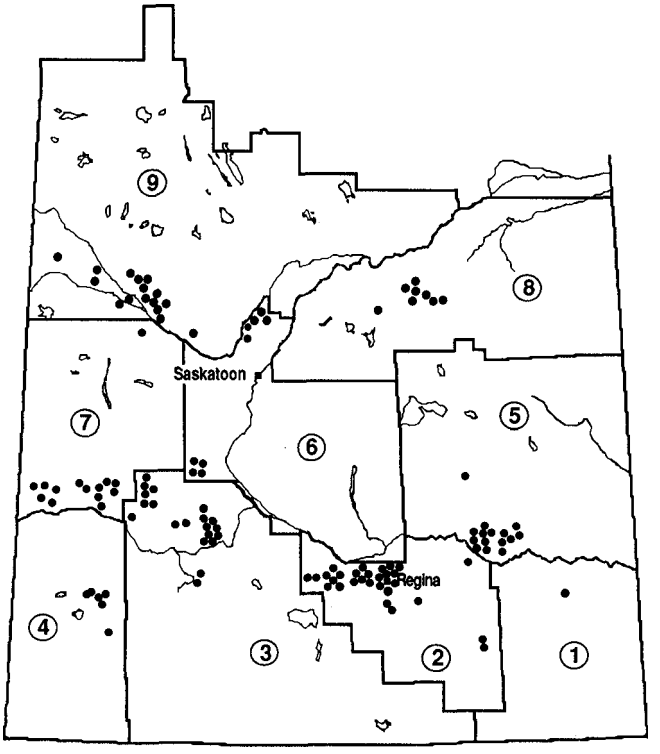

Fig. 1. Map of Saskatchewan crop districts showing approximate locations of lentil crops surveyed.

Table 1. Incidence of ascochyta blight in lentil crops in Saskatchewan in 1988.

Sask. crop district**	First inspection* No. of crops	First inspection* No. of crops with ascochyta	Second inspection No. of crops	Second inspection No. of crops with ascochyta
1	1	a		
2	28	a		
3	20	3		
4	6	1		
5	15	0	14	5
6	10	1	5	1
7	14	2	3	1
8	8	0	7	0
9	16	1	15	10
Total	118	8	44	17

* First inspection from June 21 to July 15. second inspection from July 22 to August 4.
** See Fig. 1.

During harvest seed samples were collected by the growers. In crops adjacent to 1987 lentil residues, growers were requested to collect separate samples from the side of the field adjacent to the residues and from elsewhere in the field. The samples were tested for percentage ascochyta infection at Saskatoon, as described above.

Results and discussion

The relative frequency of lentil cultivars and types among the crops surveyed was as follows: Laird – 78%; Eston – 7%; French Green (Du Puy) – 9%; Common Chilean – 6%. In contrast with the other three highly susceptible types, Laird is moderately resistant to ascochyta blight. However, this resistance tends to break down at maturity and a high level of seed infection and discoloration may occur (1).

Drought resulted in poor emergence, short plants, early maturity and very low yields in many areas, especially crop districts 1-4 and 6-7 (Fig. 1). Ascochyta blight was found in only 8 of 118 crops (7%) inspected during initial visits in June or early July and 17 of 44 crops (39%) revisited in August (Table 1). Generally the crops most affected were in central and northern districts, which were least affected by the drought. There was no obvious relationship between disease severity and cultivar, crop density, crop history of the field or agronomic practices. However, by August, the heaviest infection was in a field where the crop had been planted on lentil stubble.

Ascochyta blight was found in 16 of 38 crops (42%) which were adjacent to residues of a 1987 lentil crop. In many of these crops there was more disease on the side of the field adjacent to the residues than elsewhere. In three such crops in the very dry southern and western regions, infected plants were found only very close to the 1987 residues. Thus, movement of ascochyta blight into lentil crops from infested residues in adjacent fields was limited.

The ranges of infection levels in samples of seed planted and harvested are presented in Tables 2 and 3. Over 50% of seed samples planted contained at least a trace of infection and some were as high as 5%. The most heavily infected samples were planted mainly in the northern crop districts, where moister conditions made the potential for disease spread greater.

A substantial number of crops were not harvested because of the drought and 62.5% of all harvested seed samples showed no ascochyta infection (Tables 2 and 3). Samples were collected from two or more parts of 30 crops where either fields with 1987 lentil residues were adjacent or a disease gradient had been observed (Table 3). In 21 of these, levels of seed infection were higher in one part than another, thereby confirming the indicatiion during field inspection that movement of ascochyta into the crop was limited.

Table 2. Percentage ascochyta infection of seed samples planted and harvested by Saskatchewan lentils growers in 1988.*

Percentage ascochyta infection	No. of samples of seed planted**	No. of samples of seeds from crops where only a single sample was harvested
0	50	37
Trace***	14	3
0.25–1.0	22	2
1.25–2.0	7	1
2.25–4.75	8	4
5.00–7.00	3	–
Total	102	47

* See Table 3 for results for harvested seed samples from crops where more than one sample was collected.
** Some samples were planted in more than one field.
*** Trace–ascochytainfection only in selected discolored seeds.

Table 3. Distribution of 1988 lentil crops in which seed samples were harvested at more than one location in relation to extreme values of perecntage seed infection with ascochyta.

Extreme values of % ascochyta infection	No. of crops	Extreme values of % ascochyta infection	No. of crops
0–0	9	3–16	
0–Trace*	1	5-33	
0–0.25	1	6-23	
0–1	7	8–19	
0–2	2	11–12	1
0–5	1	15-32	1
0.5-8	1	39–55	1
1-46	1		

* Trace–ascochyta infection only in selected discolored seeds.

Root rot and heat canker (5) were also observed in the present survey. Root *rot,* probably caused by *Rhizoctonia* and *Fusarium,* was present at trace levels in most fields. Heat canker was very common in early summer, due to the extreme heat accompanying the drought. In some fields as many as 50% of the plants were affected.

Conclusions

Low disease severity and seed infection in most crops were a result of very dry conditions in most lentil growing areas. In crops where disease was observed, a frequent source of infection was lentil residues from 1987 in adjacent fields. Gradients of disease severity and percentage seed infection were evident in these crops. Further work on quantitative aspects of such gradients is necessary. However, in about half of the crops surveyed seed-borne inoculum was present, albeit usually at low levels. This emphasizes a potential for disease development in the Saskatchewan lentil crop when very moist conditions prevail, even when stubble-borne inoculum is absent.

Acknowledgements

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