Oilseeds and Special Crops / Oleagineux et cultures speciales

CROP: Dry Bean

LOCATION: Southern Alberta

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TITLE: SURVEY OF DISEASES OF DRY BEAN IN SOUTHERN ALBERTA IN 1994

METHODS: Thirty-seven irrigated crops of dry bean were surveyed during late August 1994 for white mold (*Sclerotinia sclerotiorum*), gray mold (*Botrytis cinerea*) and bacterial blights (*Xanthomonas campestris* pv. *phaseoli*, *Pseudomonas syringae* pv. *phaseolicola*) in the area surrounding Bow Island, Alberta. Each crop was sampled by selecting ten sites in a U-shaped pattern, approximately 20 m apart, with each site consisting of a 3 m long section of row (Howard and Huang, 1983). The number of plants with disease symptoms, and the number of healthy plants were recorded at each site. The percentages of plants with white mold, gray mold, and bacterial blights were then calculated for each crop by averaging the incidence at the ten sites. The level of disease in each crop was then characterized according to the following scale: (1) none (0% of plants infected), (2) trace (<1%), (3) light (1—10%), (4) moderate (11—25%), (5) severe (26—50%), (6) very severe (>50%).

RESULTS: White mold was present in 33 of the bean crops surveyed (Table 1). The frequency of crops with moderate, severe, and very severe incidence of white mold was 22%, 27%, and 11%, respectively. The four crops with very severe disease incidence had 51%, 53%, 62%, and 89% of plants infected by the pathogen. The disease was distributed throughout the entire bean production area surrounding Bow Island (Figure 1).

Gray mold was present in 23 of the 37 crops surveyed (Table 1). The frequency of crops with light to moderate incidence was 8% and none of the surveyed crops had severe or very severe incidence of gray mold. The disease was found throughout the survey area. Bacterial blights were present in 19 of the crops surveyed. The frequency of crops with light to moderate incidence of bacterial blights was 8%. None of the crops surveyed had severe or very severe incidence of the disease. Bacterial blights were found throughout the survey area.

DISCUSSION: White mold, gray mold and bacterial blights were reported as major diseases of dry bean in southern Alberta (Huang and Erickson, 1993). The same diseases were widespread in southern Alberta in 1994, with white mold being the most serious disease in both years. Although gray mold and bacterial blights were widespread in southern Alberta, the incidence of these diseases was lower than white mold in 1993 and 1994.

TABLE 1. Diseases of dry bean in southern Alberta in 1994.

Disease Incidence (% plants infected)	Number of Crops		
	white mold	gray mold	bacterial blights
None (0%)	4	14	18
Trace (<1%)	1	20	16
Light (1—10%)	10	1	1
Moderate (11—25%)	8	2	2
Severe (26—50%)	10	0	0
Very Severe (>50%)	4	0	0

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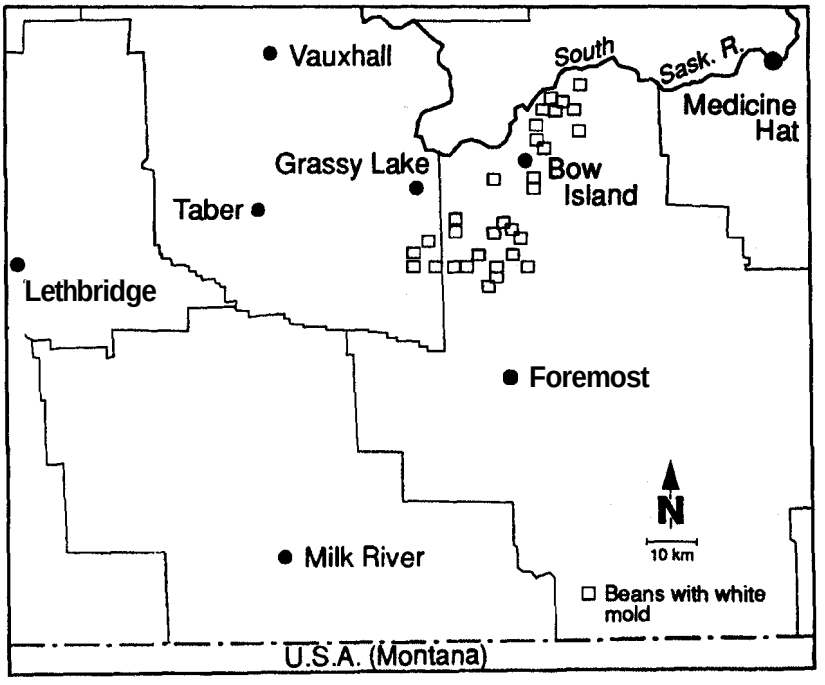

FIG. 1. White mold of dry bean in southern Alberta in 1994.

CROP: Field Bean

LOCATION: Ontario

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TITLE: STATUS OF ANTHRACNOSE DISEASE ON FIELD BEAN IN SOUTHWESTERN ONTARIO IN 1994

METHODS: Isolations were made from anthracnose-diseased bean samples collected from six trial locations (Brussels, Exeter, Kippen, Mitchell, Shetland and Woodstock) in September 1993. The isolates were characterized to the race level using a series of differentials (Dark Red Kidney, Widusa, Kaboon, Michelite, Sanilac, Prelude and Cornell 49-242). Later, all 42 lines of white bean and 39 lines of coloured beans at nine trial locations were destroyed, the machinery and instruments were decontaminated, and the trial sites abandoned.

For 1994 trials, all submitted seeds were visually inspected and treated with DCT (diazinon 6%, captan 18% and thiophanate-methyl 14% w/w) before sowing. Nine trials were conducted at new sites in the same townships as in 1993. (Ailsa Craig, Brussels, Elora, Exeter, Kippen, Mitchell, Shetland and Kemptville). Two official inspections for anthracnose disease were made in mid- and late-August.

RESULTS AND CONCLUSIONS: Ten isolates of *Colletotrichum lindemuthianum* were obtained from diseased pods of five cultivars (Centralia, Midland, Mitchell, OAC Spring and Shetland) and three breeding lines in 1993. Pure cultures of the isolates were nearly identical in morphology to that of the alpha race. Based on their pathogenicity to the series of differential hosts noted above, all isolates were determined to be not the alpha but the alpha-Brazil race of the pathogen. This is the first finding of this race in Canada.

Tests conducted in the laboratory and greenhouse showed that the currently-used seed treatment compound (DCT) was effective in eradicating the fungus from the infected seeds.

All trial sites were carefully observed for anthracnose disease during the 1994 growing season. During official field inspections which were conducted in late-August the disease was not found. Thus, the Ontario field bean has again returned to anthracnose-free status.

CROP: Canola

LOCATION: British Columbia

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TITLE: 1994 CANOLA BLACKLEG SURVEY IN THE BC PEACE RIVER REGION

METHODS: The purpose of the survey was to determine whether the virulent strain of blackleg (*Leptosphaeria maculans*) had been introduced into the Peace River region of British Columbia. The survey was conducted from September 6 to 9, 1994 by eight B.C.M.A.F.F. staff and two volunteers. All canola producing areas were surveyed, with emphasis on areas of intensive production and areas where canola commonly follows canola. Every *Brassica napus* and every second *B. campestris* crop encountered were surveyed. Crops were sampled in an inverted W pattern starting 30 metres from the field entry point. Ten plants were pulled and examined for blackleg every 30 m for a total of 50 stems per crop. Additional plants were also examined for blackleg along the edge of the field near the field access. All samples were retained and rated in the laboratory for the presence of blackleg and sclerotinia (*Sclerotinia sclerotiorum*). Stems with pycnidia were cultured at the provincial plant diagnostic lab. Blackleg cultures were forwarded to Dr. P. Ellis, Agriculture and Agri-Food Canada, Vancouver Research Centre, for ELISA testing using monoclonal antibodies.

RESULTS AND COMMENTS: Virulent blackleg was not detected in this survey. A total of 134 canola crops were surveyed, representing 8710 ha out of a total of 48,000 ha grown. Non-virulent blackleg was detected in 54.5% of crops. None of the samples had girdling lesions, and very few had basal stem cankers. The average incidence of non-virulent blackleg within infested crops was 13%. Sclerotinia stem rot was detected in 50.7% of crops surveyed at an average incidence of 7.6% within infested crops. Virulent blackleg has not yet been detected in British Columbia.

ACKNOWLEDGEMENTS: Many thanks to the following for assisting with the canola survey: A. Anderson, K. Nickel, G. Carter, J. Dobb, J. Elmhirst, J. Forbes, L. Bowd, V. Joshi, D. Bray, C. Anderson.

CROP: Canola

LOCATION: Peace River region of Alberta

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TITLE: SPREAD AND DISTRIBUTION OF VIRULENT BLACKLEG OF CANOLA IN THE PEACE RIVER REGION OF ALBERTA IN 1994

INTRODUCTION AND METHODS: In 1993, virulent blackleg was found extensively in the Peace River region in over 100 canola crops (1). In 1994, canola acreage was expected to increase to a record high of 600,000 hectares. The purpose of the survey was to monitor the spread of blackleg in municipalities where the prevalence was high in 1993 and to survey more canola crops in other municipalities in the Peace River region. The survey was conducted from June to September 1994, with the cooperation of agricultural fieldmen in all 13 municipalities. Canola crops in fields with shortened or no rotation were given priority in the survey. In two municipalities, all canola crops were checked at least once during the summer whereas in all other municipalities crops were selected at random. Crops were sampled as previously described (2). Additiional samples were collected at the road access to crops and in low spots in the fields. Stems with blackleg-like lesions and stubble pieces with pycnidia were collected. These plant samples were tested to confirm virulent blackleg at the Regional Crops Laboratory, Fairview, the Pest Diagnostic Clinic, Vegreville and Brooks Diagnostics Ltd, Brooks.

RESULTS AND COMMENTS: A total of 2010 crops was surveyed in the Peace River region. There were 104 crops with confirmed virulent blackleg. Most of the canola crops had disease incidence at low or trace levels. The disease was found to have spread from four municipalities in 1993 to seven municipalities in 1994. In the two municipalities with high prevalence of virulent blackleg in 1993 (1) there were fewer infested crops in 1994, ie 14 crops in the County of Grande Prairie and 24 in the Municipal District of Smoky River. The highest number [52] of infested crops in 1994 was found in the Improvement District of Birch Hills. Many of these infested crops were in fields in which cv. Westar had been grown continuously for two or more years and some showed moderate to high incidence. The Regional Crops Laboratory in Fairview surveyed 131 of the 2010 crops, received 448 canola specimens and confirmed 78 with virulent blackleg. One hundred of the 448 specimens were sent to Brooks Diagnostics Ltd to test their new ELISA procedure using monoclonal antibodies. The Diagnostic Pest Clinic in Vegreville received 110 canola specimens and identified 26 with virulent blackleg.

ACKNOWLEDGEMENTS: Thanks to the agricultural fieldmen and inspectors involved in surveying the canola crops, to Ellen Dalke for assistance in isolating virulent blackleg from canola specimens,,and to the Alberta Canola Producers' Commission for financial support.

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CROP: Canola

LOCATION: Alberta

NAME AND AGENCY:

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TITLE: BLACKLEG OF CANOLA SURVEY IN ALBERTA - 1994

INTRODUCTION AND METHODS: The provincial survey for virulent blackleg (*Leptosphaeria maculans*) of canola was continued for the seventh consecutive year. Fieldmen in each of Alberta's **67** municipalities where canola was grown were assigned crops of canola to inspect in proportion to the amount grown in their respective areas of jurisdiction ie one crop of canola for every **2000** ha grown. The **50%** increase over **1993** in area sown to canola was reflected in the survey crop numbers. Fieldmen were expected to pay particular attention to short or non-existent rotations and sample as previously described **(3).** Agriculture and Agri-Food Canada seed inspectors reported on the presence of virulent blackleg in seed crops. Diagnostic confirmation of virulent blackleg-infected samples was provided by the Alberta Environmental Centre at Vegreville and laboratories at Fairview and Brooks.

RESULTS AND COMMENTS: In central regions of Alberta virulent blackleg infection was at trace to minor levels. The first stem and foliar lesions did not generally appear until late June. In southern regions of the province, particularly around the Vulcan area, significant losses occurred in many crops of Westar canola. Field histories typically showed that canola, usually Westar, had been grown for **3** years in a row. A similar situation existed in the Birch Hills area of the Peace region **(1,2,4)** again involving continuous Westar, but virulent blackleg infection levels there were generally low. Province-wide **2784** canola crops were surveyed and **202 (7.2%)** were positive for virulent blackleg.

Agriculture and Agri-Food Canada inspectors found only **10** seed crops of canola with trace levels of virulent blackleg in the Vermilion region. These **10** crops totalled **384** ha out of **664** seed crops province-wide, totalling **18,402** ha.

Six private seed laboratories in Alberta and one in Saskatchewan checked **1635** lots of canola seed for virulent blackleg and **42** lots were found to be positive. Infected samples were for the most part from lots of common seed.

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CROP: Canola

LOCATION: Saskatchewan

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TITLE: SURVEY OF CANOLA DISEASES IN SASKATCHEWAN, 1994

METHODS: Between 15 and 23 August 1994, 106 canola crops (at growth stages 5.1-5.4 [1]) were surveyed in Saskatchewan crop districts 1, 2, 5, 6, 7, 8 and 9 (Fig. 1), where the majority of canola in the province was grown. The number of crops surveyed per crop district (CD) was approximately in proportion to the area of canola seeded in each district [2], and the acreage in the seven districts surveyed accounted for 94% of the estimated 1994 production for Saskatchewan. Crops were usually surveyed along preplanned routes, with a minimum distance of 40 km between survey sites. Twenty-plant samples from each of 5 locations per field, taken along a horseshoe-shaped path starting 25 m from the edge of the field, were collected and rafted. A total of 74 *Brassica napus* and 32 B. rapa crops were assessed for the prevalence (percent of crops infested) and incidence (percent of plants infected per crop) of sclerotinia stem rot (*Sclerotinia sclerotiorum*), foot rot (*Fusarium* spp. and *Rhizoctonia* sp.), aster yellows (mycoplasma-like organism) and staghead (*Albugo candida*). Blackleg (*Leptosphaeria maculans*) lesions that occurred on any part of the canola stem were noted, as were basal stem cankers that destroyed or weakened the structural integrity of tissues [3]. The prevalence and severity (percent surface area of pod covered by lesions) of alternaria pod spot (*Alternaria* spp.) was determined.

RESULTS: The overall prevalence of sclerotinia stem rot was high in CDs 8A, 8B and 9A (86—100% of crops infested) (Table 1). Mean prevalence was slightly higher for B. rapa (59%) than for B. napus (53%), although mean disease incidence was lower in *B.* rapa (5%) than in *B.* napus (6%) (Table 2).

Blackleg lesions occurred in 76% of B. napus and 91% of B. rapa crops, with overall incidences of 11% and 25%, respectively (Table 2). Disease incidence was over 50% in 3 B. napus and 5 B. rapa crops. In CD 8B, blackleg occurred in 91% of the crops with a mean incidence of 36% (Table 1); in CDs 7B and 8A, 100% of crops were infested. Basal stem cankers were not prevalent generally; no cankers were recorded in 47% of both B. napus and *B.* rapa crops. However, in CD 7B and 9B, basal stem cankers were recorded in all crops, with mean incidences of 11% and 7%. Lesions caused by the weakly virulent strain of *L. maculans* were observed in many crops of B. napus and B. rapa, but incidence was low.

The incidence of foot rot was generally low, but prevalence was high (Table 2). Similarly, the overall incidence of aster yellows was low, but most crops were infested. However, appreciable disease incidences (11—20%) had developed in 5 crops of B. rapa.

The incidence of staghead was low (1.9%), but 69% of B. rapa crops were infested. Malformations similar to small stagheads, caused by *Peronospora parasitica*, were recorded in 4 crops of B. *napus*.

The severity of alternaria pod spot was low, with means ranging from 0.3—2.7% in different crop districts, but prevalence was high (Table 2). More than 50% of the crops were infested in 7 of the 12 crop districts surveyed, with the highest prevalence (83%) in CD 76 (Table 1).

COMMENT: In 1994, rainfall was above average for most of the Saskatchewan grain belt in late May and June. This trend continued for July and August, although below average rainfall was reported for these months in southeast, southwest and northwest districts. Excess moisture was a problem in northeast districts [2]. The generally low incidence of diseases was surprising given the favorable moisture levels and moderate to high disease prevalence. Growing conditions for canola, and for development of sclerotinia stem rot, were generally favorable but disease incidence was not high in any district. However, in 5 crops (2 in 8B, 2 in 9A and 1 in 5A) disease incidence was over 20%. The low prevalence of stem rot in the southeast districts may have been partly due to the lower moisture levels during July and August, and because there is less of a history of canola production in these districts. It was not possible to determine if any of the surveyed crops had been sprayed with fungicides for the control of stem rot or blackleg. The occurrence of 5 crops (2 in 8B, 2 in 9A and 1 in 5B) with 11—20% aster yellows was unusual, although the high prevalence was normal.

The prevalence of blackleg lesions was generally high except in CDs 1A and 2B. Petrie [4] also reports a high prevalence of blackleg in CDs 6, 8 and 9. The incidence of lesions was generally lower in this survey, but there was close agreement in the incidence of cankers reported in CDs 8 and 9. In this survey, the overall incidence of blackleg lesions was higher in *B. rapa* than in *B. napus,* agreeing with the reports by Petrie in 1993 [3] and 1994 [4]. However, the incidence of stem cankers was found to be higher in *B. rapa* than in *B. napus* in this survey, whereas Petrie reported a higher incidence in *B. napus* in 1994.

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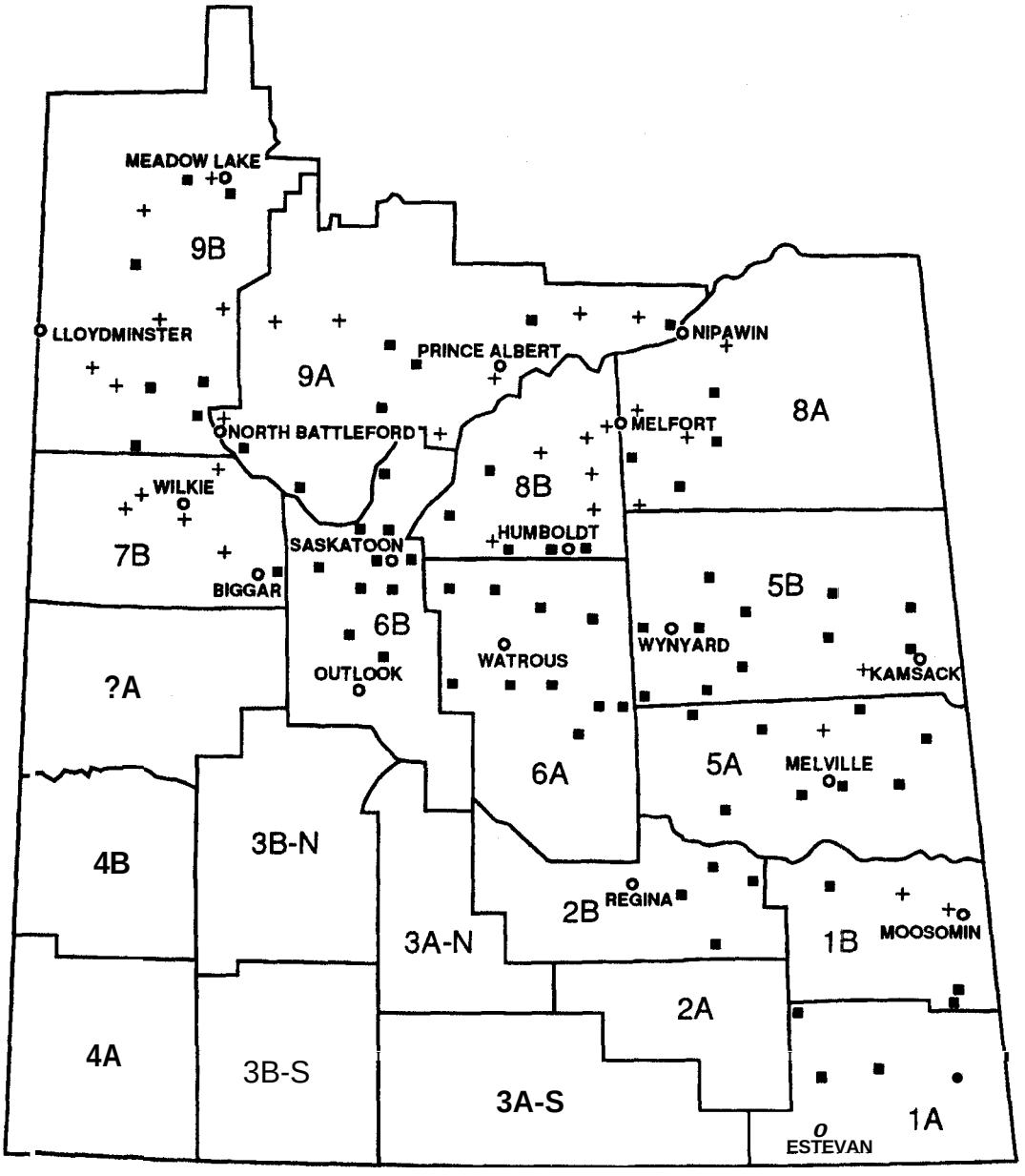

Legend: ■B. napus, +B. rapa, oTown or City

FIG. 1. Distribution of surveyed crops in Saskatchewan in relation to crop districts.

TABLE 1. Canola acreage, number of crops surveyed, disease prevalence and disease incidence or severity in Saskatchewan, 1994.

Crop district	Estimated canola acreage (x 10^3 ha)	No. of crops surveyed		Sclerotinia stem rot		Blackleg		Alternaria pod spot	
		B. napus	*B. rapa*	P*	DI**	P lesions	DI lesions /cankers	P	Mean% severity
1A	116	4	0	0		0		50	0.3
1B	154	3	2	0		60	4/1	60	1.6
2B	84	4	0	0		0		75	0.2
5A	309	8	1	67	4	44	1/0	44	0.8
5B	292	1	1	58	4	83	14/3	75	0.8
6A	264	0	0	20	<1	90	4/1	50	0.1
66	184	0	0	50	3	90	14/1	40	0.7
76	174	1	5	0		100	22/11	83	0.8
8A	180	4	4	100	7	100	19/2	38	2.6
8B	222	5	6	91	10	91	36/14	55	1.5
9A	313	7	7	86	11	93	19/11	64	1.2
96	228	7	6	62	1	100	24/7	62	2.7

* Mean percent prevalence.
** Mean percent disease incidence.

TABLE 2. Mean incidence, prevalence and distribution of diseases in relation to categories of disease incidence in 74 crops of *B. napus* and 32 of *B. rapa* in Saskatchewan, 1994.

	Number of crops with						
	Stem rot	Blackleg lesion	Blackleg canker	Foot rot	Aster yellows	Staghead	Alternaria pod spot
B. rapa							
0	13	3	15	4	3	10	7
trace <1%	2				11	3	4
1-5%	9	3	10	22	11	17	17
6-10%	2	6	2	4	2	1	2
11-20%	5	5	3	2	5	1	2
21-50%	1	10	2				
>50%		5					
Mean % DI*	5	25	5	4	3	2	3
Mean % P**	59	91	53	88	91	69	75
B. napus							
0	35	18	47	34	15		39
trace <1%	4				34		26
1-5%	26	19	20	31	25		7
6-10%	3	11	2	9			2
11-20%	2	14	5				
21-50%	3	9					
>50%	1	3					
Mean % DI*	6	11	2	2	1	n/a	1
Mean % P**	53	76	36	54	80		47

* Disease incidence.
** Prevalence.

CROP: Canola

LOCATION: Central Saskatchewan

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TITLE: 1994 SURVEY FOR BLACKLEG AND OTHER DISEASES OF CANOLA

METHODS: Between **15** August and **30** September, **141** canola crops **(111** of *Brassica napus* [BN] and **30** of B. *rapa* [BR] were surveyed in the **11** Saskatchewan rural municipalities (RM's) visited annually between **1991** and **1993 (6).** The stubble from **10** plants was pulled at each of six sites per field and the mean disease incidence (DI) for each pathogen present was calculated. Both the incidence of all blackleg (*Leptosphaeria maculans*) infections and the incidence of severe basal stem cankers (6) were recorded. Swathed plants were examined for alternaria black spot *(A. brassicae* and *A. raphani*), staghead *(Albugo candida),* and aster yellows. The severity of *Alternaria* pod infection was rated as trace, slight, moderate, or severe, corresponding, respectively, to **1, 5, 10,** and **20%** (or more) of the surface area covered by lesions (2). Notes were taken on the extent of weed infestation, hail damage, herbicide damage, and the presence of blackleg-infested residue of earlier canola crops.

RESULTS AND DISCUSSION: Blackleg was found in **140** of the **141** crops. In most RM's DI ranged from very low to very high (Table **1).** The overall DI of **64%** was lower than that recorded in **1991** or **1993 (6).** However, the mean DI for severe basal stem cankers, **5%,** was higher than that recorded for either **1992** or **1993.** Crops in fields with short rotations (typically canola-cereal-summerfallow-canola) had the highest incidences of severe basal stem cankers, ranging from **30—72%.** Plants with severe stem cankers were frequently severed at the stem base, prostrate, and prematurely ripened. There was often a close association with pieces of blackleg-infested root residue from a preceding canola crop. Abundant rainfall in the latter half of May, **1994,** may have been an important factor contributing to the increase in frequency of severe basal stem cankers. Frequent rain showers stimulated ascospore production and liberation, resulting in early infections.

Blackleg incidences of **70—90%** occurred in some fields where canola had not been grown for **10** years or more. However, plants with severe cankers were rare in these fields. Inquiries determined that the seed sown had usually been treated with a fungicide specifically for blackleg control; thus, ascospore inoculum apparently had blown in from adjacent fields. As in **1993 (6),** overall blackleg infection in BR crops was higher than in BN (Table **2).** However, in **1994,** the mean incidence of basal stem cankers was higher in BN. Many of the short rotations involved BN. Producers apparently were relying on the greater blackleg resistance of BN cultivars to help negate the possible adverse effects of shorter rotations.

Sclerotinia stem rot (*Sclerotinia sclerotiorum*) occurred in **104** crops **(74%);** infection incidences between **10** and **37%** were recorded in **16** fields **(11%).** Stem rot was most common in the northeastern part of the surveyed area, or RM's **401, 402,** and **431** (Table 1). As previously reported (5), it was more prevalent, and the DI was higher, in BN than in BR (Table **2).** Foot rot (*Rhizoctonia solani* and *Fusarium roseum*) and aster yellows also were more common in BN crops (Table **2),** in keeping with earlier results **(3, 5, 7).** Alternaria black spot was less severe in BN than in BR (Table 2), reflecting their relative susceptibility to the disease **(1).** Grey stem (*Pseudocercosporella capsellae*) was rarely found in BN (Table 2), but BR stubble often was extensively colonized by the pathogen. Presently grown cultivars of BN are less affected by grey stem than were those grown previously (4). Staghead (Albugo candida) was conspicuous in **11** BR crops **(37%).**

Hail damage was noteworthy in 11 crops (8%). In one field south of Asquith in RM 345, early hail left gaping wounds in the stems, many of which were broken over. Blackleg lesions were often associated with hail injury. Herbicide drift caused significant damage in only three crops (2%). Partial sterility was noted in plants near the edge of one of these fields, and proliferation of stem tissues was observed in the two others. Infestations of stinkweed (*Thlaspi arvense*), wild mustard (*Sinapis arvensis*), and volunteer cereals were a serious problem in several fields throughout the area.

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TABLE 1. Blackleg and sclerotinia stem rot infection of stubble of canola (*Brassica napus* and **O.** *rapa*) crops in 11 rural municipalities in central Saskatchewan, 1994.

Rural Municipality	Virulent blackleg				Sclerotinia stem rot	
	Mean incidence & range of stem infections		Mean incidence & range of severe		% fields infested stem cankers	Mean incidence
343 Blucher	60	(3 - 98)	4	(0 - 22)	42	1
344 Corman Park	57	(0.1-100)	5	(0 - 56)	69	2
345 Vanscoy	72	(10 -100)	10	(0 - 72)	65	6
372 Grant	81	(55 - 98)	7	(0 - 30)	91	4
373 Aberdeen	65	(5 - 99)	6	(0 - 59)	70	2
401 Hoodoo	53	(18 - 80)	2	(0 - 8)	100	12
402 Fish Creek	49	(12 - 90)	1	(0 - 3)	100	6
403 Rosthern	62	(10 - 95)	6	(0 - 32)	82	5
404 Laird	58	(0 -98)	5	(0 - 33)	67	3
405 Great Bend	***64***	(18 - 95)	2	(0 - 10)	80	1
431 St. Louis	79	(58 - 98)	1	(0 - 7)	100	7
Overall mean and range for 141 crops	***64***	(0 -100)	5	(0 -72)	74	4 (0-37)

TABLE 2. Mean prevalence, incidence or severity* of diseases of two species of canola in 1994 in central Saskatchewan.

Disease	Disease measurement	*Brassica napus*	*Brassica rapa*
Blackleg	Prevalence	99	100
	Mean incidence	62	69
	Mean % basal cankers	6	4
Sclerotinia stem rot	Prevalence	77	63
	Mean incidence		
	all crops	4	2
	infested crops	6	3
Atternaria black spot	Prevalence	100	100
	Severity	7	9
Aster yellows	Prevalence	45	17
Foot rot	Prevalence	21	7
Grey stem	Prevalence	10	100
Staghead	Prevalence	0	37

• Prevalence = percent crops infested; incidence = percent plants infected in a crop; severity = percent surface area of pods with lesions.

CROP: Canola

LOCATION: Manitoba

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TITLE: DISTRIBUTION, PREVALENCE AND INCIDENCE OF CANOLA DISEASES IN MANITOBA 1994

METHODS: Three surveys of 101 canola crops in four agricultural regions of Manitoba, Southwest (crop districts 1, 2, and 3), Northwest (crop districts 4, 5, 6, and 13), Central (crop district 7 and 8), and Eastern/Interlake (crop districts 9 and 11), were conducted in the last week of August and the first week of September. The majority of crops were *Brassica napus*. Results for the three fields of B. *rapa* were combined with those for B. *napus*. The presence of diseases was noted in each field and disease incidence was determined from a sample of 50 plants. The route taken in the surveys is shown in Figure 1.

RESULTS AND COMMENTS: Sclerotinia stem rot caused by *Sclerotinia sclerotiorum* was the most frequent disease encountered in Manitoba except in the southwest region where blackleg (caused by *Leptosphaeria maculans*) was more frequently detected. The prevalence (percentage of infested crops) ranged from 37% in crop district 1 to 100% in crop districts 4, 8, 9, 11, and 13 (Table 1). The mean disease incidence ranged from 3% in crop district 3 to 32% in crop district 11 (Table 2). On a province-wide basis the prevalence was 78% and the mean disease incidence was 15%. This level of infection would likely result in about a 7.5% yield loss (Morrall et al. 1982), which is lower than in 1993 (Mathur and Platford 1994).

Blackleg was observed in all crop districts except crop district 13 which included only one crop (Table 1). Prevalence ranged from 50% in crop districts 4, 8, 9 and 11 to 87% in crop district 1. The mean disease incidence ranged from 2% in crop district 8 to 36% in crop district 11 (Table 2). Prevalence and mean disease incidence on a province-wide basis were 67% and 16% respectively, which were higher than in 1993 (Mathur and Platford 1994).

Foot rot (Rhizoctonia sp./Fusarium spp.) was observed in 38% of the crops surveyed (Table 1). The mean disease incidence ranged from 0 in crop districts 4, 5 and 13 to 14% in crop district 8 (Table 2). The overall incidence of foot rot was higher in 1994 than in 1993 (Mathur and Platford 1994). Black spot caused by *Alternaria* spp. was found at trace to moderate level with an incidence of 100% in all crop districts surveyed. Aster yellows (mycoplasma-like organism) was found in four crop districts, 1, 2, 3 and 7 and grey stem (*Pseudocercosporella* capsellae) was observed in two crop districts, 3 and 6.

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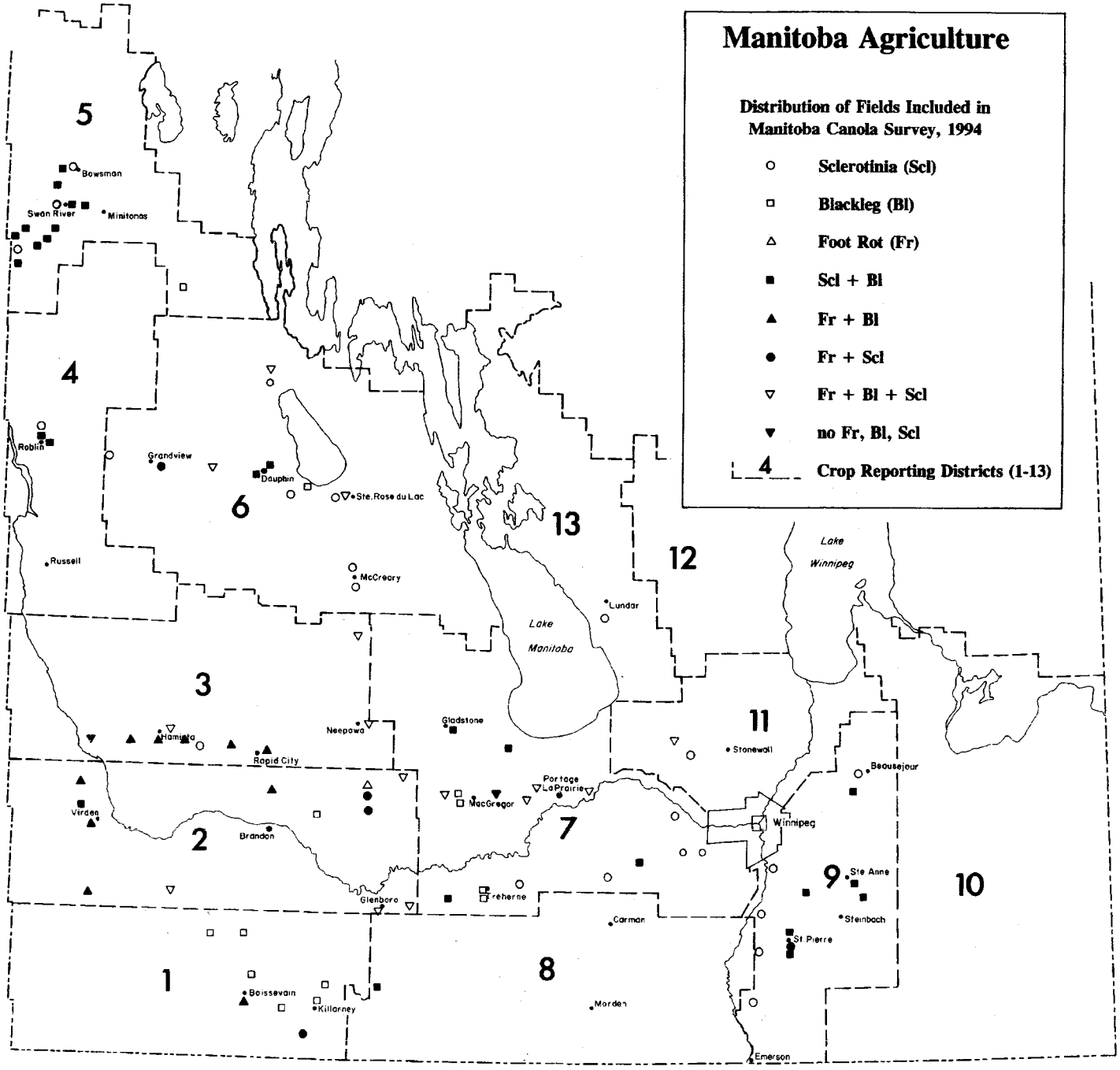
1. Morrall, R.A.A., J. Dueck and P.R. Verma. 1982. Yield losses due to sclerotinia stem rot in western Canadian rapeseed. Can. J. Plant Pathol. 6:265 (Abstr.]
2. Mathur, S. and R.G. Platford. 1994. Distribution, prevalence and incidence of canola diseases in 1994. Can. Plant Dis. Surv. 74:87.

TABLE 1. Prevalence of diseases of canola in Manitoba in 1994.

Crop District	Number of Crops Surveyed	Percentage of crops infested					
		Sclerotinia	Blackleg	Foot rot	Black spot	Grey stem	Aster yellows
1	8	37	87	37	37		12
2	12	67	75	75	50		8
3	10	60	80	80	30	10	10
4	4	100	50		75		
5	14	93	79		64		
6	14	71	57	36	93	7	
7	22	73	68	45	68		5
8	2	100	50	50	100		
9	12	100	50	8	100		
11	2	100	50	50	50		
13	1	100			100		
Manitoba Average	101	78	67	38	67	2	4

TABLE 2. Mean percentage incidence of diseases of canola in Manitoba in 1994.

Crop District	Sclerotinia	Blackleg	Foot rot	Black spot
1	6	29	13	100
2	7	18	8	100
3	3	16	8	100
4	11	12		100
5	20	10		100
6	24	18	5	100
7	17	19	7	100
8	9	2	14	100
9	11	12	4	100
11	32	36	4	100
13	18			100
Manitoba Average	15	16	6	100


Manitoba Agriculture
Distribution of Fields Included in Manitoba Canola Survey, 1994
Sclerotinia (Scl)
Blackleg (Bl)
Foot Rot (Fr)
Scl + Bl
Fr + Bl
Fr + Scl
Fr + Bl + Scl
no Fr, Bl, Scl
Crop Reporting Districts (1-13)
Bowsman
Swan River
Minitonas
Roblin
Grandview
Dauphin
Ste. Rose du Lac
Russell
McCreary
Lundar
Lake Manitoba
Lake Winnipeg
Gladstone
Neepawa
Hamiota
Rapid City
Virden
Brandon
Glenboro
MacGregor
Portage La Prairie
Stonewall
Beausejour
Winnipeg
Ste Anne
Steinbach
St Pierre
Carman
Treherne
Boissevain
Killarney
Morden
Emerson
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13

CROP: Flax

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: DISEASES OF FLAX IN MANITOBA IN 1994

METHODS: A total of 31 flax crops in southern Manitoba and 5 crops in southeastern Saskatchewan were surveyed in 1994. Sixteen crops were surveyed on August 10, 15 crops on August 18, and 5 crops on September 1. Crops were selected at random in different regions. Each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the incidence and severity of each disease were recorded.

In addition, 25 samples of flax were submitted for analysis to the Manitoba Agriculture Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Moisture conditions were adequate throughout the growing season in most flax growing regions in Manitoba. Crop emergence and stand were excellent in most of the crops surveyed. Pasmo (*Septoria linicola*) was observed in 47% of crops surveyed. The incidence of pasmo ranged from 0 to 5% in crops surveyed in early August, and from trace to 40% in crops surveyed in mid-August and early September. Severity of pasmo ranged from trace to 5% of stem and leaf area infected in early August to 5 to 40% stem and leaf area infected in mid-August and early September (Table 1). Both incidence and severity of pasmo were lower in 1994 than in 1993 due perhaps to the less favourable conditions for disease development in 1994.

Traces of aster yellows (Mycoplasma-like organism) were observed only in three crops. Fusarium wilt (*Fusarium* oxysporum f.sp. *lini*) was not observed in any of the crops surveyed in 1994. Rust (*Melampsora lini*) was not observed in any of the crops surveyed nor on the 30 rust-differential flax lines planted at Morden and Portage la Prairie. Chlorosis caused by excess soil moisture was observed on heavy clay soils in the central region.

Of the 25 samples submitted to the Manitoba Agriculture Crop Diagnostic Centre, nine were affected by root rot caused by Fusarium, *Pythium*, and *Rhizoctonia*, and one was affected by pasmo. In addition to disease problems, 11 samples were affected by herbicide injury, four affected by environmental stress caused by heat canker and excess moisture, and three affected by nutrient deficiency.

ACKNOWLEDGEMENTS: The assistance of L. J. Wiebe and G. Mardli in conducting this survey is gratefully acknowledged.

TABLE 1. Incidence and severity of pasmo on flax in Manitoba and south-eastern Saskatchewan in 1994.

No. of Crops Surveyed	% of Crops Surveyed	Incidence*	Severity**
August 10			
13	81	0	0
1	6	Trace	1%
2	13	1-5%	1-5%
August 18			
5	33	0	0
3	20	Trace	1%
2	13	1-5%	1-5%
2	13	5-20%	5-10%
3	20	20-40%	10-40%
September 1			
1	20	0	0
2	40	1-5%	1-5%
2	40	20-40%	10-40%

* Incidence is the percentage of infected plants in each field.
** Severity is estimated as the percentage of stem and leaf area infected.

CROP: Lentil

LOCATION: Saskatchewan

NAME AND AGENCY:
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TITLE: SEED-BORNE LENTIL DISEASES IN SASKATCHEWAN IN 1994

METHODS: As in 1993 (1), no systematic survey of lentil crops was conducted. However, in connection with other work 13 crops were visited in early July and again in early August in Saskatchewan Crop Districts **28,** 6A, 7A and 88 and the extreme north and south ends of 6B. Most of these crops were cv. Laird. In addition, the results of agar plate testing of 400-seed samples from the 1994 crop by three commercial companies were summarized. It was not possible to determine which of these samples came from crops where the plants had been sprayed with Bravo (chlorothalonil) or the seed treated with Crown (thiabendazole and carbathiin). Bravo is registered to control ascochyta blight ***(Ascochyfafabae*** f. sp. ***lentis***) and anthracnose ***(Colletotrichurntruncatum***) of lentil. Crown was registered in 1994 for the control of seed-borne ascochyta blight of lentil, but recent work (J. Carter and R.A.A. Morrall, unpublished) shows that it also reduces seedling blight caused by seed-borne ***Botrytis cinerea.***

RESULTS AND COMMENTS: By early July substantial infestations of ascochyta blight were evident in all crops except one in Crop District 6A and one in Crop District 7A. By mid-August ascochyta blight was widespread in all except the crop in District 7A. Botrytis stem and pod rot were also very abundant in 7 of the 13 crops. Anthracnose was not observed in any of the crops.

The growing season was marked by above normal rainfall in May and June in most lentil-growing areas. Normal to below normal rainfall occurred in late July and August and some crops in southern and western areas were harvested by early August. After the first few days in September, warm and extremely dry harvest weather continued throughout the month.

By early December about 700 lentil seed samples had been processed by the three commercial companies. Only 5.7% of the samples showed 0% ***Ascochyfa*** infection and levels of infection ranged up to 64.5%. The mean level of ***Ascochyfa*** infection was 7.6%, which is substantially higher than in any of the previous seven years (1). No seed samples infested with ***Colletotrichurn*** were detected. ***Botrytis*** infection was not detected in 25.9% of the seed samples, but in the others infection levels ranged as high as 17.5%. The overall mean level of *Botrytis* infection was 1.9%, lower than that reported in 1993 (1). Mean levels of ***Ascochyfa*** and ***Botrytis*** infection were calculated for individual crop districts from which at least 10 samples were tested. The values for ***Ascochyfa*** ranged from ***2.8%*** in Crop District 2A to 10.9% in Crop District 5A. Values for *Botrytis* ranged from 0.7% in Crop District 9A to 3.1% in Crop District 6A. However, values for individual crop districts could not be easily related to weather patterns in different parts of the province.

REFERENCES:

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2. Morrall R.A.A., Thomson, J.R., Bond, S.J., Downing, J.L., May-Melin, J. and Thompson, D.K. 1992. Diseases of lentil in Saskatchewan in 1991. Can. Plant Dis. Survey 72:80—82.

CROP: Field Pea

LOCATION: Northwestern and northeastern Alberta

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TITLE: ROOT ROT DISEASE SURVEY IN NORTHEASTERN AND NORTHWESTERN ALBERTA IN 1994

METHODS: Fifty-eight pea crops in northern Alberta were surveyed for root rot, caused by *Fusarium solani, Rhizoctonia solani*, and/or *Pythium* spp., in June (Fig. 1). Ten plants were dug up in one-metre lengths of rows at each of ten sites equally spaced along the arms of a 'W' pattern in each field. All plants were stored in a cooler at 5°C pending assessment. 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 discoloured.

RESULTS AND COMMENTS: Root rot was found in all crops surveyed. Mean disease incidence and severity of root rot were 34% and 0.5, respectively.

TABLE 1. Incidence and severity of root rot of pea in northwestern and northeastern Alberta in 1994.

Location	No. of fields	Incidence (%)		Severity (0—4)	
		Mean	Range	Mean	Range
Athabasca	2	16	11 - 21	0.3	0.2 - 0.3
Barrhead	6	46	31 - 83	0.8	0.5 - 1.5
Fort Saskatchewan	5	28	2 - 62	0.4	0.0 - 1.2
Lamont	7	31	10 - 47	0.5	0.2 - 0.6
Morinville	3	41	17 - 56	0.8	0.3 - 1.2
Stony Plain	4	50	18 - 66	0.9	0.3 - 1.1
St. Paul	10	30	8 - 66	0.3	0.1 - 0.9
Vermilion	10	12	3 - 27	0.2	0.0 - 0.4
Westlock	11	45	7 - 91	0.7	0.4 - 1.1
Total/Average	58	34		0.5	

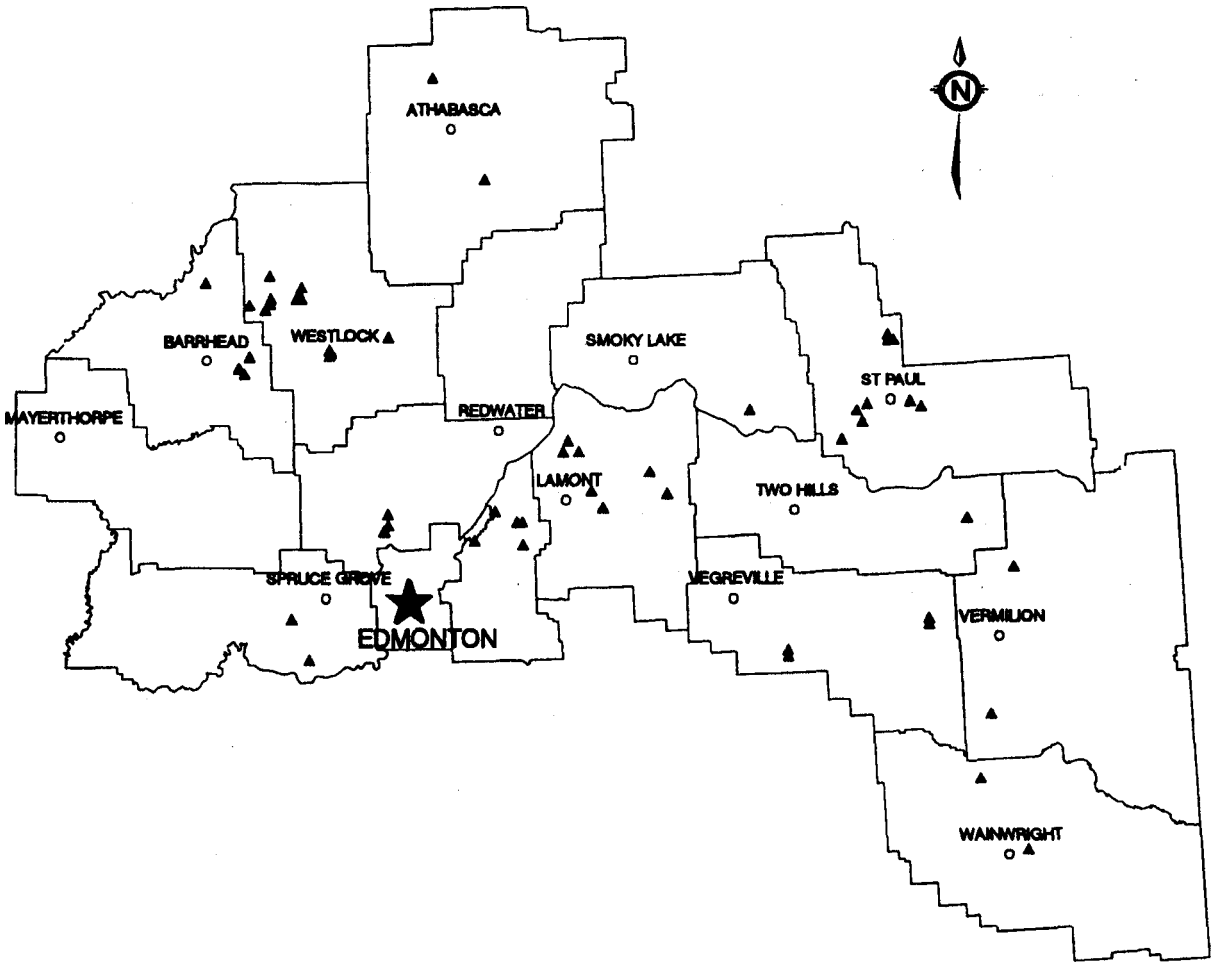

FIG. 1. Locations of pea fields in northeastern and northwestern Alberta surveyed for root rot disease in 1994.

CROP: Field pea, *Pisum sativum* L.

LOCATION: Southern Alberta

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TITLE: PEA ROOT ROT SURVEY IN SOUTHERN ALBERTA IN 1994

METHODS: Fifteen commercial pea crops (Fig. 1) were surveyed in mid-June for root rot, caused primarily by *Pythium* and *Fusarium* species. Ten plants were dug in one-meter-length rows at each of ten equally spaced sites along the arms of a 'W-shaped pattern that was walked in each field. The plants were returned to the laboratory where the roots were washed and root rot incidence and severity were assessed. Root rot incidence was determined by counting the number of seedlings with root rot symptoms, then calcullating the percentage of diseased seedlings out of the total number examined. Root rot severity was estimated visually on the same samples using a five-point scale, ie clean (0) = no root, slight (1) = 1—10% root discoloration, moderate (2) = 11—25%, severe (3) = 26—50%, and very severe (4) = >51%. Pieces of diseased root from each field were surface sterilized for one minute, rinsed in sterile distilled water, then plated onto cornmeal-rose bengal agar, cornmeal agar amended with pimaricin, vancomycin and penicillin, and acidified potato dextrose agar to determine if root rot organisms were present. The plates were examined after 3-7 days and the genera of fungi present were identified.

RESULTS: Root rot was found in all 15 crops (308.5 ha) surveyed. The average disease incidence was 61% and the average severity rating was 1.2 (slight). The major fungal organisms retrieved from the plated root pieces were *Pythium*, Fusarium and Mucor species.

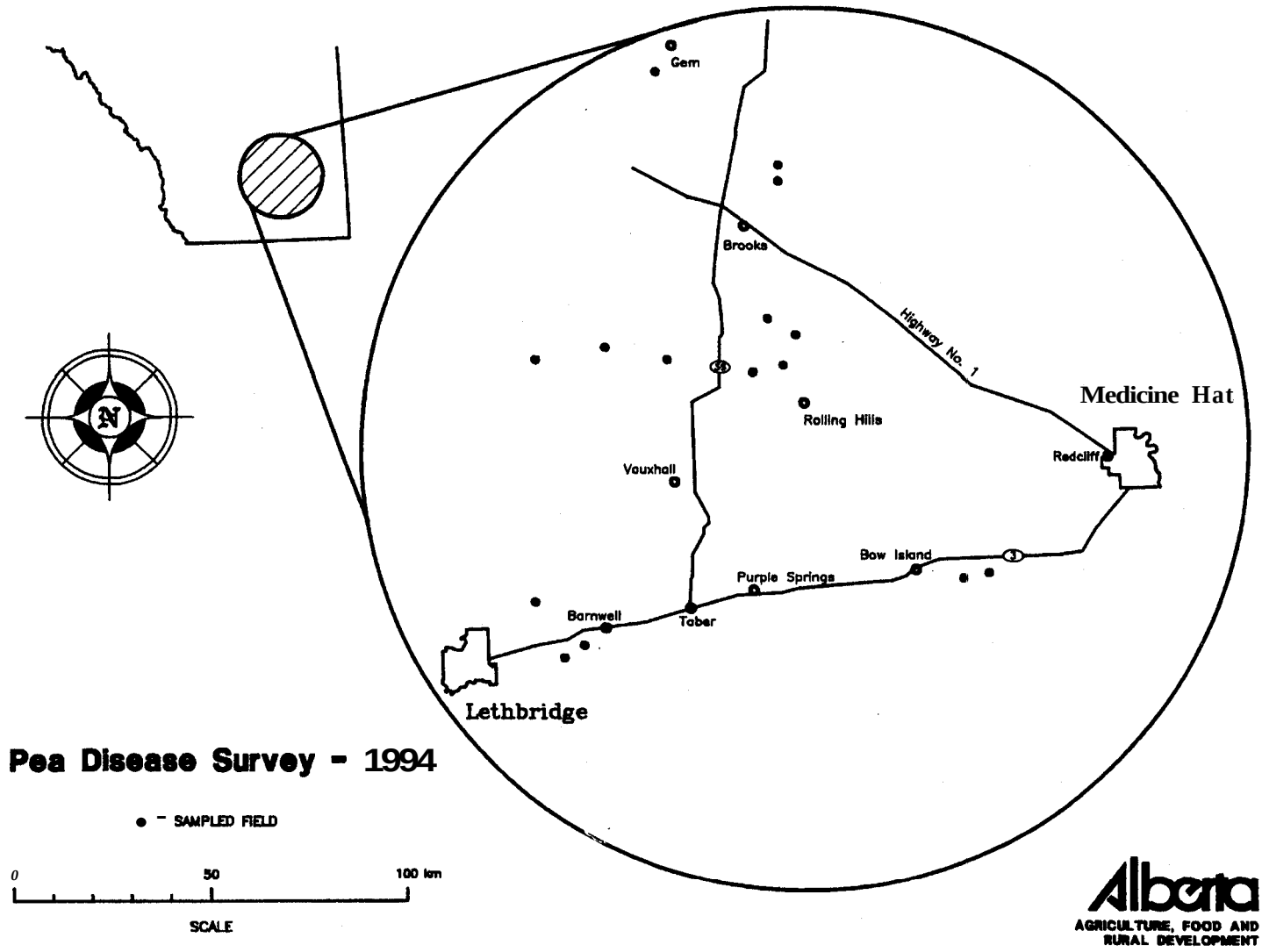
COMMENTS: Pea root rot incidence was moderate to high in most of the pea crops surveyed, but the severity of the disease was generally low.

TABLE 1. Incidence and severity of root rot from in fifteen commercial pea crops in southern Alberta in 1994.

Field No.	Field Size (ha)	Cultivar	End use	Avg. disease incidence (%)*	Avg. disease severity (0—4)**
1	12.1	Onward	Seed	64	1.1
2	12.1	Onward	Seed	65	0.9
3	12.1	Stampede	Processing	49	0.7
4	27.5	Stampede	Processing	18	0.2
5	38.7	Stampede	Processing	57	0.8
6	36.4	ICI	Seed	38	0.5
7	27.5	Lincoln	Seed	65	1.3
8	28.3	Scout	Seed	95	2.9
9	20.2	Century	Processing	27	0.3
10	16.1	Lincoln	Seed	78	1.9
11	24.2	Lincoln	Seed	88	2.2
12	25.0	Lincoln	Seed	75	1.8
13	10.9	Frosty	Seed	70	1.4
14	16.1	Lincoln	Seed	55	0.8
15	11.3	Lincoln	Seed	71	0.9

* Percentage of plants with root rot out of 100 examined per field.

** Clean (0) = no root discoloration, slight (1) = 1—10% root discoloration, moderate (2) = 11—25%, severe (3) = 26—50%, and very severe (4) = >51%.



very severe (4) = >51%.

FIG. 1. Location of pea fields surveyed for root rot in southern Alberta in 1994.

CROP: Field pea

LOCATION: Manitoba

NAME AND AGENCY:

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TITLE: DISEASES OF FIELD PEA IN MANITOBA IN 1994

METHODS: Thirty-three field pea crops were surveyed in southern Manitoba during the 1994 growing season. The crops surveyed were chosen at random in regions where most of the field peas in Manitoba are grown (Figure 1). The survey was conducted from July 21-28 when the crops were in the late flowering and pod filling stages. Ten plants were sampled at each of five random sites in each crop. Diseases were identified by symptoms and the severity of each disease was estimated using a scale of 0 (no disease) to 9 (whole plant severely diseased). In addition, diseases were diagnosed from 31 samples submitted to the Manitoba Agriculture Crop Diagnostic Centre by agricultural representatives and growers in Manitoba.

RESULTS AND COMMENTS: Eight diseases were recorded in the crops surveyed (Table 1). Of these mycosphaerella blight (*Mycosphaerella pinodes*) was prominent and occurred in all the crops examined. Severity varied from crop to crop and three crops were observed with heavy infection (severity >6). Downy mildew (*Peronospora viciae*) was observed in 30 crops but generally at trace levels (severity <2). Maximum severity was 2.5 in one crop only. The impact of this disease on yield of field pea in Manitoba is not clear. Sclerotinia rot *(Sclerotiniasclerotiorum*) was recorded in 20 crops and ranked as the third most common disease. Severe infection was observed in two crops in the Cypress and Glenboro areas, where the disease affected 100% of the plant population. Yield losses were estimated at over 70% in these crops. Powdery mildew (*Erysiphe pisi*) was observed in only 12 crops at trace to moderate levels (severity <4). However, a severe epidemic of powdery mildew occurred on pea crops in southern Manitoba late in :he growing season. Crops planted late were the most severely affected. Septoria leaf blotch (*Septoria pisi*) was observed in five crops and severe infection was found in one crop near Crystal City. Bacterial blight (*Pseudomonas pisi*), gray mold (*Botrytis* sp.) and anthracnose (*Colletotrichum pisi*) were observed in seven, five, and five crops, respectively, at trace amounts. The impact of these diseases is considered insignificant.

Of the 31 diseased samples of field pea submitted to the Manitoba Agriculture Crop Diagnostic Centre, 12 showed mycosphaerella blight, 9 root rot (*Fusarium* spp. and *Rhizoctonia solani*), 1 powdery mildew, 1 downy mildew, 1 seedling blight (*Pythium* spp.), 2 bacterial blight, 6 herbicide injury, and 3 symptoms caused by excess moisture.

ACKNOWLEDGMENT: We thank I. Wolfe and G. Mardli for their assistance in this survey.

TABLE 1. Prevalence and severity of field pea diseases in Manitoba in 1994.

Disease	No. crops surveyed	No. crops affected	Severity (0—9)*	
			Mean	Range
Mycosphaerella blight	33	33	3.0	1.0-6.8
Downy mildew	33	30	1.1	0.1-2.5
Sclerotinia rot	33	20	1.2	0.1-6.9
Powdery mildew	33	12	1.6	0.5-4.0
Bacterial blight	33	11	0.8	0.1-2.6
Gray mold	33	7	0.5	0.1-1.3
Septoria leaf blotch	33	5	1.7	0.5-6.3
Anthracnose	33	5	0.5	0.2-0.6

* 0 = no disease symptoms and 9 = whole plant severely diseased.

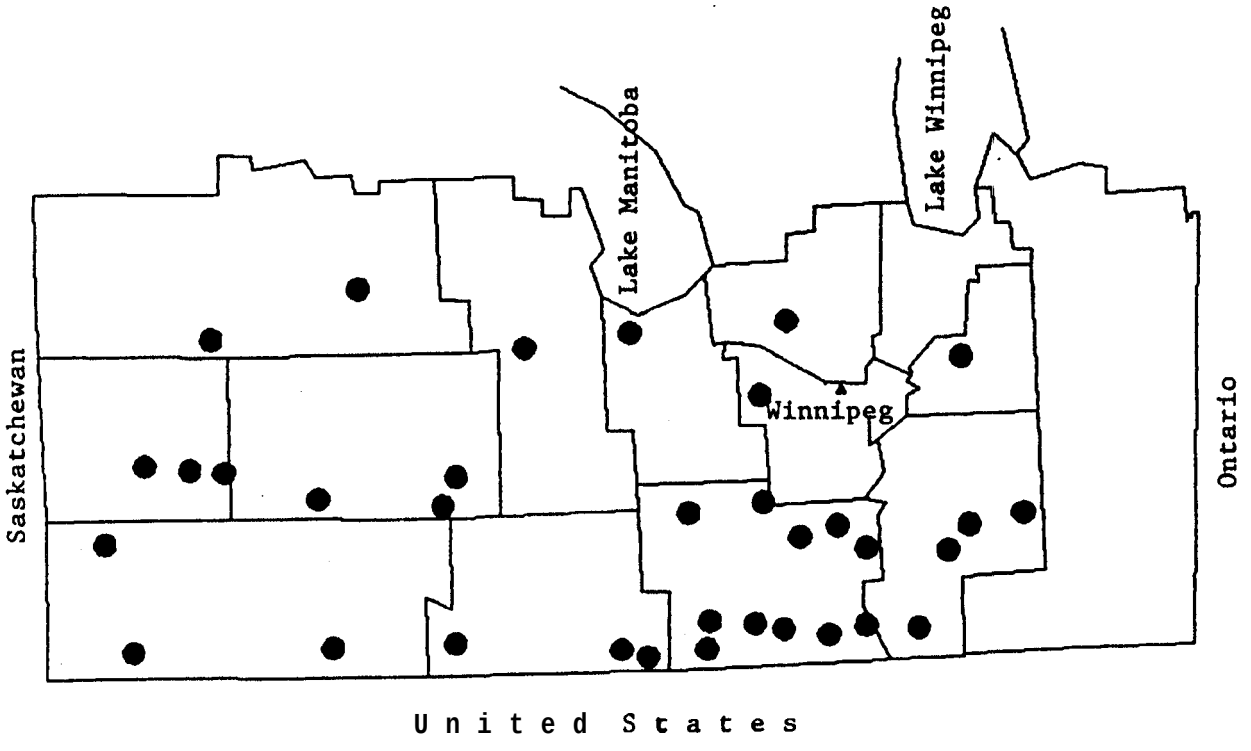

FIG. 1. Locations of 33 field pea crops surveyed for diseases in southern Manitoba in 1994.

CROP: Sunflower

LOCATION: Manitoba

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TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 1994

METHODS: A total of 56 sunflower crops in southern Manitoba and 2 crops in southeastern Saskatchewan were surveyed in 1994. Seventeen crops were surveyed in mid-July especially for downy mildew and eight of these were surveyed again in September for the other diseases. Eleven crops were surveyed on August 10, 13 crops on August 18, and 25 crops in the first week of September. Crops were selected at random, and each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the incidence of downy mildew (*Plasmopara halstedii*), sclerotinia wilt or head and stem infections (*Sclerotinia sclerotiorum*), and verticillium wilt (*Verticillium dahliae*) were estimated. Disease severity for rust (*Puccinia helianthi*) and leaf spots (*Septoria helianthi* and *Alternaria* spp.) were measured as percent leaf area infected. Only 49 crops were assessed for sclerotinia wilt, 38 crops for rust and verticillium wilt, 25 crops for sclerotinia head rot/stem rot, and 17 crops for downy mildew (Table 1). A disease index was calculated for each disease in every crop based on disease incidence or disease severity (Table 1).

In addition, 20 samples of sunflower were submitted for analysis to the Manitoba Agriculture Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Crop conditions were generally good throughout the 1994 growing season. Above normal soil moisture and slightly below normal temperatures at the seedling stage were favourable for soilborne downy mildew infections in several locations in southern Manitoba. The crop was 1-2 weeks earlier than normal in most crop regions.

Sclerotinia wilt/basal stem infection was prevalent in 78% of the crops surveyed for this disease, with incidence ranging from trace to 20% infected plants. Only one field at St. Joseph had 50% sclerotinia-wilted plants. Sclerotinia headrot and mid-stem breakage from ascospore infections were prevalent in 68% of the crops surveyed in late August and September, with incidence ranging from trace to 50% infected plants. The ratio of head rot and mid-stem infections varied among fields but seemed constant within individual fields. Only two crops had 30—50% head rot/mid-stem infected plants where yield losses were estimated at 30%.

Verticillium wilt was prevalent in 45% of the crops surveyed for this disease, with incidence ranging from trace to 1% infected plants in oilseed hybrids, and from trace to 20% in confectionery hybrids. The high disease incidence in confectionery hybrids is due to the lack of resistance in these hybrids.

Downy mildew was observed in 94% of the crops surveyed for this disease, with incidence ranging from trace to 60% infected plants. Several crops with 50—60% infected seedlings were ploughed under and re-seeded to other crops.

Rust was the least prevalent disease in 1994, and was observed in 8% of the crops surveyed. This is the second consecutive year of low incidence and severity of sunflower rust in Manitoba, and the lowest in the last ten years (1,2).

Leaf spots caused by *Septoria helianthi* and *Alternaria* spp. were observed in several crops at very low levels. Stem lesions caused by *Phoma* spp. were also observed at low levels in most crops surveyed towards the end of the season

Of the 20 samples submitted to the Manitoba Agriculture Crop Diagnostic Centre, nine were infected with downy mildew, two with sclerotinia head rot, and one with fusarium root rot. In addition to diseases, 11 of the samples were found to be affected by herbicide injury and one affected by insect damage.

ACKNOWLEDGEMENTS: The assistance of L.J. Wiebe and G. Mardli in conducting this survey is gratefully acknowledged.

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TABLE 1. Prevalence and intensity of sunflower diseases in Manitoba and south-eastern Saskatchewan in 1994.

Disease	No. and % of Crops Infested'		Disease Index** Mean	Disease Index** Range
Sclerotinia wilt	38	(78%)	1.1	T-3
Sclerotinia head rot	17	(68%)	1.1	1-3
Sclerotinia mid-stem	17	(68%)	1.1	1-3
Verticillium wilt	17	(45%)	0.9	T-2
Downy mildew	16	(94%)	2.0	T-4
Rust	3	(8%)	0.2	Traces
Stand	49		1.6	1-3
Vigour	49		1.5	1-3

* Sclerotinia wilt was assessed on 49 crops surveyed; sclerotinia head rot/mid-stem infections were assessed on 25 crops in mid-August and September; rust and verticillium wilt were assessed on 38 crops in August-September; while downy mildew was assessed on 17 crops.

** Disease index is based on a scale of 1 to 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 downy mildew, verticillium wilt, sclerotinia infections, and on disease severity measured as percent leaf area infected for rust. Indexes for stand and vigour are based on 1-5 scale (1= very good and 5= very poor).

CROP: Sunola

LOCATION: Saskatchewan

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TITLE: INCIDENCE OF SCLEROTINIA ON SUNOLA IN SASKATCHEWAN IN 1994

INTRODUCTION: Before 1992, sunflower production in Saskatchewan was limited by the short growing season and conventional farm equipment. Since the development of AC Sierra and AC Aurora, two miniature early maturing sunflower (sunola) cultivars, production has been on the rise. However, there was a decrease in production from 35,000 tonnes in 1993 to 26,000 tonnes in 1994, and a shift to southern regions of Saskatchewan [3]. These changes are due in part to the high incidence of sclerotinia diseases (*Sclerotinia sclerotiorum*) in 1993. The purpose of this survey was to examine the relationship between geography, plant density, crop history, and the incidence of aerial and basal stem rot.

MATERIALS AND METHODS: Thirty-two sunola crops were surveyed between August 30 and September 18, 1994, with three of the crops being resurveyed on October 7 to determine late season disease development. The survey was conducted as in 1993 with focus on four areas of canola production (Crop Districts 6B, 8A, 8B, and 9B) and one area of non-canola production (CD 7A) [1]. Disease incidence (DI) was calculated based on the number of diseased plants in four 100-plant samples taken at well-separated sites within each crop (Table 1). Basal stem infections and aerial infections (lesions on the head or upper stem) were recorded separately. If less than 5% plants were infected, DI was recorded as a trace. Mean plant density (number plants/m^2) was determined for each crop. Information on crop history and seeding rate was obtained from the grower.

RESULTS AND DISCUSSION: Total DI ranged from 0 to 36%, of which 55 to 100% was due to aerial infections. The high incidence of aerial infections was similar to that found in 1993 [1] and may be attributed to mid-summer precipitation which favoured the production of air-borne ascospores and disease development in flowering heads. However, some rural municipalities (RMs) in CDs 6B, 9B, and 8A received below normal precipitation in July and August [3] which may have limited disease development compared to the more favourable environment in 1993 [1].

Total DIs were greatest in CD 8A, followed by 9B, 6B, and 8B. Other susceptible crops, such as canola and pea, are commonly grown in these CDs and may have contributed sclerotia to the soil which when combined with sufficient moisture could result in high amounts of disease. For example, in CD 8A in a field which was sown to pea in 1991 and canola in 1990, a crop developed 36% total DI of which 33% was due to aerial infection. A crop in CD 9B developed a total of 23% disease, of which 10% was basal stem rot. This field had a large weed population (annual sow thistle, *Sonchus paniculata*) and had been sown to pea in 1993; both factors would contribute to the high DI. However, there was a low correlation between the number of years since the last susceptible crop and total DI ($r=0.45$).

Except for one crop in which a trace of head rot was found, disease was absent in CD 7A. This low level of disease also occurred in 1992 and 1993 and can be attributed to lack of previous host crops and lower precipitation in this area [1,2,3].

Plant density ranged from 12 plants/m^2 in CD 9B to 22 plants/m^2 in CD 7A. There was a low correlation between plant density and total disease development ($r=-0.37$). The mean seeding density in 1994 was 11 kg/ha which was similar to that of 1993 and twice that of 1992.

Of the three crops in CD 6B that were resurveyed, two showed an increase in total DI from 11 to 19% and from 5 to 10%, respectively. The RMs in which these two crops were located received 13 mm of precipitation in early September which would favour late disease development. The third crop, which showed no increase in disease, was located in an RM which received no late precipitation. Therefore, the values given in Table 1 may not reflect the full impact of *S. sclerotiorum* as they were recorded at least one month before harvest.

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TABLE 1. Summary of plant density, crop rotation, and percent sclerotinia disease incidences for 32 sunola crops in Saskatchewan, 1994.

Crop District	# Crops Surveyed	Mean Plant Density (plants/m^2)	Crop* Rotation	Mean %** Aerial DI (range)	Mean %** Basal DI (range)
8A	3	15	4	12 (t-33)	1 (0-3)
9B	7	12	3	4 (t-13)	2 (0-11)
66	10	16	6	2 (0-9)	1 (0-3)
86	4	17	6	2 (t-6)	1 (0-2)
7A	8	22	>10	0 (0-t)	0

* Mean number of years between susceptible host crops.
** t = trace amounts of disease (<5%).
Traces were counted as 1% when calculating mean DI.