Oilseeds and special crops / Oleagineux et cultures speciales

Crop / Culture: Canola

Location / Emplacement: British Columbia

Title / Titre: 1988 and 1989 CANOLA DISEASE SURVEY IN BRITISH COLUMBIA

Name and Agency / Nom et Organisation:
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METHODS: Canola surveys were conducted in 1988 and 1989 to determine if virulent blackleg (Leptosphaeria maculans) had been introduced into the Peace River region of British Columbia (B.C.). Since virulent blackleg is carried on infected seed B.C. growers have been advised to use seed from the Peace River region where the disease is not known to occur. Although Brassica campestris cv. Tobin is the major canola cultivar grown in the region, approximately 10–15% of the acreage is B. napus cv. Westar. Westar seed is imported so these fields were given priority during the surveys.

In mid–September, 1988, a disease survey was carried out on canola fields after swathing in the Peace River region of B.C. Surveying was done by walking into each field along an inverted V transect and stopping five times at 30 m intervals to examine ten plants. A total of 50 stems per field were examined for blackleg lesions and roots were rated for root rot caused by Rhizoctonia solani. Two hundred fields totalling 16,000 ha were surveyed out of 48,000 ha of canola grown that year. The number of fields surveyed represents one field per 240 ha of canola grown in the region.

In 1989, the survey was carried out in mid–July during blossoming to the early ripening stage. Fields were surveyed by examining plants along short transects in the field and along the field margins. Just over one hundred fields totalling 8,000 ha were surveyed out of 40,000 ha grown in 1989. The number of fields surveyed represents one field per 400 ha of canola. In addition, two fields totalling 40 ha of B. napus cv. Global were surveyed in the Chilliwack area of south coastal British Columbia.

Canola stems with lesions resembling blackleg were collected during both surveys and diagnosed at the provincial plant diagnostic clinic in Cloverdale. A total of 126 canola stem samples were collected for diagnosis in 1988 and 42 samples in 1989. Samples were incubated and examined under the microscope and tissue isolated onto selective media according to McGee and Petrie (1). Virulence determinations of L. maculans isolates were made by Dr. G.A. Petrie in 1988 and by researchers at the Agriculture Canada Research Station, Vancouver in 1989.

RESULTS AND COMMENTS: Eight L. maculans isolates from the 1988 survey were identified as G.S. Pound's weekly virulent Puget Sound strain by Dr. G.A. Petrie. No strongly virulent blackleg was found in 1988. Only two suspect isolates from the 1989 survey require further testing.

Root rot (Rhizoctonia solani) occurred in all of the fields surveyed in 1988. Average disease ratings ranged from a trace to severe.

An important disease noted during the 1989 survey was sclerotinia stem rot (Sclerotinia sclerotiorum) which occurred in 33% of the fields surveyed. Low levels of white rust (staghead), (Albugo candida), black spot (Alternaria spp.) and downy mildew (Peronospora parasitica) were also recorded. Slight hail injury and stem cracking from moisture fluctuations were also reported.

1. McGee, D.C. and G.A. Petrie. 1978. Variability of Leptosphaeria maculans in relation to blackleg of oilseed rape. Phytopathology 68: 625–630.

Crop/Culture:

Canola

Location/Emplacement:

Alberta

Title/Titre:

BLACKLEG OF CANOLA SURVEY IN ALBERTA - 1989

Name and Agency/ Nom et Organisation:

EVANS, I.R., Plant Industry Division, Alberta Agriculture, Edmonton, Alberta; KHARBANDA, P.D., Alberta Environmental Centre, Vegreville, Alberta; HARRISON, L., Regional Crop Laboratory, Alberta Agriculture, Fairview, Alberta; KAMINSKI, D., Alberta Special Crops and Horticultural Research Center, Brooks, Alberta.

A province-wide survey for virulent blackleg (Leptosphaeria maculans) of canola was carried out in July and August with the co-operation of provincial/municipal fieldmen and Agriculture Canada seed inspectors and assistance from plant pathologists at Brooks, Fairview, and Vegreville in confirming the virulent nature of the pathogen.

METHODS:

The survey was based on inspecting a minimum of one commercial field for every 2,000 ha of canola in Alberta. Field sites were randomly preselected from a computor-based list. If canola was not being grown on the selected site then the nearest canola field to that site was surveyed. The number of fields surveyed in each municipality was determined by the acreage of canola. Each field was sampled by walking along the path of an inverted W, starting 100 paces from the edge of the field and examining plants at 5 stops about 100 paces apart. At each stop, ten plants were examined visually and those suspected to be infected with blackleg were counted and collected for laboratory testing. The presence of the virulent form of blackleg was confirmed by cultural methods(2).

RESULTS:

The results are summarized in the Table. Infested fields were found primarily in east-central Alberta, census divisions 7 and 10(1) in the survey of commercial fields. There were an additional 12 municipalities (198 fields) in and around this region in which no blackleg was found. Blackleg was absent from all 505 fields surveyed in the remaining census divisions. In addition to the survey of commercial fields, all 626 pedigree seed fields and 14 Grow With Canola research plots were checked during routine inspections and blackleg was found in only one pedigree seed field in census division 10. Province-wide the average field infestation level, for the 1.12 million ha of canola, is close to 2.5%.

COMMENTS:

The environment was conducive to blackleg development throughout the summer. Disease incidence, however, was much lower in **1989** than **1988,** although the disease was found at several new locations in **1989,** including the Counties of Beaver and Smoky Lake, and the Municipal District (M.D.) of Bonnyville. The lower disease incidence was probably due to fewer farmers growing canola on canola stubble and a **15%** decline in acreage. Furthermore, since the survey was conducted from mid-July to early August, as opposed to after swathing i.n **1988,** full expression of the disease symptoms may not have occurred in certain fields. Apart from the fields sampled randomly, as described above, another **43** canola fields were confirmed as positive for virulent blackleg in **1989** primarily in census divisions **7** and 10 but isolated instances of infestations occurred in census division **4,** 8 and 12.

TABLE BLACKLEG OF CANOLA SURVEY IN ALBERTA - **1989**

Municipalities with Confirmed Virulent Blackleg of Canola

MUNICIPALITY	NUMBER OF FIELDS SURVEYED	NUMBER OF FIELDS WITH VIRULENT BLACKLEG
EAST CENTRAL ALBERTA		
Co. of Paintearth #18	18	**2**
Co. of Flagstaff **#29**	**30**	**2**
Co. of Beaver **#9**	**42**	**2**
Co. of Smoky Lake **#13**	**5**	**1**
Co. of Vermilion River **#24**	**22**	**6**
Co. **of** Minburn **#27**	**14**	**1**
M.D. of Provost **#52**	**19**	**4**
M.D. of Wainwright **#61**	**17**	**3**
M.D. **of** Bonnyville **#87**	6	1
TOTAL	**173**	**22**

REFERENCES:

1. Kharbanda, P.D., I.R. Evans, L. Harrison, S. Slopek, H.C Huang, D. Kaminksi, and J.P. Tewari, **1989.** Blackleg of Canola Survey in Alberta - **1988.** Can. Plant Dis. Surv. **69(1):55-57.**

2. McGee, D.C. and G.A. Petrie. **1978.** Variability of Leptosphaeria maculans in relation to blackleg of oilseed rape. Phytopathology **68:625-630.**

Crop/Culture: Rapeseed/Canola

Location/Emplacement: Alberta

Name and Agency/ Nomet Organisation:
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Title/Titre: CANOLA DISEASE SURVEY IN THE PEACE RIVER REGION IN 1989

METHODS: A survey of 48 rapeseed/canola fields was conducted in July and August, 1989 in the Peace River region of Alberta. The total area of canola production in 1989 was approximately 365,000 hectares. The diseases reported in this survey were the same as in 1988 and include root rot, foot rot, sclerotinia stem rot, black spot and blackleg.

Fields were sampled by walking into each one in a W pattern and collecting the first plants at a site 100 paces from the edge of the field. Ten plants were selected at random at each of five sites along the W pattern for a total of 50 plants per field. Disease incidence was recorded on every plant. Root rot ratings were recorded using a 0–4 scale, where 0 = no lesions on taproot, 1 = light brown lesions on taproot but no girdling, 2 = coalesced brown lesions on taproot but no girdling, 3 = dark brown lesions girdling taproot above main laterals (wirestem appearance), 4 = severe necrotic lesions on taproot, roots rotted off and plant dead.

RESULTS AND COMMENTS: The results are given in Table 1.

The root rot complex was, as in previous years, the most prevalent disease affecting 100% of the fields surveyed with 47.6% of the plants infected (Table 1). Disease incidence was lower than in 1988 when 99.1% of plants were infected. Disease severity was also lower in 1989 with a mean root rot rating of 1.1 compared to 2.4 in 1988. Prevalence of sclerotinia stem rot increased over 1988 with 48% of fields infested compared to 35% in 1988. The mean number of plants infected was 20.5% compared to 5% in 1988. Prevalence of black spot and foot rot was lower with 85% and 52% respectively.

Table 1. Prevalence and incidence of root rot, foot rot, sclerotinia stem rot, blackleg and black spot of canola in the Peace River region in 1989.

Disease	Prevalence (% fields infested)	Incidence (% plants infected)
Root Rot (Rhizoctonia, Pythium, Fusarium)	100	47.6
Black Spot (Alternaria spp.)	85	24.9
Foot Rot (Rhizoctonia, Fusarium)	52	4.6
Sclerotinia (Sclerotinia sclerotiorum)	48	20.5
Avirulent Blackleg (Leptosphaeria maculans)	17	1.6

Crop / Culture: Canola

Location/ Emplacement: Central Alberta

Name and Agency / Nom et Organisation: K.L. Conn and J.P. Tewari
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Title / Titre: SURVEY OF ALTERNARIA BLACKSPOT AND SCLEROTINIA STEM ROT IN CENTRAL ALBERTA IN 1989

METHODS: Fifty-seven randomly selected fields were surveyed in central Alberta during the middle of August, 1989. Two locations within each field, away from the edge or corners, were assessed visually for disease severity and the average recorded. For assessment of alternaria blackspot, percent areas of siliqua covered with lesions were determined. For assessment of sclerotinia stem rot, the percentage of stems with symptoms was determined. Fields with less than 1% sclerotinia stem rot were categorized as having trace levels.

RESULTS AND COMMENTS: Every field surveyed had alternaria blackspot. Percent areas of siliqua covered with lesions ranged from 1 to 50% (Fig. 1). The average for the 9 fields of Brassica napus in the survey was 5% and for the 48 fields of B. campestris it was 22%. This supports the findings that B. *napus* is less susceptible to Alternaria brassicae than B. campestris (Skoropad and Tewari, 1977; Conn and Tewari, 1989). The level of blackspot depended partly on how early the crop was planted. Fields that were more mature at the time of survey had less disease. Every field surveyed had sclerotinia stem rot. The percentage of stems infected ranged from trace to 95% (Fig. 2). If the trace levels are set to 0%, then the average for the 9 fields of B. napus was 3.4% and for the 48 fields of B. campestris it was 13.6%. Thus, the average levels of both diseases in fields of B. campestris were about 4 times those in the fields of B. *napus*.

Yield data were obtained from 3 fields in the Innisfail area that had been rated for the 2 diseases (Table 1). Yield data were obtained from 5 fields in the Barrhead area in which disease had not been rated (Table 1). Yields in the Barrhead fields were only about 52% of the farmers' expectations with an average of 19% dockage (Table 1). Yields in the 3 Innisfail fields were only about 60% of the farmers' expectations with 11% dockage (Table 1). In 1988 these same Innisfail farmers obtained 1970–2250 kg/ha, with 4% dockage. The crops in 1989 looked better than those in 1988 but yielded less. The levels of alternaria blackspot and sclerotinia stem rot in the Innisfail area were lower in 1988. This indicates that these diseases were likely the principal cause of yield loss in 1989. The relationship between level of disease and yield loss in the Innisfail fields shown in Table 1, indicates that a greater portion of yield loss may have been due to blackspot rather than to sclerotinia stem rot, since an increase of sclerotinia stem rot from 10 to 30% did not appreciably affect yield. However, the timing of infection with Sclerotinia in the different fields is not known and may have affected yield. The field near Edmonton that had 95% sclerotinia stem rot (Fig. 2) had practically 100% yield lass and must have been infected early. There were also reports of some farmers in the Sylvan Lake and Rimbey areas suffering practically 100% yield losses when they had expected good yields. The levels of the 2 diseases in these specific fields are, however, not known. The severity of blackspot was also evidenced by the fact that seeds of some siliqua were colonized by A. brassicae. The wet weather in August may have allowed A. brassicae to grow inside siliqua and led to higher dockage since many seeds were shrivelled. The diseases caused yield losses indirectly as well. Some of the fields surveyed had hail damage. Damage due to hail was greater in fields with higher levels of disease because diseased plants were more mature and siliqua shattered easily. Also, since diseased siliqua shattered more easily, there would have been greater seed losses during swathing and combining. Thus, alternaria blackspot caused significant yield losses and was the most economically important disease of canola in central Alberta this year. Sclerotinia stem rot did not appear to have caused significant yield losses in most of the fields in this survey. If weather conditions are favorable for these diseases next year, yield losses may be much more severe because of the large amounts of inocula present.

During this survey the presence or absence of some other diseases was also noted. Gray stem was the next most common disease with about 30% of the fields infected. Staghead and aster yellows were observed in only 2 fields. In the previous year these 2 diseases had been relatively more common. No symptoms of blackleg were observed in this survey.

ACKNOWLEDGEMENT: This survey was financed by a grant from the Natural Sciences and Engineering Research Council of Canada. We thank Mr. J. Soldan, District Agriculturist, Alberta Agriculture, Barrhead, Alberta, for providing yield data from his area.

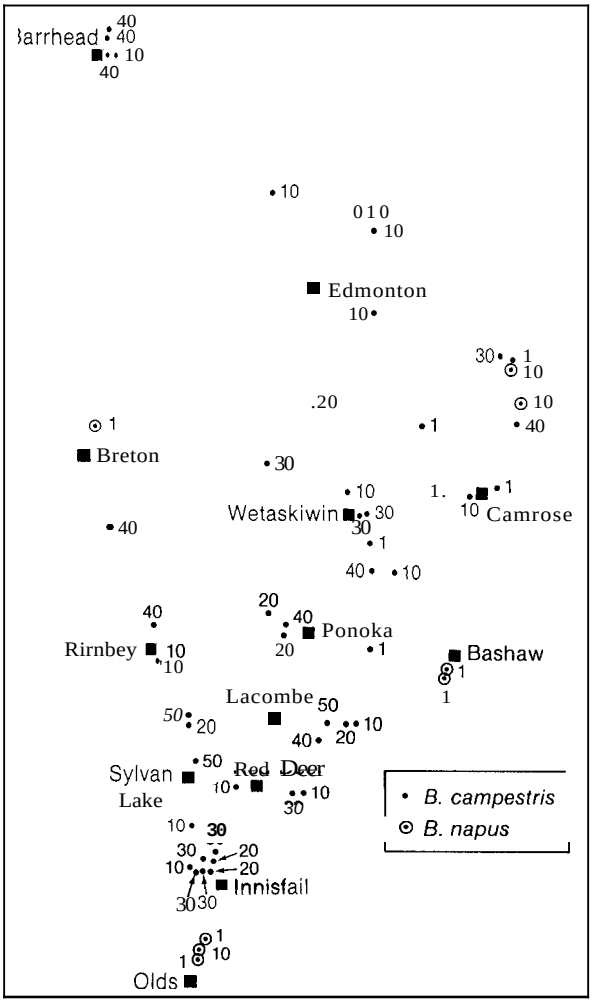

Figure 1. Locations of fields surveyed for alternaria blackspot in 1989. The numbers represent percent areas of siliqua covered with lesions.

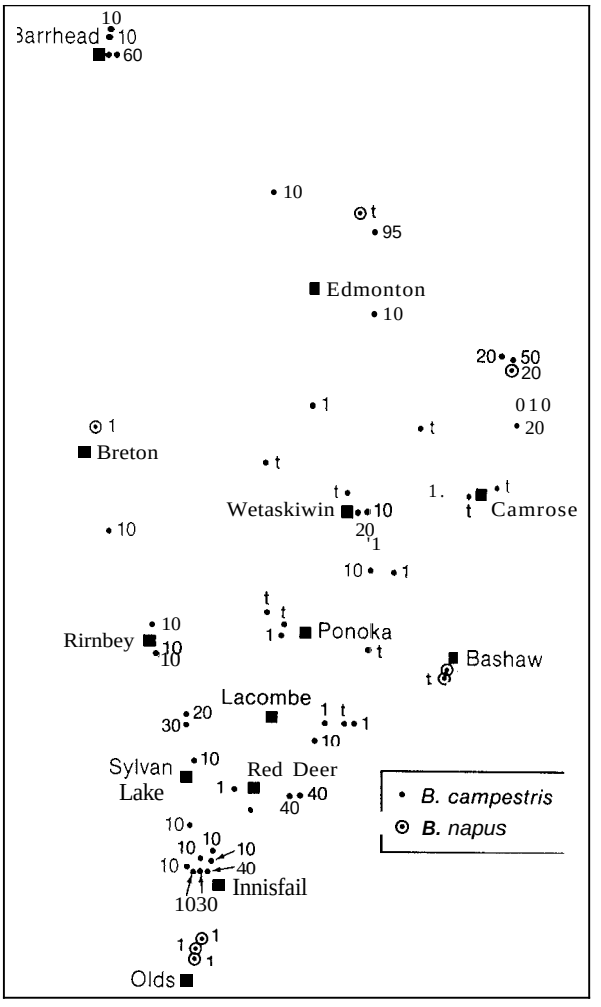

Figure 2. Locations of fields surveyed for sclerotinia stem rot in 1989. The numbers represent percent of stems with symptoms. Fields with less than 1% were categorized as having trace (t) levels.

Table 1. Levels of diseases and yields in canola (B. campestris) fields in central Alberta in 1989.

area	Alternaria blackspot(%)	Sclerotinia stem rot(%)	expected yield (kg/ha)	actual yield (kg/ha)	dockage (%)
Innisfail	30	30	2250	1240	11
Innisfail	30	10	2250	1400	11
Innisfail	30	10	2250	1400	11
Barrhead	*	*	1400	960	24
Barrhead	*	*	1690	1070	20
Barrhead	*	*	2250	1070	18
Barrhead	*	*	2250	960	24
Barrhead	*	*	1970	900	30

* Levels of diseases were not determined in these fields.

REFERENCES: Conn, K.L. and J.P. Tewari 1989. Interactions of Alternaria brassicae conidia with leaf epicuticular wax of canola. Mycol. Res. 93:240-242.

Skoropad, W.P. and J.P. Tewari 1977. Field evaluation of the role of epicuticular wax in rapeseed and mustard in resistance to alternaria blackspot. Can. J. Plant Sci. 57:1001-1003.

Crop / Culture: Canola

Location / Emplacement: Saskatchewan

Title / Titre: CANOLA DISEASES IN N.E. SASKATCHEWAN, 1989

Name and Agency / Nom et Organisation:

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METHODS: Fifty canola fields were surveyed between August 8 and 18, 1989 in crop districts 5b, 8a, 8b and 9a. Fields surveyed were selected at random in each crop district, and samples were collected by walking diagonally into the field and selecting one plant every 10 paces until a total of 10 plants had been sampled. Diseases were assessed according to the visual symptoms on each plant. Root rot readings were based on a scale where 0 = healthy, 2 = trace, 5 = moderate and 10 = severe, according to lesions found on the roots. All other diseases were recorded as the estimated percentage of leaf or stem area affected. Results for each disease were averaged over the number of samples and fields surveyed to give the disease index. Numbers of fields affected over the total number of fields surveyed by 100 gave the percentage of fields affected.

RESULTS AND COMMENTS: The severity and prevalence of diseases of canola in the areas surveyed are shown in Table 1. Disease severity was lower in 1989 than in 1988 and 1987 when surveys were also carried out in the same crop districts. However, except for blackleg, diseases occurred in a greater percentage of the fields in 1989. Blackleg occurred in only 44% of the fields in 1989 compared to 70% and 100% in 1987 and 1988, respectively. Adequate moisture in the spring of 1989 allowed good germination, but hot, dry and windy weather beginning in mid-July probably suppressed disease development, resulting in low disease levels. The fact that a majority of the diseases were more widespread than in previous surveys may mean more severe disease problems in the future if conditions are favorable.

Table 1. Severity and prevalence of canola diseases in 1989.

Crop district	No. fields	Disease index/% fields affected				
		Blackleg	Blackspot	Stem rot	White rust	Root rot
5b	12	1.3/75	0.7/92	0.1/17	0/0	0.2/17
8a	9	0/0	1.7/100	0.1/11	0.1111	0.1/11
8b	17	0/0	0.5182	0.116	0.2/30	<0.1/12
9a	12	0.9/100	2.1/92	1.0/58	<0. 1/42	<0.1/8
Total or average	50	0.6/44	1.3/92	0.3/23	<0.1/21	<0.1/12

Blackleg (Leptosphaeria maculans), Blackspot (Alternaria spp.), Stem rot (Sclerotinia sclerotiorum), White rust (Albugo candida), Root rot (Rhizoctonia solani & Fusarium spp.).

Crop / Culture: Canola

Location / Emplacement: Saskatchewan

Name and Agency / Nomet Organisation:
G. D. JESPERSON
Saskatchewan Agriculture and Food
Soils and Crops Branch
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Title / Titre: SURVEY OF BLACKLEG AND SCLEROTINIA IN SASKATCHEWAN CANOLA CROPS, 1989

METHODS: Two hundred and fifty-five canola fields were surveyed after swathing during the period August to October, 1989. The majority were sampled by extension agrologists or regional soils and crops specialists according to instructions provided to them. Twenty-five stem bases per field were collected by pulling up 5 plants every 25 paces while walking a diagonal from the edge of the field. All samples were mailed to a central location for disease assessment. Isolations were made for the determination of blackleg virulence according to the method of McGee & Petrie (1978) for samples originating from areas without a history of virulent blackleg. A severity index was established for each field by averaging severity ratings which were made on a scale of 0 to 3, where 0 = no disease, 1 = small lesion covering 1/4 stem circumference or less, 2 = lesion covering greater than 1/4 stem circumference but not completely girdling stem, and 3 = lesion completely girdling stem.

RESULTS AND COMMENTS: Results broken down by crop district are shown in the table. The majority of extension agrologists in the canola growing region of Saskatchewan participated in the survey. Some samples were also received from traditionally non-canola growing areas in south east and south west Saskatchewan. While some crop districts were more heavily sampled than others, the numbers generally reflect the amount of canola grown in an area.

Blackleg (Leptosphaeria maculans) was found in 92% of fields surveyed. The mean percentage of infected plants per field was 52% for all fields or 56% for fields where blackleg was detected. Blackleg was most damaging in crop district 5b followed closely by 8b, 6a and 9a. Incidence of blackleg was found to be higher than reported in the past. A previous Saskatchewan Agriculture survey (Jesperson, 1989) conducted in 1986 found virulent blackleg in 65% of fields at a mean percentage of 29% infected plants per field for all fields or 45.5% for fields where blackleg was detected. Results indicate that blackleg has continued to spread across Saskatchewan.

Sclerotinia stem rot (Sclerotinia sclerotiorum) was found in 13% of fields surveyed at a mean incidence of 2% of plants per field. In infested fields only, mean incidence was 14%. Incidence was highest in crop district 9b, followed by 1a and 8a. Damage due to sclerotinia appeared to be limited by dry weather over much of the province.

REFERENCES:

1. McGee, D.C. and Petrie, G.A. 1978. Variability of Leptosphaeria maculans in relation to blackleg of oilseed rape. Phytopathology 68:625-630.

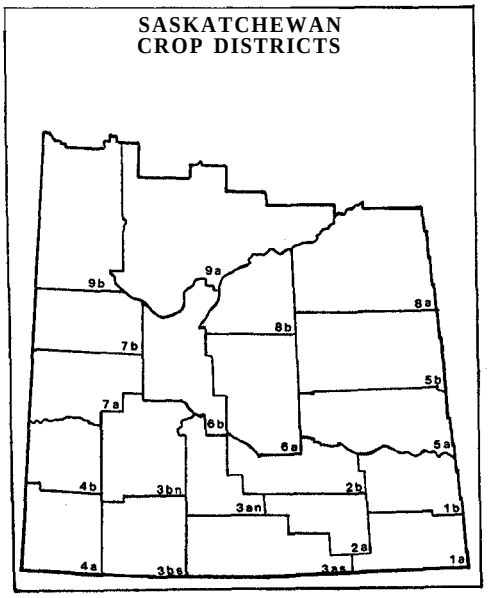
2. Jesperson, G.D. 1989. Survey of blackleg, sclerotinia and footrot in Saskatchewan canola crops, 1986. Canadian Plant Disease Survey 69(1):60-61.

Table. Incidence of blackleg and sclerotinia of canola in Saskatchewan, 1989

Crop District	Number of Fields Surveyed	BLACKLEG			SCLEROTINIA	
		% Fields Affected	Mean % Incidence	Mean Severity Index*	% Fields Affected	Mean % Incidence
1a	8	25	2	0.1	38	5
1b	10	40	21	0.4	0	0
2b	4	75	20	0.3	0	0
3 + 4	6	00	23	0.3	17	1
5a	24	00	42	0.9	0	0
5b	29	00	79	1.9	0	0
6a	30	00	65	1.4	0	0
6b	17	82	40	0.9	18	1
7	13	85	38	0.9	15	1
8a	30	87	39	0.8	33	3
8b	25	100	67	1.7	4	0.2
9a	34	91	60	1.4	24	2
9b	25	100	52	1.0	36	10
Total or Average	255	92	52	1.1	13	2

* Severity index scale = 0 to 3

Figure 1. Saskatchewan crop districts and subdistricts



Crop / Culture: Canola

Location/ Emplacement: Manitoba

Title / Titre: DISTRIBUTION, PREVALENCE AND INCIDENCE OF CANOLA DISEASES IN 1989

Name and Agency / Nom et Organisation:
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Winnipeg, Manitoba and
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Manitoba Agriculture

METHODS: Two surveys were conducted in southern Manitoba during the third week in August. During the first survey, 62 fields of Brassica napus and 9 fields of B. rapa (synonym: B. campestris) were surveyed. The presence of various diseases was noted in each field. For each field disease incidence was determined on a sample of 60 plants. Plants with disease symptoms were taken from 42 fields. Pieces of the stem, stem base and tap root were plated on V8-juice agar containing rose bengal and streptomycin (McGee and Petrie 1978). Developing fungal colonies were identified.

A second survey was conducted in the Dauphin area in which 32 fields of B. napus were inspected. The presence of various diseases was noted in each field. Disease incidence was determined on a sample of 40 plants in each field. In addition, results are included from samples that were received by the plant pathology lab of Manitoba Agriculture from four fields near Winnipeg.

Results: Blackleg, caused by Leptosphaeria maculans, was found in 66 of the 107 fields (Fig. 1). Fields with blackleg infection were distributed over the entire arowina area. Blackleg was more prevalent in crop districts 3, 4, and 6 than in other districts: Symptoms were variable and ranged from the typical stem canker to a foot rot without pycnidia. In addition, stems with large grey lesions, caused by L. maculans, were observed in 23 fields.

Pieces of the stem, stem base and root were incubated on V8-juice agar. Colonies of L. maculans, Rhizoctonia solani and Fusarium spp. were obtained. Pieces of the stem base and tap root from the same plant often yielded colonies of more than one pathogen. Pieces with grey stem lesions yielded only colonies of L. maculans. Based on pycnidia and pigment production on agar, strains of L. maculans can be differentiated into aggressive and non-aggressive (McGee and Petrie 1978). Cultural characteristics of the colonies obtained indicated that aggressive strains were present in all infested fields and that several fields were infested by a combination of aggressive and non-aggressive strains.

Foot rot and root rot, caused by Fusarium spp. and R. solani, were observed in 42 fields (Fig. 1). Fields were distributed over the entire province. Prevalence was higher in crops districts 3, 4 and 8 than in other districts. As plants were often colonized by more than one pathogen, it was impossible to determine the incidence of blackleg and foot rot/root rot separately. When the incidence for blackleg and foot rot/root rot are combined, up to 30% of the plants were infected in crop districts 2, 5, 7, 8 and 12, and up to 80% of the plants in districts 3, 4, and 6.

Sclerotinia stem rot, caused by Sclerotinia sclerotiorum, was observed in 21 fields (Fig. 2). Most affected fields were located in crop districts 5 and 6. Incidence ranged from 2 to 33% in both districts.

Blackspot, caused by Alternaria spp., was observed in 14 fields (Fig. 2). Affected fields were mainly located in crop districts 5 and 6. In the affected fields most plants were diseased but severity was low. Blackening of the swath, caused by Alternaria spp., was observed in several fields in crop districts 5 and 6. A trace of aster yellows was observed in 4 fields (Fig. 2). These fields were mainly located in crop district 5.

Heat and moisture stress were a serious problem in 1989 as they were in 1988. The most severely affected area was crop district 1, where significant yield reductions due to environmental stress were observed.

REFERENCE: McGee, D.D., and G.A. Petrie. 1978. Variability of L. maculans in relation to blackleg of oilseed rape. Phytopathology 68: 625-630.

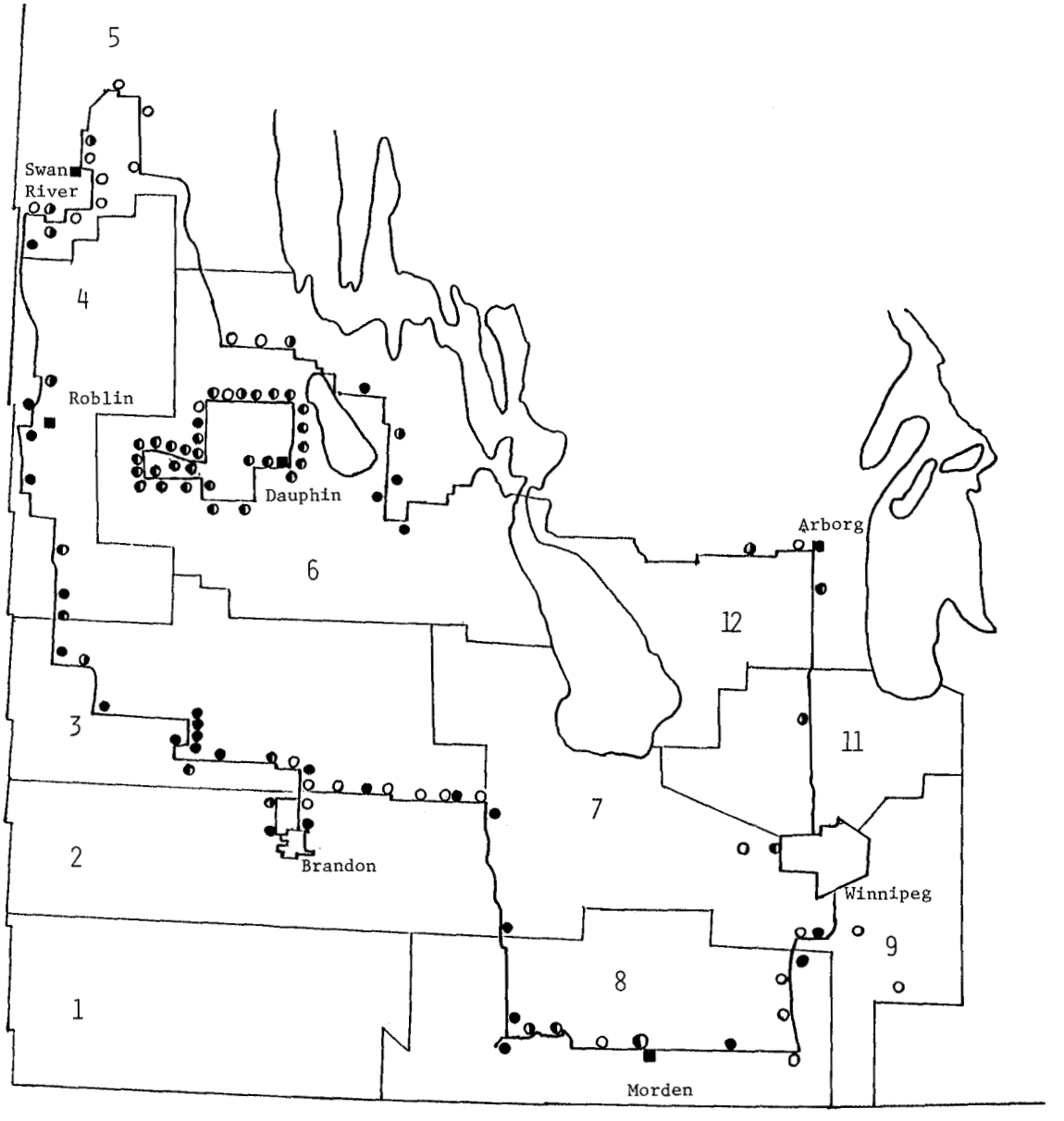

Fig. 1. Distribution of the fields for the canola survey in Manitoba in 1989. Symbols indicate the presence of diseases: ◐ :blackleg; ◑ :footrot/root rot; ● :both blackleg and foot rot/root rot. Numbers indicate Manitoba Crop Districts.

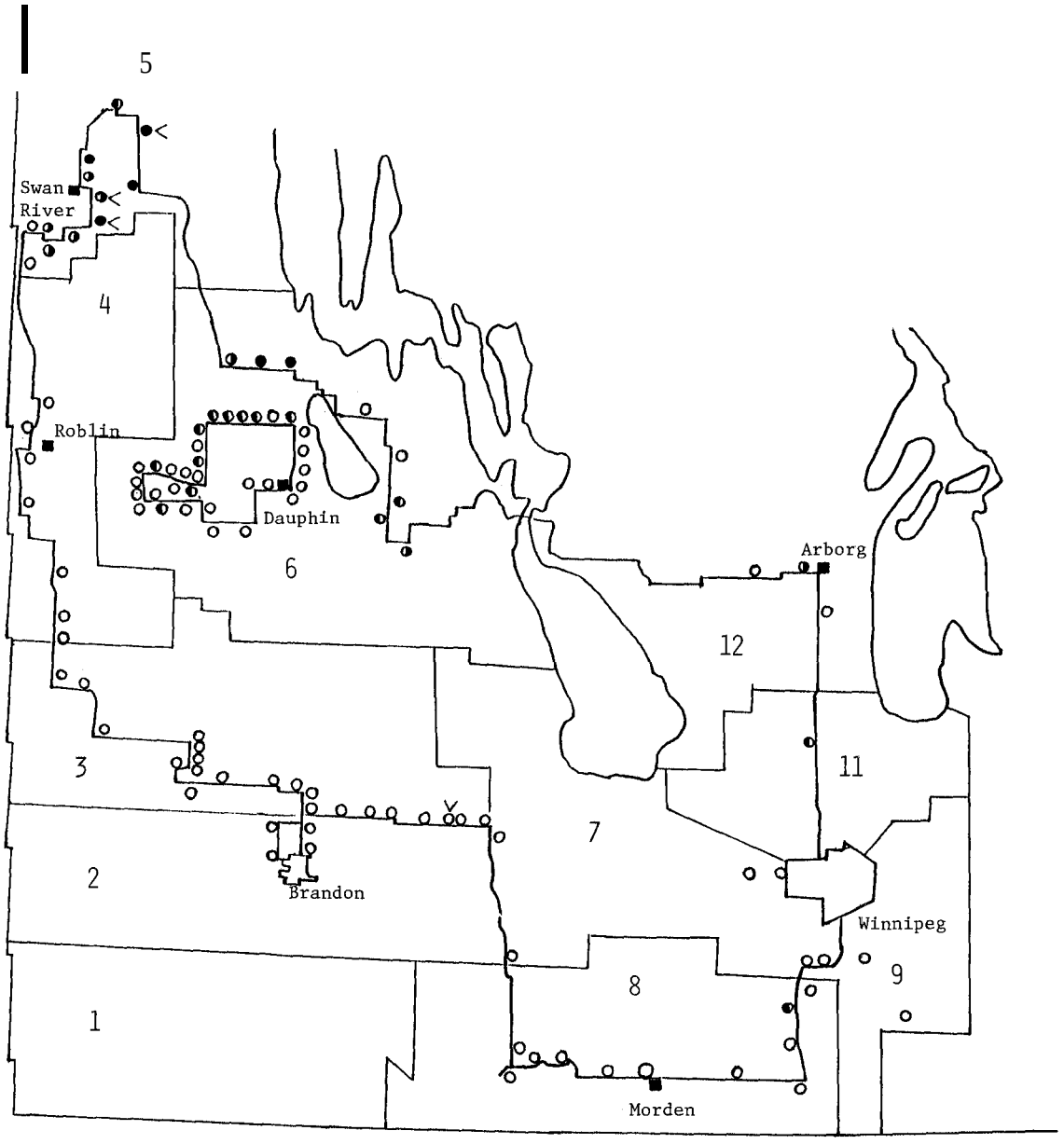

Fig. 2. Distribution of the fields for the canola survey in Manitoba in 1989. Symbols indicate the presence of diseases: ■ :Sclerotinia stem rot; ◑ :blackspot; ● :both Sclerotinia stem rot and blackspot; >:aster yellows. Numbers indicate Manitoba Crop Districts.

Crop/Culture: Rapeseed/Canola

Location/Emplacement: Southwestern Ontario

Name and Agency/ Nom et Organisation:
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Title/Titre: SURVEY FOR SCLEROTINIA STEM ROT OF WINTER AND SPRING RAPESEED/CANOLA IN SOUTHWESTERN ONTARIO IN 1988 AND 1989.

METHODS: A disease survey was conducted in 1988 and 1989 to determine the prevalence of sclerotinia stem rot (Sclerotinia sclerotiorum) of rapeseed/canola (Brassica campestris, B. napus) in southwestern Ontario. Individual fields were sampled by assessing 100 plants for disease symptoms at each of eight locations along a diamond-shaped sampling pattern within each field. Each side of the sampling pattern was 100 m long and samples were taken every 50 m. All fields were assessed within two weehs of harvest.

RESULTS AND COMMENTS: Results of the disease surveys are summarized in Table 1. Sclerotinia stem rot was not observed in any of the winter or spring rapeseed/canola fields observed in southwestern Ontario in 1988. In 1989, sclerotinia stem rot was present in all of the winter rapeseed/canola fields (100%) examined and in 16 of 25 spring rapeseed/canola fields (64%). Disease incidence within the winter and spring crops averaged 22.6 and 1.7%, respectively. Environmental conditions during 1988 were relatively hot and dry during much of the growing season and few apothecia were observed in the survey fields during crop flowering. In 1989, environmental conditions were cool and wet during much of the flowering period of the winter crops but were warmer and dryer during the flowering period of the spring crops. Apothecia were commonly observed during the flowering period of many of the winter crops but were less commonly observed during the flowering period of the spring crops.

Table 1. Prevalence and incidence of sclerotinia stem rot of winter and spring rapeseed/canola in southwestern Ontario in 1988 and 1989.

YEAR	CROP	NUMBER OF FIELDS		PERCENTAGE OF DISEASED PLANTS	
		Evaluated	Diseased	Mean	Range
1988	Winter	35	0	---	---
	Spring	35	0	---	---
1989	Winter	25	25	22.6	0.6 - 76.6
	Spring	25	16	1.7	0 - 8.0

Crop / Culture: Flax

Location/ Emplacement: Saskatchewan

Title / Titre: FLAX DISEASES IN N.E. SASKATCHEWAN, 1989

Name and Agency Nomet Organisation:

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METHODS: Thirty-nine flax fields were surveyed between August 9 and 21, 1989 in crop districts 5b, 8a, 8b, and 9a. Fields surveyed were selected at random in each crop district and sampled by collecting one plant every ten paces until a total of 10 plants had been collected in each field. Diseases were identified by visual symptoms and the severity of each disease recorded as the estimated leaf, stem or root area affected. Results for each disease were averaged over the total number of samples and fields surveyed to give the disease index. Number of fields affected over total number of fields surveyed by 100 gave the percentage of fields affected.

RESULTS AND COMMENTS: Extremely low levels of disease were found in 1989 (Table 1). Pasmo (Septoria linicola) had an average disease index of less than 0.3 and occurred in 77% of the fields surveyed. Root rot (several fungi) had an even lower disease index than pasmo, and was found in only 48% of the surveyed fields. No other leaf, stem or root diseases were encountered during this survey.

Table 1. Severity and incidence of flax diseases, 1989

Crop district	No. fields	Disease index/% fields affected	
		Root rot	Pasmo
5b	8	0.1/50	0.1/75
8a	9	0.2/56	0.3/89
8b	13	0.4162	0.3/69
9a	9	0.1/22	0.3/78
Total or average	39	0.2/48	0.3/77

Crop / Culture: Flax

Location/ Emplacement: Manitoba

Title / Titre: SURVEY OF FLAX DISEASES IN MANITOBA IN 1989

Name and Agency / Nom et Organisation:

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Methods: A total of 57 flax fields were surveyed south of Highway No. 1 in southern Manitoba in 1989. Twenty-seven fields were surveyed on July 24, 22 fields on August 2 and 8 fields on August 22. Fields were selected at random and each field was sampled by two persons walking 100 m in opposite directions inside the field following an inverted V pattern. Diseases were identified by symptoms and the prevalence and incidence of each disease were recorded. In addition 19 samples of flax submitted to the Manitoba Agriculture Plant Pathology Laboratory by agricultural representatives and growers were analysed.

Results: The flax crop in southern Manitoba had a good but slow start in 1989 with good emergence. The stand was very good in most of the fields surveyed and few fields were fair to poor. The incidence of heat canker was very low in comparison with high levels in 1988. The crop vigour ranged from good to poor depending on the moisture level, which was generally below normal in southern Manitoba. Fusarium wilt (Fusarium oxysporum f. sp. lini) was observed only in one field and at less than 1%. Aster yellows (Mycoplasma like organism) was also observed at less than 1% in one field. Pasmo (Septoria linicola) was observed in 4 fields at levels of trace to 1% towards the end of the season. Rust (Melampsora lini) was not encountered in any of the 57 fields surveyed nor on the 30 rust differential lines planted at Morden and Portage la Prairie. However, it is important to note that moderate to high levels of aphid infestation were observed in 56% of the fields surveyed and must have contributed to a reduction in flax yield. Of the 19 samples submitted to the Manitoba Agriculture Plant Pathology Laboratory, 2 showed seedling blight (Rhizoctonia solani, Fusarium spp.), 2 pasmo (Septoria linicola), 1 Fusarium wilt (Fusarium oxysporum f. sp. lini) and 10 environmental stress from low soil moisture and high temperatures. In addition, 4 samples showed herbicide drift injury.

Crop / Culture: American Ginseng
Panax quinquefolium

Location/ Emplacement: British Columbia

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Title / Titre: GINSENG DISEASES IN BRITISH COLUMBIA FROM 1987 - 1989

The first B.C. ginseng planting was established in 1981 at Lytton. Since then, small plantings ranging in size from 0.2 - 1 ha have been established throughout the Okanagan - Kootenay and Thompson - Cariboo regions of B.C. (Figure 1). The total ginseng acreage in B.C. is now estimated at 120 ha worth over $38 million. Ginseng growers have been concerned about diseases that could decrease crop yield and quality. A common disease first diagnosed in commercial ginseng plantings in 1987 was damping off (Rhizoctonia, Fusarium). This was followed by an isolated incidence of alternaria leaf and stem blight (Alternaria panax) in the Kootenays and phytophthora root rot (Phytophthora cactorum) in the Okanagan. Another problem was interveinal chlorosis due to zinc deficiency in the Okanagan and Lytton ginseng plantings.

Since 1987, the number of ginseng samples submitted to the provincial plant diagnostic clinic at Cloverdale has steadily increased (Table 1.) Alternaria leaf and stem blight, phytophthora root rot and damping off due to Rhizoctonia and Fusarium are the three most common ginseng diseases. Sclerotinia white mold was also identified in a Kamloops ginseng planting.

Non-pathogenic disorders of ginseng include phytotoxicity, winter injury, rusty root, sun scorch, paper leaf and nutrient deficiencies. The most widespread disorder in 1989 was severe phytotoxicity from mancozeb sprays. Damage resulted when ginseng seedlings were sprayed during hot weather with mancozeb at the full label rate. Ginseng seedlings became stunted and distorted with distinct red ring spots and necrotic blotches on the leaves. We expect that the plants will recover from the spray injury. Winter injury occurred in plantings in Kamloops and Winfield. Heavy rains followed by freezing temperatures led to brown, decayed ginseng roots in Winfield. The problem in Winfield was compounded by poor soil drainage. Rusty root characterized by dark, red-brown root lesions may have been due to an insect maggot feeding on roots at a Lillooet site. Sun scorch showed up as distinct white spots and blotches on ginseng leaves left exposed to direct sunlight when side panels for shading were omitted. Drought stress differs from sun scorch by the papery, light brown lesions (paper leaf) that form at leaf margins and tips. In certain areas ginseng plants developed interveinal chlorosis of the leaves due to zinc or magnesium deficiency.

TABLE 1: Ginseng Diseases in B.C. from 1987 - 1989

	Number of Ginseng Samples Diagnosed				
	Alternaria	Fusarium	Phytophthora	Rhizoctonia	Sclerotinia
OKANAGAN - KOOTENAY REGION					
Armstrong	1				
Galloway	1				
Glade	1				
Kelowna	2		1		
Nelson			2		
Peachland	1				
Vernon	1		3	2	
Winfield	2		1		
THOMPSON - CARIBOO REGION					
Clearwater	1	1			
Kamloops	1				2
Lillooet/Lytton	2	2	1	1	

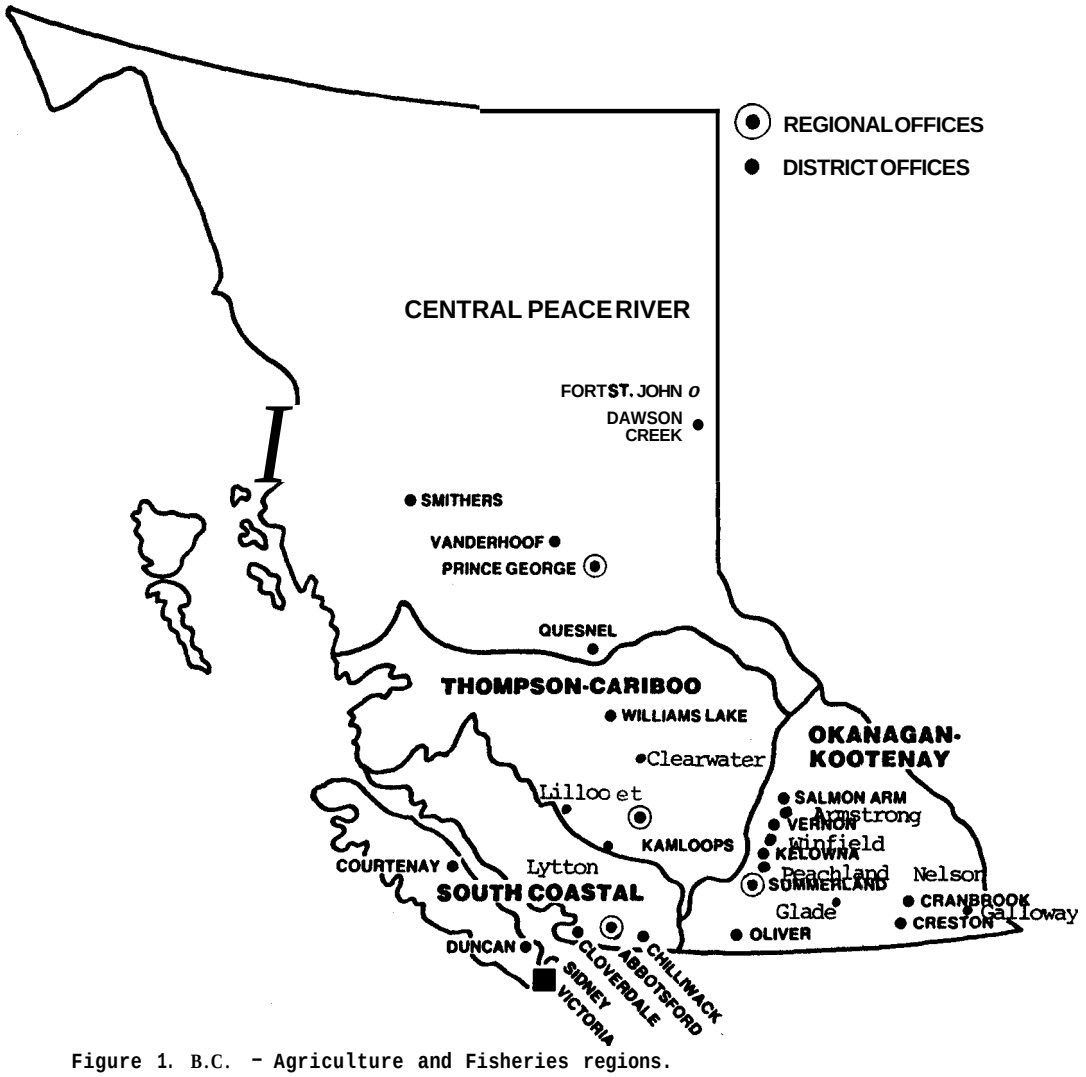

Figure 1. B.C. – Agriculture and Fisheries regions.

Crop / Culture: Lentil

Location/ Emplacement: Manitoba

Title / Titre: ANTHRACNOSE OF LENTIL IN MANITOBA IN 1989

Name and Agency / Nom et Organisation:

R.A.A. MORRALL[1], R.J. GIBSON[2] and C.C. BERNIER[2]
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METHOD: A new anthracnose disease of lentil caused by Colletotrichum truncatum was discovered in southern Manitoba in 1987. A survey during the 1988 season which was marked by drought and extreme heat, showed that the disease was present in all major areas of lentil production but mostly at low levels. Precipitation and temperature were more favourable for disease development in 1989 and a limited survey was conducted in two major areas of lentil production, namely the Rosenort/St. Jean area south of Winnipeg, and the Portage La Prairie area west of Winnipeg. During visits a semi-quantitative assessment of anthracnose was made by walking at least 100 m through the crop and rating disease severity as none, slight, moderate or severe.

RESULTS AND COMMENTS: In the Rosenort/St. Jean area the disease was detected in 12 out of 16 fields visited. The disease was slight in most crops, moderate in a few, and severe in one. The frequency of infested crops and the disease severity appeared to decline towards the southern Manitoba border near Emerson. In the Portage region 9 out of 10 crops surveyed were moderately to severely infested with anthracnose. In severely diseased crops, numerous lesions were present on stems, leaves and pods, and large areas with diseased plants were visible from a distance. The climatic conditions in the Portage area appeared to have favoured movement of the disease into the upper part of the canopy leading to the large areas of plant dieback. In the St. Jean area, lesions were restricted to the lower part of the canopy due to either late infection or to less favourable conditions. The high incidence and severity observed in 1989 in contrast to 1988 indicate clearly that anthracnose can build up rapidly even in fields where the crop was not sown on lentil stubble.

The effect of anthracnose on yield of lentil was determined in plot trials sown on lentil stubble at Portage. Disease was moderate in plots sprayed with the fungicide chlorothalonil and severe in non-sprayed plots. Seed yields of plots not sprayed with the fungicide were on the average 44% lower than the yields in plots sprayed several times. Based on plot results, yield reductions due to anthracnose in farm fields in the Portage area were estimated to range from 40 to 60%.

ACKNOWLEDGEMENTS: This work was supported by the Western Grains Research Foundation.

Crop / Culture: Field pea

Location/Emplacement: Northwestern Alberta

Title / Titre: ROOT ROT DISEASE COMPLEX SURVEY IN NORTHWESTERN ALBERTA IN 1989

Name and Agency / Nom et Organisation:

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METHODS: Twenty-eight pea fields in northwestern Alberta were surveyed in June of 1989 for root rot (Fig. 1). The plants in one-meter length rows were dug up at each of ten sites spaced equally along the arms of a W pattern in each field. All plants were stored in a cooler at 5°C. Roots were washed and the incidence and severity of root rot assessed. Severity ratings were assigned based on a scale of 0 to 4 where 0 = healthy, 1 = 1 - 10%, 2 = 11 - 25%, 3 = 26 - 50%, and 4 = 51 - 100% root discolored.

RESULTS AND COMMENTS: Peas with root rot were found in all fields surveyed. Mean disease incidence and severity of root rot were 26% and 0.37 (on a scale of 0 - 4), respectively (Table 1).

Table 1. Incidence and severity of root rot of pea in northwestern Alberta in 1989.

Location	No. of Fields	Incidence (%) Mean	Incidence (%) Range	Severity Mean	Severity Range
Barrhead	6	26	6-47	0.41	0.06-1.06
Morinville	9	28	11-52	0.37	0.12-0.66
Stony Plain	2	20	10-30	0.25	0.10-0.40
Thorhild	5	25	16-32	0.40	0.21-0.59
Westlock	6	31	15-42	0.42	0.16-0.55
Total/Average	28	26	-	0.37	-

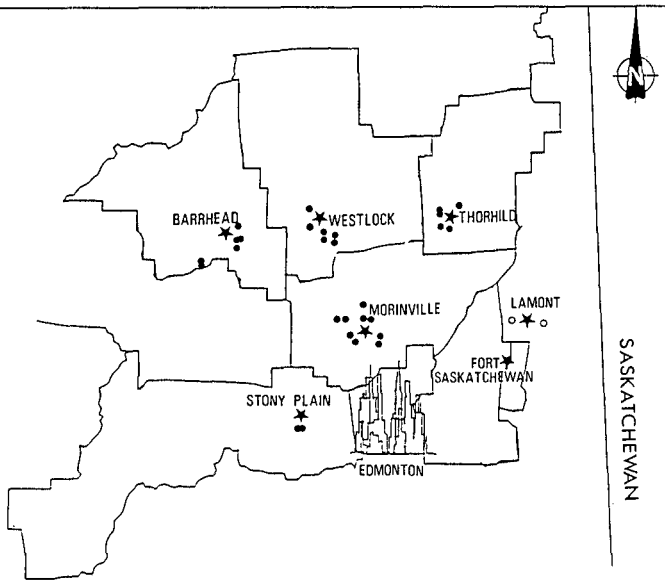

Fig. 1

Crop/Culture: Pea

Location/Emplacement: Saskatchewan

Title/Titre: PEA DISEASES IN N.E. SASKATCHEWAN, 1989

Name and Agency/ Nomet Organisation:

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METHODS: Eleven fields of pea were surveyed from August 11 to 18, 1989 in N.E. Saskatchewan. Fields surveyed were selected at random throughout the survey route and sampled by collecting one plant each ten paces, ten times in each field. Diseases were identified by the visual symptoms on the plant and the severity of each disease recorded as the estimated percentage of leaf or stem area affected. Root rot and foot rot severity were assessed on a scale where 0 = healthy, 2 = trace, 5 = moderate and 10 = severe. Results for each disease were averaged over total number of samples and fields surveyed to give the disease index. Number of fields affected over total number of fields surveyed by 100 gave the percentage of fields affected.

RESULTS AND COMMENTS: The reduction in the number of pea fields surveyed in 1989 compared with previous years was due to the lack of seeded acres. According to Statistics Canada seeded pea acreage in 1989 was about half of that seeded in both 1987 and 1988. Powdery mildew (*Erysiphe polygoni*) was the most serious disease this year (Table 1). Mycosphaerella blight (*Mycosphaerella pinodes*) was less severe but had a similar prevalence to the previous two years. Foot rot (*Ascochyta* sp.) was more severe and more widely distributed than in the two previous years. Levels of root rot (*Fusarium* sp.), ascochyta leaf spot (*Ascochyta pisi*) and downy mildew (*Peronospora viciae*) were comparable to those found in 1987 and 1988.

Table 1. Severity and prevalence of peas diseases in 1989

Disease	Severity*	Prevalence**
Powdery mildew	20.3	82
Mycosphaerella blight	6.3	91
Foot rot	2.9	91
Root rot	1.8	55
Ascochyta leaf spot	0.2	45
Downy mildew	<0.1	9

*Disease index
**%fields affected

Crop / Culture: Safflower

Location/Emplacement: Southern Alberta

Name and Agency/ Nom et Organisation:
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Title / Titre: SURVEY FOR SEEDLING BLIGHT OF SAFFLOWER

METHODS: From May 26 to June 20, 1989, 11 safflower fields in southern Alberta (Fig. 1) were surveyed for disease when crops were at the seedling stage or slightly older. The survey procedure consisted of walking through each field in a teardrop pattern and stopping at 200-pace intervals a total of 10 times. At each stop, plants within a 1 m^2 area were counted, carefully dug to preserve the roots intact, and bagged. Plants were washed, examined for disease symptoms, and rated for disease severity. Samples of diseased tissue were assayed for fungal pathogens by surface sterilizing in 1% sodium hypochlorite, rinsing in sterile water, and plating onto selective media. Plates were incubated at 20°C for 5–7 days before observation. Prevalent fungal species were subcultured for pathogenicity tests, which are pending.

RESULTS AND COMMENTS: Plants with root rot and/or stem canker symptoms were found in all fields. These were collectively termed seedling blight, and disease incidence and severity ratings were made accordingly (Table 1). No leaf diseases were observed. Plant density ranged from 15.5 to 49.7/m^2. A stand of 40–70 plants/m^2 is considered optimum under Alberta conditions. Seedling blight incidence varied from 18.9 to 82.4%, and the disease severity index ranged from 9.4 to 28.6. In general, seedling blight incidence and severity were higher in 1989 compared to 1988. Cool, wet weather conditions prevailed during late May'89 and this appeared to favor seedling blight. The predominant fungi isolated and average % tissue pieces colonized by each were: Alternaria spp. - 24.6, Fusarium spp. - 8.7, Penicillium spp. - 5.7, and Pythium spp. 2.3. A considerable amount of wireworm damage (5.8 to 38.6% incidence, $\bar{x}$ = 17.4%)) was also seen.

Table 1. Safflower survey data, 1989.[1]

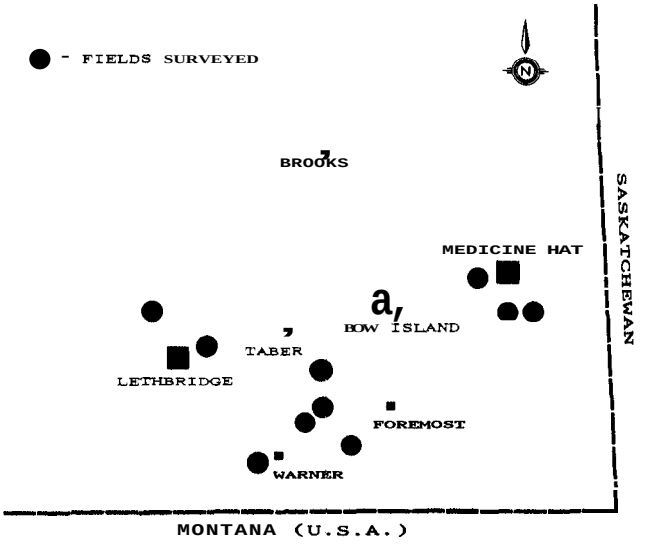
Field no.	Density (plants/m^2)	Seedling blight Incidence (%)	Seedling blight Severity[2]
1	44.2	18.9	9.7
2	23.0	69.3	21.6
3	41.0	55.5	18.6
4	31.0	53.6	18.9
5	30.9	56.3	22.0
6	49.7	38.0	14.4
7	15.5	73.4	25.7
8	20.5	82.4	28.6
9	26.7	42.9	15.2
10	21.8	47.4	15.6
11	38.3	28.5	9.4
Avg.	31.1	51.5	18.2

[1] Figures in this table are averages of 10 sampling sites/field.

[2] Severity Index = $\left[\frac{(S_1 \times 1)+(S_2 \times 2)+(S_3 \times 3)}{T \times 3}\right] \times 100$

Where S_1 = No. of plants with 1–25% of stem/root blighted.
S_2 = No. of plants with 26–75% of stem/root blighted.
S_3 = No. of plants with 76–100% of stem/root blighted.
T = Total no. plants examined, including healthy ones.

Figure 1. Safflower fields surveyed in 1989.



REFERENCE: Howard, R.J., E.R. Moskaluk, and F.T. Allen. 1988. Survey for seedling blight of safflower. Can. Plant Dis. Sum. 69(1):69.

Crop / Culture: Soybean

Location/ Emplacement: Prince Edward Island

Title / Titre: INCIDENCE AND POPULATIONS OF SOILBORNE ORGANISMS IN SOYBEANS GROWN ON PRINCE EDWARD ISLAND

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MATERIALS AND METHODS: The purpose of this study was to determine the incidence and population levels of soilborne organisms in soybeans grown on P.E.I.. Observations on foliar diseases were also taken. A total of 12 commercial soybean fields were sampled from 1986–1989. Thirty soybean plants were sampled during each of June, July, and September. Each plant was rated for root rot (0 = healthy; 5 = death), before hypocotyl, epicotyl, and root tissue was excised and plated on selective growth media. Root rot severity was calculated using the formula:

$$\text{Disease Severity} = \frac{\sum(\text{No. plants in disease category} \times \text{No. value of category})}{\text{Total no. of plants} \times 5} \times 100$$

Nematodes and fungi were isolated from the plant tissues and soil sampled from soybean fields.

RESULTS AND COMMENTS: White mold (*Sclerotinia sclerotiorum*), anthracnose (*Colletotrichum lindemuthianum*), and brown spot (*Septoria glycines*) were observed more often on soybean stems and leaves in fields during 1986 than in 1987 or 1988. During the course of this study, severity of root rot differed greatly from year to year (Table 1). Root rot was particularly severe in 1986.

Fungi were isolated most often from hypocotyl tissue (Table 2). *Fusarium oxysporum* was recovered most frequently from all tissue. *Rhizocotnia solani*, *F. sambucinum*, and *F. avenaceum* were recovered at similar levels from hypocotyl tissue. The impact of *F. sambucinum* and *F. avenaceum* affecting soybeans is unknown. Notably, these two species were isolated from all soybean tissues (Table 2). *Fusarium solani* was isolated primarily from hypocotyl tissue although at relatively low levels. A root lesion nematode (*Pratylenchus penetrans*) was extracted frequently from roots. All organisms were isolated from soil in soybean fields, however *F. oxysporum* and a root lesion nematode appeared to be most prevalent.

Table 1. Soybean root rot severity (1-100) from 1986–1988.

Year	Sample date		
	June	July	September
1986	16.7a*	72.5a	91.7a
1987	11.1a	36.7b	68.9b
1988	28.8a	33.3b	49.7c

*Figures in columns followed by the same letter are not significantly different (P=0.05) using Least Significant Differences.

Table 2. Mean incidence and population levels of soilborne organisms in soybeans.

Tissue	Rhizoctonia solani %	Fusarium oxysporum %	Fusarium solani %	Fusarium sambucinum %	Fusarium avenaceum %	Root lesion nematode no./g dry roots
Hypocoty1	12.8a*	44.Oa	6.4a	16.2a	16.4a	-
Epicotyl	5.9b	32.9b	4.6ab	13.1ab	8.7b	-
Roots	3.0b	13.3c	2.1b	9.1b	6.4b	8342
Soil populations**	cfu/50g 5.4	cfu/g 2800	cfu/g 348	cfu/g 424	cfu/g 189	no./kg 4459

*Figures in columns followed by the same letter are not significantly different (P=0.05) using Least Significant Differences.
**Colony forming units (cfu) per dry soil weight basis.

Crop/Culture: Sunflower

Location/Emplacement: Southern Alberta

Name and Agency / Nom et Organisation:
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Title/Titre: SURVEY FOR SCLEROTINIA WILT AND HEAD ROT OF SUNFLOWER IN SOUTHERN ALBERTA IN 1989

METHODS: Nine fields of sunflower (Helianthus annuus L.) in the County of Forty Mile and the Municipal District of Taber were surveyed on August 31, 1989. In each field, six rows of 25 plants per row were rated for incidence of sclerotinia wilt and head rot.

RESULTS AND COMMENTS: Sclerotinia wilt was found in all 3 fields surveyed in the County of Forty Mile near Bow Island, and in 5 of the 6 fields surveyed in the Municipal District of Taber (Table 1). The disease incidence varied with fields, ranging from light or less than 5% wilt to severe or greater than 50% wilt.

Sclerotinia head rot was found in only 2 of the 9 fields surveyed. The disease incidence was very light (less than 1%) in both fields.

Table 1. Survey for sclerotinia wilt and head rot of sunflower in southern Alberta, 1989.

County or Municipality	Field No.	Sclerotinia disease (%) Wilt	Head Rot
County of Forty Mile	1	54	0
	2	1.3	0
	3	16.7	0
Municipal District of Taber	4	0.7	0
	5	4.0	0
	6	0	0
	7	2.7	0.7
	8	31.3	0.7
	9	5.3	0

Crop / Culture: Sunflower

Location/ Emplacement: Manitoba

Title / Titre: SURVEY OF SUNFLOWER DISEASES IN MANITOBA IN 1989

Name and Agency / Nomet Organisation:

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Methods: A total of 34 oilseed and 9 non–oilseed (confectionery) sunflower fields were surveyed mostly south of Highway No. 1 in southern Manitoba in 1989. Three fields were surveyed on July 24, 12 fields on August 2, 7 fields on August 9, 14 fields on August 24 and 7 fields on September 6. Fields were selected at random and each field was sampled by two persons walking 100 m in opposite directions across the field following an inverted V pattern. Diseases were identified by symptoms and the prewalence and incidence of each disease was recorded. The rust disease severity was measured as percent leaf area infected. A disease index was calculated for each field based on disease incidence (DI) or disease severity (DS), (Table 1). In addition 14 samplessubmitted to the Manitoba Agriculture Plant Pathology Laboratory by agricultural representatives and growers were analysed.

Results: Sclerotinia wilt (Sclerotinia sclerotiorum) and rust (Puccinia helianthi) were the most common and widespread diseases on sunflower in 1989. Sclerotinia wilt was observed during and after flowering in 88%of the fields surveyed and ranged from trace to 40%DI in most fields with up to 100%DI in one field north of Morden. Rust was found in 86%of the fields surveyed with severity ranging from 10%to 100%. The highest rust severity scores were obtained from western Manitoba where race 3 is prevalent and resistance is absent in commercial hybrids. The lack of rust in 7 fields surveyed in central Manitoba on and before the first week in August may be due to the earliness of the survey and the prevalence of race 1, to which most commercial hybrids are resistant. However, moderate levels of rust (up to 40% DS) were recorded from fields in the central area towards the end of the season.

Verticillium wilt (Verticillium dahliae) was found in 49% of the fields surveyed with a range from trace to 20% DI. Traces of downy mildew (Plasmopara halstedii) were observed in three fields and up to 20% DI was observed in 23% of the fields, especially those surveyed towards the end of the season. Traces of septoria leaf spots (Septoria helianthi) and stem lesions (Phoma spp. and Phomopsis spp.) were observed in various sunflower fields towards the end of the season. No signs of sclerotinia head rot (S. sclerotiorum) or botrytis head rot (Botrytis spp.) were encountered during the 1989 field survey.

The incidence and severity of sclerotinia wilt, rust and rhizopus head rot were relatively the same in the oilseed and non–oilseed sunflower fields. However, the incidence of verticillium wilt and downy mildew were higher (2 to 3 fold) in the non–oilseed than in oilseed sunflower fields probably due to the lack of resistance in non–oilseed sunflower hybrids.

In the 14 samples of sunflower submitted to the Manitoba Agriculture Plant Pathology Laboratory, 3 showed sclerotinia wilt (Sclerotinia sclerotiorum) 3 head rot (Rhizopus spp.), 2 phoma black stem (Phoma spp.) and 1 root rot (Fusarium spp.). In addition to disease, 4 samples showed herbicide drift injury and 1 insect damage.

TABLE 1: Sunflower fields affected and disease severity in southern Manitoba in *1989*.

Disease	% of fields infested	Mean of disease index*	Range of disease index
Sclerotinia wilt	88%	1.6	1–5
Verticillium wilt	*49%*	1.1	1–2
Rust**	*86%*	1.7	1–5
Downy mildew	9%	1.3	1–2
Rhizopus head rot	23%	1.0	0–1
Stand	-	1.3	1–2
Vigour	-	2.0	1–3

* Disease index is based on a scale 1–5 (1= trace to 5% disease, 2= 5% to 20% disease, 3= 20% to *40%* disease, 4= *40%* to 60% disease and 5= greater than 60% disease levels). Index is based on disease incidence for all except rust, which is based on disease severity neasured as leaf area infected. Indexes for stand and vigour are based on a 1–5 scale (1= very good and 5= very poor vigour.

** The most severely rust infested fields were in western Manitoba where races 3 and *4* were predominant in the rust population.