Diseases of specialty crops in Saskatchewan: II. Notes on field pea in 1973-74 and on lentil in 1973

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Ascochyta blight *[Ascochyta pinodes],* sclerotinia stem rot *[Sclerotinia sclerotiorum],* and fusarium root rot were the most common diseases of field pea (*Pisum sativum* var. *arvense)* in Saskatchewan in both 1973 and 1974. In 1973 fusarium root rot and heat canker caused by high temperatures near the soil surface were prevalent on lentil *(Lens culinaris).*

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Les maladies les plus communes du pots (*Pisum sativum* var. *arvense)* en 1973 et 1974 ont ete, en Saskatchwan, le pourridie ascochytique *[Ascochyta pinodes],* le pourridie fusarien. et la flétrissure sclerotique *[Sclerotinia sclerotiorum].* En 1973, les maladies dominantes de la lentille *(Lens culinaris*) etaient le pourridie fusarien et un chancre induit par des temperatures elevees.

Disease surveys were done in Saskatchewan on crops of field pea (*Pisum sativum* var. *arvense* (L.) Poir.) in 1973 and 1974, and on crops of lentil *(Lens culinaris* Medik.) in 1973. These surveys comprised part of a continuing study of specialty crop diseases (3,4,5,6). Both crops are important protein sources and, as such, are being studied intensively at the Crop Development Centre, Saskatoon. However, provincial acreage data suggest that only field pea has considerable commercial prospects in the near future (3,6). Estimated figures for 1973-74 are as follows: field pea: 1973 - 4,000 acres; 1974 - 6,500 acres; lentil: 1973 - 2,500 acres; 1974 - 600 acres. The low acreage in 1974 was the principal reason for not continuing the lentil survey in 1974.

Methods

In 1973 11 fields of lentil and 24 of field pea were examined. Survey trips were made at three different times during the growing season, although all the fields were not surveyed each time. The objective was to avoid missing diseases that might be masked by the end of the growing season, and also to obtain some idea of changes of disease with time. However, time limitations in 1974 required that the 17 fields of pea surveyed be sampled only once, at the end of the season.

The fields of lentil were all in the Eston-Kindersley area (150 miles SW of Saskatoon). In both 1973 and 1974 the majority of crops of field pea were in the traditional growing areas of Bellevue (60 miles NE of Saskatoon) and Nipawin (150 miles NE of Saskatoon). However, one field near Marengo (170 miles WSW of Saskatoon) in 1973 and five fields in the Tisdale area (120 miles NE of Saskatoon) in 1974 were also surveyed; these were in new areas for the cultivation of field pea in Saskatchewan.

Observations prior to the final sampling in 1973 were largely qualitative. The presence, and approximate levels of diseases in each field were noted while walking about 300 meters in a semicircular pattern through the crop. Quantitative estimates of disease intensity at the end of the two growing seasons were made using techniques slightly modified from those described previously (3). Plants were sampled in only two widely separated parts of each field and, in the case of field pea, estimates of percentage area diseased were made on 100 triplets of leaflets and 100 pods from each sample area. Intensity of root and stem diseases of field pea were measured on a m^2 basis, but those of lentil on a percentage of total plants basis. Isolations from diseased plant material were always made, using routine laboratory procedures, when the causal organism was unknown or uncertain.

Results

Field pea (Tables 1, 2)

The principal diseases in both years were ascochyta blight *[Ascochyta pinodes* L.K. Jones], sclerotinia stem rot *[Sclerotinia sclerotiorum* (Lib.) de Bary] and fusarium root rot [*Fusarium* spp.]. Other diseases observed at trace levels were rhizoctonia root rot *[Rhizoctonia* sp.], botrytis stem blight and leaf spot [*Botrytis cinerea* Pers.] and powdery mildew [*Erysiphe polygoni* DC. ex Mérat] in 1973, and bacterial blight *[Pseudomonas pisi* Sackett] in 1974.

In 1973 ascochyta blight had appeared in only one field by mid-June (Table 1). However, by mid-July it was present in all fields in the Nipawin and Bellevue areas, and often at higher than trace levels. By the final sampling date the disease was observed even in the field at Marengo. At the end of the season considerable variation between fields occurred in the mean percent-

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Table 1. Summary of qualitative survey data for field pea, Saskatchewan 1973

District	Date	No. of fields examined	Number of fields where diseases were present: Ascochyta blight	Sclerotinia stem rot	Fusarium root rot	Other*
Bellevue	1416	2	1	0	0	0
	1717	5	5	1	1	a
	2718	7	7	5	5	b
Nipawin	1916	2	0	0	1	0
	11/7	16	16	0	7	0
	419	10	10	9	9	c
Marengo	2616	1	0	0	0	0
	31/7	1	0	0	1	0
	1318	1	1	0	1	0

* a = leaf spot, (*Botrytis cinerea*) 1 field;
b = root rot, (*Rhizoctonia sp.*) 3 fields, powdery rnildew (*Erysiphe polygoni*), 1 field, and stem blight (*Botrytis cinerea*) 1 field;
c = root rot (*Rhizoctonia sp.*) 6 fields and powdery mildew (*Erysiphe polygoni*) 1 field.

Table 2. Intensity of diseases of field pea in late season by district, Saskatchewan 1973-74

Year and District	Percentage area diseased: Ascochyta on leaves Mean	Ascochyta on leaves Range	Ascochyta on pods Mean	Ascochyta on pods Range	Number of plants diseased/m^2: Sclerotinia stem rot Mean	Sclerotinia stem rot Range	Fusarium root rot Mean	Fusarium root rot Range	Rhizoctonia root rot Mean	Rhizoctonia root rot Range
7973										
Bellevue	3.9	1.2– 7.7	2.1	0.9– 3.7	3.0	0–10.5	2.9	0–7.0	0.5	0–1.5
Nipawin	4.7	1.3–10.1	5.9	0.4–13.6	4.1	0–10.0	1.3	0–2.5	0.8	0–1.5
Marengo	2.4	na	0.3	na	0	na	1.0	na	0	na
Mean	4.3	1.2–10.1	4.1	0.9–13.6	3.4	0–10.5	1.9	0–7.0	0.6	0–1.5
1974										
Bellevue	11.3	2.8–19.4	5.7	1.0– 8.0	0.5	0– 1.0	0.2	0–1.0	0	na
Nipawin	2.0	0.2– 6.8	0.4	0 – 0.8	0.3	0– 1.5	0.2	0–1.0	0	na
Tisdale	5.1	3.8– 8.3	2.5	0.8– 2.7	0	na	0.2	0–1.0	0	na
Mean	5.7	0.2–19.4	2.6	0 – 8.0	0.3	0– 1.5	0.2	0–1.0	0	na

na = not applicable

age leaf area infected (Table 2), hut there appeared to be generally more disease in the Nipawin area than in the Bellevue area. **Pod** infections were also common in both areas, with seeds in the more extensively infected pods usually being partially decayed. At the end of the 1974 season ascochyta blight appeared to be more intense in the Bellevue area than in the Nipawin area (Table 2). The presence of the disease at Marengo in 1973 and of relatively high levels of it in the Tisdale area in 1974 were not unexpected in view of the well known seed-

Table 3. Summary of qualitative survey data for lentil, Saskatchewan 1973

Date	Number of fields examined	Number of fields where diseases were present*						
		Fusarium root rot	Rhizoctonia root rot	Unknown† root rot	Botrytis stem rot	Sclerotinia stem rot	Heat canker	Others
26/6	11	10	2	0	3	0	9	a
31/7	10	5	0	1	0	1	0	b
13/8	9	9	0	5	0	0	5	0

* Diseases indicated were all present at trace levels except for heat canker on 26/6, and fusarium root rot and the "unknown" root rot on 13/8, when the levels ranged from trace to slight.

† The cause of this root rot is unknown; see text.

§ a = Leaf blight (*Alternaria* sp.) 3 fields and leaf blight (*Cladosporium* sp.) 3 fields;
b = Leaf blight (*Alternaria* sp.) 2 fields.

borne nature of *A. pinodes.* Nonetheless, they are disturbing examples of the introduction of unwanted pathogens into new areas of cultivation of the host.

In 1973 and 1974 (Table 2) the mean levels of ascochyta blight, fusarium root rot, and powdery mildew were comparable to those recorded in 1972 (3). Powdery mildew, a common disease on peas in Saskatchewan gardens, was rarely observed in fields in any of the 3 years, probably because of the different microclimate which commonly prevails in large fields. In sharp contrast to other diseases, sclerotinia stem rot was, compared with 1972, 10 times more abundant in 1974 and 50 times more so in 1973. However even in 1973 the disease was only observed late in the season, with the exception of one field in the Bellevue area.

Lentil (Table 3)

One of the major diseases of lentil was fusarium root *rot,* and most isolates from diseased roots were cultivars of *Fusarium roseum* (sensu Snyder and Hansen). A seedling blight phase of the disease occurred in trace amounts in many fields on June 26. On August 13, shortly before swathing in most fields, the disease affected a mean of 2.7% of the plants (Range: 0.5–6.0%). This was less than in an earlier survey (3), but apparently, as in the earlier survey, damage to infected plants was slight. Root rot or seedling blight caused by *Rhizoctonia* sp. was also recorded in early season in two fields. A third root rot, of unknown etiology, occurred in several fields, and on August 13 affected a mean of 1% of the plants (Range: 0–4.0%). Isolations from diseased tissue yielded only bacteria, and proof of pathogenicity was not established. Most of the bacteria were cream- or yellow-pigmented and gram negative.

Heat canker of seedlings was very common in early summer. The symptoms of basal stem necrosis and leaf discoloration (Fig. 1) were very similar to those on flax described by Vanterpool **(7).** A period of hot weather with intense insolation had occurred in the area shortly

Figure 1. Heat canker of lentil. Note the constriction of the stem at the soil level and the discoloration of the leaves.

before the survey trip. In midsummer heat canker was not observed on standing plants in the field; however, dead plants with shrunken stem bases were seen lying on the ground, apparently broken off by wind action. In late summer standing plants with heat canker symptoms were again observed, but they appeared to be as vigorous as healthy plants, judging by size and pod formation. A mean of 2.9% of the plants (Range: 0–25.0%) were affected.

Traces of stem rots caused by *Botrytis cinerea* and *Sclerotinia sclerotiorum* were observed at different times during the season. These diseases were also reported in previous surveys (3, 6). Although no attempt was made to assess leaf disease quantitatively, plants with leaf necrosis were occasionally found in early and mid-season. *Alternaria* sp. and *Cladosporium* sp. were isolated from these leaves.

Discussion

In 1973 the weather in the area of Saskatchewan where lentil was cultivated was abnormally dry. This is probably consistent with the low levels of botrytis and sclerotinia stem rots but with the frequent occurrence of heat canker. However, it is worth noting that surveys over 4 years now (3, 6, and present study) have failed to reveal any serious pathological problems on lentil, especially on dryland crops. Thus it is somewhat ironic that lentil acreages have declined in the period 1972-74 in Saskatchewan (3), and that prospects for the near future are not bright. The main problems seem to relate to weed control and the value of the crop relative to cereals.

On the other hand the future for field pea seems bright. This crop is mainly cultivated in the moister northern and northeastern crop districts of Saskatchewan. In this part of the province, especially in the Nipawin area, 1973 was an exceptionally wet year. Such conditions would be expected to have favored two of the major diseases of peas, ascochyta blight and sclerotinia stem rot.

The importance of ascochyta blight on peas throughout Canada is already well documented (1, 2, 3, 6, 8) and considerable work has been done on the disease. However, adequate control appears to be a somewhat distant prospect. Ali-Khan et al. (1) showed that among 1200 plant introductions none showed a high level of resistance to *A. pinodes.* Thus resistant varieties, such as have been used successfully to control *A. pisi* Lib. (9), are likely to be available only after an extensive breeding program.

It is noteworthy that one of the major diseases of pea in this survey, sclerotinia stem rot, was not recorded at all in an extensive survey of peas in eight other Canadian provinces in the years 1970 and 1971 (2). However, our two previous surveys in Saskatchewan (3, 6) recorded this disease. The reasons for this difference are unclear, although two explanations seem possible. Most of the survey by Basu et al. (2) was on processing peas and was done during the main harvest period. Since processing peas are harvested earlier than field (dry) peas, and since in the present survey sclerotinia stem rot was usually observed only in late season, it is possible that the disease had not had time to develop in the fields surveyed by Basu et al. Another possible factor relates to other crops grown in rotation with peas. In the pea growing areas of Saskatchewan, rapeseed, an important alternative host for *S. sclerotiorum* is frequently cultivated, whereas a similar situation may not exist in certain other Canadian provinces.

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