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THE CANADIAN PHYTOPATHOLOGICAL SOCIETY / CANADIAN PLANT DISEASE SURVEY - DISEASE HIGHLIGHTS

SOCIÉTÉ CANADIENNE DE PHYTOPATHOLOGIE / INVENTAIRE DES MALADIES DES PLANTES AU CANADA - APERÇU DES MALADIES

The Society recognizes the continuing need for publication of plant disease surveys which benefit both federal and provincial agencies in planning appropriate research for the control of plant diseases. The reports you contribute are important to document plant pathology in Canada.

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Contents: DISEASE HIGHLIGHTS OF THE 1996 GROWING SEASON

The *Canadian Plant Disease Survey* is a periodical of information and record on the occurrence and severity of plant diseases in Canada and on the assessment of losses from disease.

Authors who have traditionally published scientific notes in the *Canadian Plant Disease Survey* are encouraged to submit this material in the future to the scientific journal of their choice, such as the *Canadian Journal of Plant Pathology* and *Phytoprotection.*

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L'Inventaire des maladies des plantes au Canada est un périodique d'information sur la fréquence des maladies des plantes au Canada, leur gravité, et les pertes qu'elles occasionnent.

On encourage les auteurs, qui traditionnellement publiaient des articles scientifiques dans l'Inventaire des maladies des plantes au Canada, à soumettre dorénavant leurs textes au journal scientifique de leur choix, par exemple, la *Revue canadienne de phytopathologie* et *Phytoprotection.*

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Diagnostic Laboratories / Labatoires diagnostiques

CROP: Commercial crops - Diagnostic Laboratory Report

LOCATION: British Columbia

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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS IN BRITISH COLUMBIA, 1996

METHODS: The B.C.M.A.F.F. Plant Diagnostic Laboratory provides diagnosis and control recommendations for diseases and disorders of commercial agricultural crops. The following data reflects samples submitted to the laboratory by ministry extension staff, growers, agribusiness, parks, and Master Gardeners. Diagnoses were accomplished by microscope examination, culturing onto artificial media, ELISA, BIOLOG® and dot blot assay. Some specimens were referred to other laboratories for identification or confirmation of the diagnosis.

RESULTS AND COMMENTS: Summaries of the diseases and/or causal agents diagnosed on commercial crops are presented in Tables 1-9 by crop category. The total number of submissions for each crop category is listed at the bottom of each table. Problems not listed include: nutritional stress; pH imbalance; water stress; poor sample; physiological responses to growing conditions; chemical damage; insect related injury; and damage where no conclusive disease-causing organism was identified.

Table 1. Summary of diseases diagnosed on **greenhouse vegetable** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	CASUAL AGENT/DISEASE	NO. OF SAMPLES
Cucumber	*Pythium* spp. crown and root rot	4
	Didymella bryoniae gummy stem blight	5
	Fusarium oxysporum wilt & stem rot	5
	Phomopsis sclerotioides black root rot	2
Lettuce	*Botrytis cinerea* gray mould	2
Pepper	Pythium/Phytophthora crown & root rot	2
	Cladosporium sp. mould	1
	INSV	1
Tomato cv. Trust	*Pythium* spp. root rot	5
	Humicola fuscoatra Corky root	1
	Erisyphe sp. powdery mildew	4
	TSWV	2
T. cv. Roncardo	*Fusarium oxysporum* f. sp. *radicis-lycopersici* Race 1 Crown and Root Rot	1
T. cv. Sweet Million	*Sclerotinia sclerotiorum* white mould	1
TOTAL DISEASES		36
TOTAL SUBMISSIONS		58

Table 2. Summary of diseases diagnosed on **floriculture** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Alyssum saxatile	*Albugo candida* white rust	1
Anemone sp.	INSV	1
Antirrhinum majus	*Pythium* spp. root rot	2
	Chalara elegans black root rot	1
	Peronospora sp. downy mildew	1
	Pseudomonas syringae pv. *antirrhini* bacterial leaf spot and blight	1
	INSV	1
Arabis caucasica	*Albugo candida* white rust	1
Begonia (Reiger)	INSV	1
Centaurea cineraria	*Pythium* sp. root rot	1
	Chalara elegans black root rot	1
Cyclamen persicum	*Botrytis cinerea* foliar blight	1
	Phytophthora sp. root rot	1
Dahlia x *hybrida*	*Botrytis cinerea* leaf spot	1
Dendranthema sp.	*Fusarium* sp. wilt	1
	Pythium/Phytophthora crown & root rot	2
	Rhizoctonia solani crown. & root rot	1
Dracaena sp.	Pythium/Phytophthora root rot	1
Euphorbia pulcherrima	Pythium/Phytophthora crown & root rot	5
	Chalara elegans black root rot	3
	Botrytis cinerea blight & stem canker	1
	Sclerotinia sclerotiorum crown rot	1
Eustoma grandiflorum	Pythium/Phytophthora root rot	1
Exacum affine	*Botrytis cinerea* stem rot	1
	INSV	1
Freesia x *hybrida*	*Pseudomonas marginata* bacterial scab	1
	Fusarium oxysporum f. sp. *gladioli* basal rot	1
	Freesia mosaic virus	1
Fuchsia x *hybrida*	*Botrytis cinerea* foliar blight	1
Gerbera jamesonii	Pythium/Phytophthora crown & root rot	4
Helianthus sp.	*Sclerotinia sclerotiorum* white mould	1
Hemerocallus fulva	Pythium/Phytophthora root rot	1
	Rhizoctonia solani crown & root rot	1
Impatiens wallerana	INSV	6
	Rhizoctonia solani foliar blight	1
New Guinea impatiens	INSV	1
Iris sp.	*Botrytis cinerea* foliar blight	1
	Rhizoctonia solani neck and bulb rot	6
	Pythium/Phytophthora root rot	1
	Ditylenchus dipsaci bulb & stem nematode	1
Kalanchoe blossfeldiana	INSV	1
Lilium sp.	Pythium/Phytophthora root rot	1
	Rhizoctonia solani scale and root rot	1
	Myxomycete slime mould	2
	Botrytis elliptica leaf spot & blight	3

(cont'd)

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Narcissus spp.	*Stromatinia gladioli* dry scale	1
	Fusarium sp. bulb rot	1
	Botryotinia narcissicola smoulder	1
	Ditylenchus dipsaci bulb & stem nematode	5
Pelargonium x *hortorum*	*Xanthomonas campestris* pv. *pelargonii* bacterial blight	2
	Pythium sp. blackleg	1
	Botrytis cinerea grey mould	2
	Tobacco Ringspot Virus	1
	Leaf cupping virus	1
P. x *domesticum*	*Chalara elegans* black root rot	1
Petunia x *hybrida*	*Pythium* sp. root rot	1
	Chalara elegans black root rot	1
Senecio cruentus	INSV	2
Trillium ovatum	Pythium/Phytophthora root and stem rot	1
Tulipa sp.	*Botrytis tulipae* fire	2
	Rhizoctonia tuliparum grey bulb rot	1
	Penicillium sp. flower embryo rot	1
Verbena x *hybrida*	*Chalara elegans* black root rot	1
Viola spp.	*Pythium* sp. root rot	1
	Peronospora violae downy mildew	1
Zinnia sp.	Virus (ELISA reaction to WMV-2)	1
TOTAL DISEASES		98
TOTAL SUBMISSIONS		182

Table 3. Summary of diseases diagnosed on **small fruit** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Blueberry	*Alternaria tenuissima* fruit rot	1
	Botrytis cinerea fruit rot	3
	Colletotrichum gloeosporioides fruit anthracnose	1
	Botrytis cinerea blossom blight	24
	Botrytis twig blight/leaf necrosis	1
	Coryneum sp. stem canker	1
	Phomopsis vaccinii stem canker	1
	Godronia cassandrae stem canker	10
	Monilinia vaccinii-corymbosi mummy berry	5
	Pseudomonas syringae bacterial blight	16
	Phytophthora spp. crown and root rot	7
	Crown and root galls	1
Blackberry	*Septoria rubi* cane spot	1
Currant	*Drepanopeziza ribis* leaf spot	1
	Botrytis cinerea twig blight/fruit rot	1
	Pseudomonas syringae bacterial blight	1
Gooseberry	*Ganoderma lucidum* mushroom at crown	2
Grape	Powdery mildew	1
Raspberry	*Didymella applanata* spur blight	3
	Leptosphaeria coniothyrium cane blight	2
	Phragmidium rubi-idaei yellow rust	2
	Phytophthora fragariae crown & root rot	12
	Pseudomonas syringae bacterial blight	4
	Colletotrichum gloeosporioides cane anthracnose	1
	Cladosporium sp. fruit rot	1
Saskatoon	*Phytophthora* sp. root rot	1
	Powdery mildew	1
	Fabraea maculata leaf spot	1
	Apiosporina collinsii fruit spot	1
Strawberry	*Phytophthora* sp. crown & root rot	4
TOTAL DISEASES		111
TOTAL SUBMISSIONS		184

Table 4. Summary of diseases diagnosed on **specialty crop** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Basil	*Fusarium oxysporum* wilt	1
	Pythium sp. root rot	1
Dill	*Pythium* sp. root rot	1
Echinacea	*Fusarium* sp. crown rot	1
	Pythium/Phytophthora root rot	1
Evening Primrose	*Erysiphe* sp. powdery mildew	1
Ginseng	*Alternaria panax* leaf & stem blight	15
	Alternaria alternata on leaf/stem	6
	Cylindrocarpon destructans root rot	2
	C. destructans rusty root lesions	3
	Fusarium sp. root lesions	1
	Rhizoctonia spp. crown & root rot	2
	Pythium/Phytophthora damping off	4
	Pythium/Phytophthora root rot	1
	Phytophthora spp. root rot	5
	Phytophthora cactorum foliar blight	5
	Meloidogyne sp. root knot nematode	1
Goldenseal	*Rhizoctonia* sp. crown rot	1
Oregano	*Rhizoctonia solani* stem blight	1
Stevia	*Septoria steviae* leaf spot	1
Wasabai horseradish	*Botrytis cinerea* blight	1
TOTAL DISEASES		55
TOTAL SUBMISSIONS		82

Table 5. Summary of diseases diagnosed on **tree fruit** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Apple	*Venturia inaequalis* scab	1
	Nectria galligena canker	3
	Cytospora sp. (Valsa) canker	3
	Phytophthora spp. crown & root rot	2
	Phytophthora cactorum crown & root rot	1
	Basidiomycete wood rot fungus	1
	Cylindrocarpon didymum twig canker	1
	Phoma sp. leaf spot	1
	Agrobacterium tumefaciens crown gall	1
	Pezicula malicorticis anthracnose canker	2
Fuji /Gala /Smoothee	*Erwinia amylovora* fireblight	4
Ottawa 3 rootstock	*Erwinia amylovora* fireblight	2
M9 rootstock	*Erwinia amylovora* fireblight	1
Apricot	*Monilinia* sp. brown rot	1
Cherry	*Phytophthora* sp. twig bundle rot	1
	Phytophthora spp. crown and root rot	3
	Pseudomonas syringae pv. *morsprunorum* bacterial blight	1
	Wilsonomyces carpophilus canker/dieback	1
Peach	*Coryneum beyerinckii* blight	1
	Taphrina deformans leaf curl	1
	Phytophthora sp. crown and root rot	1
Pear	*Erwinia amylovora* fireblight	1
Walnut	*Xanthomonas campestris* bacterial blight	1
TOTAL DISEASES		35
TOTAL SUBMISSIONS		78

Table 6. Summary of diseases diagnosed on **field vegetable** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Asparagus	*Fusarium oxysporum* f. sp. *asparagi* crown & root rot	1
Brussels sprout	*Alternaria brassicae* leaf spot	1
Cucumber	*Fusarium oxysporum* crown & root rot	1
Eggplant	*Erwinia* sp. bacterial soft rot	1
Lettuce	*Bremia lactucae* downy mildew	1
	Pythium sp. root rot	1
Melon	*Pythium* sp. root and stem rot	1
Onion	*Botrytis squamosa* leaf blight	1
	Sclerotinia cepivorum white rot	1
	Pseudomonas cepacia sour skin	1
Parsnip	*Fusarium* sp. rusty root lesions	1
Pea	*Sclerotinia sclerotiorum* white mould	1
Potato	*Phytophthora infestans* late blight	6
	Alternaria solani early blight	2
	Spongospora subterranea powdery scab	1
	Bacterial soft rot of tubers	1
	Erwinia carotovora blackleg	2
	Verticillium dahliae wilt	3
	Rhizoctonia solani stem canker	1
	Botrytis cinerea grey mould	1
	Potato Virus Y º	1
Pumpkin	*Didymella bryoniae* gummy stem blight	1
Tomato	*Phytophthora infestans* late blight	1
Turnip	*Plasmodiophora brassicae* club root	1
TOTAL DISEASES		33
TOTAL SUBMISSIONS		69

Table 7. Summary of diseases diagnosed on **woody ornamental and herbaceous perennial** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Abies sp.	Pythium/Phytophthora root rot	4
	Phaeocryptopus pseudosugae needle cast	1
Acer japonicum	*Phytophthora* sp. crown & root rot	1
	Apiognomonia errabunda anthracnose	1
	Kabatiella apocrypta anthracnose	1
Acer palmatum	*Pseudomonas syringae* bacterial blight	4
	Verticillium dahliae wilt	1
	Phytophthora sp. root rot	1
	Kabatiella apocrypta anthracnose	3
Acer sp.	*Phytophthora* sp. crown & root rot	1
	Nectria cinnabarina canker	1
Arbutus menziesii	Pythium/Phytophthora root rot	1
Arctostaphylos uva-ursi	*Phytophthora* sp. crown & root rot	1
Artemisia sp.	*Rhizoctonia solani* crown rot	1
Aster sedifolius	*Sclerotinia sclerotiorum* stem rot	1
Azalea japonica	*Exobasidium* sp. leaf gall	1
Azalea spp.	Pythium/Phytophthora root rot	1
	Agrobacterium tumefasciens crown gall	1
Boxus sp.	Pythium/Phytophthora root rot	1
Chamaecyparis nootkatensis	*Phytophthora* sp. root rot	1
C. lawsoniana	*Phytophthora* spp. root rot	3
Cornus sp.	*Discula* sp. anthracnose	1
Dicentra spectabilis	*Rhizoctonia solani* crown & root rot	1
Galium sp.	*Rhizoctonia solani* crown & root rot	1
Gaultheria shallonia	Pythium/Phytophthora crown & root rot	1
Hedera sp.	*Colletotrichum gloeosporioides* anthracnose	1
Hepatica triloba	*Septoria hepaticicola* leaf spot	1
Heuchera sp.	*Puccinia heucherae* rust	1
Hibiscus sp.	*Fusarium lateritium* twig dieback	1
Hosta sp.	Unidentified virus	1
Hydrangea spp.	*Erysiphe* sp. powdery mildew	1
	Ascochyta sp. leaf spot	1
Ilex sp.	*Phytophthora ilicis* leaf blight	4
	Sooty mould complex on leaves	2
Juniperus sabina	*Phytophthora* spp. root rot	2
Juniper sp. (Bonsai)	*Phytophthora* sp. crown & root rot	1
Juniper spp.	*Kabatina juniperi* foliar blight	3
	Lophodermium juniperi foliar blight	3
	Phytophthora sp. root rot	1
Kalmia latifolia	*Mycosphaerella* sp. leaf spot	1
Lavandula angustifolia	*Botrytis cinerea* foliar blight	1
Lavandula sp.	*Rhizoctonia solani* crown rot & blight	1
Leucothoe sp.	Powdery mildew	1
Liriope sp.	*Sarcoschypha* sp.	1

(cont'd)

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Magnolia sp.	*Colletotrichum gloeosporioides* anthracnose	1
	Phomopsis sp. leaf spot	1
	Pseudomonas syringae bacterial blight	4
Malus spp.	*Phytophthora* sp. crown & root rot	1
	Venturia inaequalis scab	1
Morus sp.	*Fusarium lateritium* twig canker	1
Picea sp.	*Phytophthora* sp. crown & root rot	1
Pinus strobus	Pythium/Phytophthora root rot	2
Pinus sp.	*Lophodermella concolour* needlecast	1
Platanus x *acerifolia*	*Apiognomonia veneta* anthracnose	3
Populus sp.	*Taphrina* sp. leaf gall	1
Prunus virginiana	*Monilinia laxa* brown rot canker	1
	Monilinia spp. brown rot	2
Prunus spp.	*Monilinia* spp. brown rot	3
	Verticillium dahliae wilt	2
	Pseudomonas syringae bacterial blight	3
Pseudotsuga menziesii	*Rhizosphaera kalkhoffii* needlecast	1
	Pythium/Phytophthora root rot	2
	Botrytis & *Phomopsis* spp. twig blight	2
	Taphrina caerulescens leaf blister	1
Rhamnus purshiana	*Puccinia coronata* rust	1
Rhododendron spp.	*Phytophthora* spp. crown & root rot	3
	Phomopsis sp. stem canker	1
	Microsphaera sp. powdery mildew	1
Rosa rugosa	*Phytophthora* sp. root rot	1
Rosa woodsii	*Phragmidium* sp. leaf rust	1
Rosa spp.	Pythium/Phytopthora crown & root rot	5
	Peronospora sparsa downy mildew	2
	Cladosporium sp. sooty mould	1
	Phomopsis sp. stem canker	1
Rosmarinus sp.	*Phytophthora* sp. root rot	1
Salix sp.	*Glomerella miyabeana* black canker	1
Schefflera sp.	Pythium/Phytophthora root rot	1
Sequoiadendron giganteum	*Phytophthora* sp. root rot	1
Smilacina stellata	*Stemphylium* sp. leaf spot	1
Spirea trilobata	Pythium/Phytophthora root rot	1
Stephanotis sp.	INSV	1
Syringa vulgaris	*Pseudomonas syringae* bacterial blight	1
Taxus sp.	*Phytophthora* sp. crown & root rot	1
Thuja occidentalis	*Kabatina thujae* foliar blight	1
	Pythium/Phytophthora root rot	3
	Armillaria mellea root rot	2
T. plicata	*Kabatina thujae* foliar blight	1
Thuja spp.	*Didymascella thujina* (Keithia) blight	1
	Seiridium cardinale (Berckmann's)	1
	Phytophthora spp. crown & root rot	2
Tilia sp.	*Verticillium dahliae* wilt	2

(cont'd)

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Ulmus sp.	Pythium/Phytophthora root rot	1
	Nectria cinnabarina canker	1
Veronica spicata	*Botrytis elliptica* foliar blight	1
Viburnum opulus	*Ascochyta* sp. leaf spot	1
TOTAL DISEASES		141
TOTAL SUBMISSIONS		434

Table 8. Summary of diseases diagnosed on **turfgrass** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996*.

DISEASE/CAUSAL AGENT	Green	Sod	Lawn	
Pythium spp. root rot		21		
Pythium sp. foliar blight		1		
Gaeumannomyces graminis	4	3		
Ascochyta spp.		2	3	
Microdochium nivale		7	10	1
Typhula incarnata		1	1	1
Colletotrichum graminicola		6	1	
Rhizoctonia solani		1		1
Rhizoctonia cerealis		1		
Fusarium sp. crown/root rot				1
Limonomyces roseipellis			1	
Laetisaria fuciformis			1	2
Curvularia sp.			1	
Drechslera sp.		1		
Puccinia sp.				1
Leptosphaeria korrae				4
Basidiomycete fairy ring		2	4	1
TOTAL DISEASES		45	23	16
TOTAL SUBMISSIONS		65	36	28

*Golf and bowling greens and sod are primarily creeping bentgrass and/or annual bluegrass. Lawn turf refers to mixtures of fescues, ryegrass, Kentucky bluegrass and annual bluegrass.

Table 9. Summary of diseases diagnosed on **field crop** samples submitted to the B.C.M.A.F.F. Plant Diagnostic Laboratory in 1996.

CROP	DISEASE/CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Phytosplasma witches-broom	1
	Fusarium oxysporum crown & root rot	1
Canola	*Alternaria brassicae* black spot	1
	Leptosphaeria maculans virulent blackleg[x]	6
Orchard Grass	*Drechslera* sp. leaf spot	1
Pea	Pythium/Rhizoctonia/Fusarium root rot	1
	Pythium/Phytophthora root rot	1
Wheat	*Gaeumannomyces graminis* take-all	1
	Septoria sp. leaf blight	1
TOTAL DISEASES		14
TOTAL SUBMISSIONS		77

[x] 66 canola samples were submitted for testing from Peace River district, Alberta. Virulent blackleg was confirmed by culture pigment assay, ELISA, and PCR (Dr. J. Taylor) at Agriculture and Agri-Food Canada Biotechnology Laboratories, Saskatoon, Sask.

CROP: Commercial Crops - Diagnostic Laboratory Report

LOCATION: Alberta

NAME AND AGENCY:
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P.O. Box 1701, Brooks, Alberta, Canada T1R 1C5

TITLE: DISEASES DIAGNOSED ON CROP SAMPLES FROM ALBERTA SUBMITTED TO BROOKS DIAGNOSTICS LIMITED IN 1996

METHODS: Brooks Diagnostics Limited (BDL), a private plant health clinic, assumed responsibility for operating the plant diagnostic laboratory at the Alberta Crop Diversification Centre - South, Brooks on July 1, 1993. BDL offers a full range of services in diagnosing plant health problems in fields, greenhouses, nurseries, golf courses, yards, gardens, acreages, parks and interiorscapes. The clinic applies state-of-the-art technologies such as Enzyme-Linked Immunosorbent Assay (ELISA), immunofluorescence (IMF), and others for specialized diagnostic requirements, as well as using conventional diagnostic procedures such as visual examination of symptoms, microscopic observation and culturing on artificial media for general diagnostic requirements. BDL provided diagnosis of, and control recommendations for, disease problems on commercial crops and other plants submitted by farmers, extension specialists, scientists, agribusinesses, market gardeners, florists, greenhouse growers, landscaping companies, municipal parks staff, nurseries, golf course supervisors, and the general public from January 1 to November 30, 1996. We thank D.R. Bolding and E.A. James for technical assistance.

RESULTS: Disease identifications from various crop categories are summarized in Tables 1-8, and are organized according to the region of submission. BDL also received samples associated with insect damage and from regions other than Alberta. These data are not included in this report.

Table 1. Summary of diseases diagnosed on **field-grown vegetable** crops submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	SOUTHERN ALBERTA	
Bean	Common blight	*Xanthomonas campestris* pv. *phaseoli*
	Root rot/wilt/ yellowing	*Fusarium solani*
		Rhizoctonia solani
		Pythium spp.
Potato	Early blight	*Alternaria solani*
		Alternaria alternata
	Black scurf/stem canker	*Rhizoctonia solani*
	Pink rot	*Phytophthora erythroseptica*
	Dry/root rot	*Fusarium solani*
	Blackheart	Inadequate oxygen supply
	Vascular discoloration	Physiological
Sugar Beet	Chlorosis/tip burn	Nutrient deficiency
	NORTH WESTERN ALBERTA	
Potato	Dry rot	*Fusarium solani*
	Soft rot	*Erwinia carotovora* subsp. *carotovora*

Table 2. Summary of diseases diagnosed on **greenhouse crop and interiorscape plant** samples submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	SOUTHERN ALBERTA	
Chrysanthemum	Leaf spot	TSWV-L & INSV*
Cucumber	Angular leaf spot	*Pseudomonas syringae* pv. *lachrymans*
Ficus	Brown spot/ discoloration	Magnesium deficiency
Geranium	Leaf curling/stem twisting	Herbicide damage
Lipstick plant	Pale green foliage	Environmental stress Magnesium deficiency Humidity damage
Liatrus	Dieback/corm rot	*Pseudomonas* spp.
Mint	Root rot	*Pythium* spp. *Fusarium* spp.
Statice	Root rot	*Fusarium* spp. *Rhizoctonia* spp. *Phytophthora* spp.
Tomato	Pith necrosis Root/crown rot Early blight	*Pseudomonas corrugata* *Fusarium oxysporum* *Alternaria* spp.
	SOUTH CENTRAL ALBERTA	
African Violet	Crown/root rot	*Pythium ultimum*
Begonia	Mottling & browning	Suspect TSWV-L or INSV
Chrysanthemum	Dieback & necrosis	Fertilizer damage
Cineraria	Leaf mottling/spot	TSWV-L & INSV*
Cordyline	Root rot	*Fusarium solani* *Pythium* spp.
Geranium	Fiddlenecking/ leaf distortion	Freezing damage/ growth retardants
Impatiens	Necrotic spots/dieback	Water stress
Pandanus	Gummosis	Environmental stress
Pothos	Root rot	*Fusarium solani* *Pythium* spp.

(cont'd)

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	NORTH CENTRAL ALBERTA	
Tomato	Necrotic spots	Suspect autogene necrosis (genetic disorder)
	Stem/root rot	*Pythium* sp.
	Crown/root rot/ wilt	*Fusarium oxysporum* f. sp. *lycopersici*
		Rhizoctonia solani
	PEACE RIVER REGION	
Geranium	Root rot	*Rhizoctonia solani*
	Stem black rot	*Xanthomonas campestris* pv. *pelargonii*

* Strains of tomato spotted wilt virus (TSWV-L) and impatiens necrotic spot virus (INSV) listed above were identified with strain specific antisera using the ELISA technique.

Table 3. Summary of diseases diagnosed on **herbaceous and woody ornamental plants** submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	SOUTHERN ALBERTA	
Ash	Fiddleheading/rolling	Herbicide damage
Birch	Fiddleheading/rolling	Herbicide damage
Chokecherry	Leaf discoloration	Magnesium deficiency
Elm	Wilt & dieback	*Verticillium albo-atrum*
Maple	Chlorosis	Herbicide damage
Poplar	Fiddleheading/ leaf rolling/distortion	Herbicide/frost damage
Spirea	Leaf margin burn	Environmental stress
	Gummosis	*Botryosphaeria obtusa*
Spruce	Dieback	Environmental stress
	Needle browning	Herbicide damage
	Canker	*Leucostoma kunzei*
	Needle cast	*Isthmiella crepidiformis*
	Fiddleheading/necrosis	Herbicide damage
	Pink needle discoloration	Root/soil problem
	SOUTH CENTRAL ALBERTA	
Birch	Dieback/leaf curling	Environmental stress
		Chemical damage
	Sooty mold	*Encoelia pruinosa*
	Canker	*Nectria galligena*
Elm	Wilt/dieback	*Dothiorella ulmi*
Mountain Ash	Yellowing	Magnesium deficiency
	Fire blight	*Erwinia amylovora*
	Stem canker	*Cytospora abietis*
		Leucostoma niveum
Pine	Needle browning	Environmental stress
Rose	Brand canker	*Coniothyrium wernsdorffiae*
Scots Pine	Needle browning	Environmental stress
	Needle blight	*Mycosphaerella dearnessii*
Spruce	Needle browning	Phosphorus deficiency
	Brown patches	Environmental damage to root system

(cont'd)

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	NORTH CENTRAL ALBERTA	
Aspen	Leaf/shoot blight	*Venturia populina*
Larkspur	Crown & stem rot	*Erwinia* sp.
Mayday	Black knot	*Dibotryon morbosum*
Mountain Ash	Fire blight	*Erwinia amylovora*
Pine	Brown spot	*Mycospharella dearnessii*
	Needle blight	*Dothistroma septospora*
Spruce	Needle browning	Environmental stress
	Canker	*Leucostoma kunzei*
	Needle blight	*Mycosphaerella dearnesii*
	NORTH EASTERN ALBERTA	
Juniper	Dieback	*Phomopsis* sp.
Spruce	Needle cast	*Ploioderma lethale*
	NORTH WESTERN ALBERTA	
Rose	Canker	*Nectria cinnabarina*
	Stem rot	Cultural problem/ wax too thick
	PEACE RIVER REGION	
Spruce	Needle cast	*Lophodermium piceae*

Table 4. Summary of diseases diagnosed on **fruit crops** submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	SOUTH CENTRAL ALBERTA	
Apple	Fire blight	*Erwinia amylovora*
	NORTH EAST ALBERTA	
Apple	Fire blight	*Erwinia amylovora*
	NORTH WEST ALBERTA	
Apple	Fire blight	*Erwinia amylovora*

Table 5. Summary of diseases diagnosed on samples of **turfgrass** submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	SOUTHERN ALBERTA	
Turf	Pink snow mold	*Microdochium nivale*
	Fusarium patch	*Fusarium* spp.
	Brown patch	*Rhizoctonia solani*
	Pythium blight	*Pythium* sp.
	Dead patches	*Fusarium graminearum*
		Fusarium culmorum
	SOUTH CENTRAL ALBERTA	
Turf	Leaf spot	*Drechslera poae*
	Anthracnose	*Colletotrichum graminicola*
	Stripe smut	*Ustilago striiformis*
	Summer patch	*Magnaporthe poae*
	Leaf spot	*Cercospora* sp.
	Pink snow mold	*Microdochium nivale*
	Fusarium patch	*Fusarium* spp.
	Pythium blight	*Pythium* sp.
	Brown patch	*Rhizoctonia solani*
	Patch disease	Chemical (fertilizer) burn
	NORTH CENTRAL ALBERTA	
Turf	Pink snow mold	*Microdochium nivale*
	Fusarium patch	*Fusarium* spp.
	Brown patch	*Rhizoctonia solani*
	Pythium blight	*Pythium* sp.
	NORTH EASTERN ALBERTA	
Turf	Pink snow mold	*Microdochium nivale*
	Fusarium patch	*Fusarium graminearum*
	Pythium blight	*Pythium* sp.

(cont'd)

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	NORTH WESTERN ALBERTA	
Turf	Pink snow mold	*Microdochium nivale*
	Fusarium patch	*Fusarium culmorum*
		Fusarium equiseti
	Pythium blight	*Pythium* sp.
	PEACE RIVER REGION	
Turf	Pink snow mold	*Microdochium nivale*
	Fusarium patch	*Fusarium culmorum*
		Fusarium equiseti

Table 6. Summary of diseases diagnosed on **cereal crop** samples submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	SOUTHERN ALBERTA	
Wheat	Root rot	*Rhizoctonia solani*
		Fusarium spp.
		Pythium spp.
	Black chaff	*Xanthomonas campestris* pv. *translucens*
	Twisted leaves & awns	Moisture stress/Herbicide damage
	Stunting/seed heads not fully emerged	Drought/ Herbicide damage
	Leaf/glume blotch	*Septoria tritici*
	Common root rot	*Bipolaris sorokiniana*
	Unnatural color	Phosphorus deficiency
	Leaf mottling & tip burning	Frost damage/dryness
	SOUTH CENTRAL ALBERTA	
Barley	Loose smut	*Ustilago nuda*
Wheat	Common root rot	*Bipolaris sorokiniana*
	Loose smut	*Ustilago tritici*
	Dieback	Environmental stress
		Hail damage
	NORTH CENTRAL ALBERTA	
Wheat	Root rot	*Fusarium* spp.
		Pythium spp.
	NORTH EASTERN ALBERTA	
Barley	Leaf spot	Chemical/herbicide damage
Wheat	Spot blotch	*Cochliobolus sativus*
	Leaf & glume blotch	*Septoria tritici*
	Leaf spot	*Drechslera* spp.
	Leaf blight	*Alternaria* spp.
	Root rot	*Rhizoctonia solani*
	NORTH WESTERN ALBERTA	
Wheat	Root rot	*Pythium* spp.

Table 7. Summary of diseases diagnosed on **forage crop** samples submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT
	SOUTHERN ALBERTA	
Alfalfa	Crown/root rot	*Rhizoctonia solani*
		Fusarium spp.
	Leaf spot	*Stemphylium botryosum*
	Seedling blight	*Pythium* sp.
	Downy mildew	*Peronospora trifoliorum*
	Wilt	*Verticillium albo-atrum*

Table 8. Summary of diseases diagnosed on **oilseed and special field crop** samples submitted to Brooks Diagnostics Limited in 1996.

CROP/PLANT	DISEASE/SYMPTOM	CAUSAL AGENT/PLANT PATHOGEN
	SOUTHERN ALBERTA	
Canola	Callus/gall formation, crinkled leaves	2,4-D or phenoxy herbicide damage
Ginseng	Root rot	*Fusarium* spp.
		Tylenchus sp.
		Gram positive bacteria
	SOUTH CENTRAL ALBERTA	
Canola	Blackleg	*Leptosphaeria maculans*[*]
	NORTH EASTERN ALBERTA	
Canola	Purpling of leaf margins, loss of vigor	Phosphorus deficiency
	Leaf spot	Chemical damage

[*] Disease was confirmed serologically with specific monoclonal antibodies using the ELISA technique.

CROP: Commercial and Special Crops and Ornamental Trees and Shrubs - Diagnostic Laboratory Report

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: DISEASES DIAGNOSED ON COMMERCIAL AND SPECIAL CROPS AND ORNAMENTAL TREES AND SHRUBS SUBMITTED TO THE MANITOBA CROP DIAGNOSTIC CENTRE LABORATORY IN 1996

METHODS: The Manitoba Agriculture Crop Diagnostic Centre provides diagnoses and control recommendations for disease problems of agricultural crops and ornamentals. Samples are submitted by Manitoba Agriculture extension staff, farmers, agri-business and the general public. Diagnosis is based on visual examination for symptoms and culturing onto artificial media.

RESULTS AND COMMENTS: Summaries of diseases diagnosed on samples of oilseed crops, ornamental trees and shrubs, potato, pulse crops, special crops, turfgrass, and vegetables are presented in Table 1-7. The total number of submissions is listed at the bottom of each crop section.

Table 1. Summary of diseases diagnosed on **oilseed crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1996.

SYMPTOM/DISEASE	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
FLAX		
Aster Yellows	*Aster Yellows phytoplasma*	2
Pasmo	*Septoria linicola*	5
Environmental damage		11
Herbicide injury		20
Nutrient deficiency		1
Mechanical injury		1
Total		40
SUNFLOWER		
Root rot	*Pythium* sp.	3
Herbicide injury		11
Nutrient deficiency		2
Environmental damage		1
Total		22
CANOLA		
Blackleg	*Leptosphaeria maculans*	17
Downy mildew	*Peronospora parasitica*	7
Black spot	*Alternaria* spp.	9
Root rot, seedling blight	*Rhizoctonia solani, Fusarium* spp.	13
Sclerotinia	*Sclerotinia sclerotiorum*	5
Aster yellows	*Aster Yellows phytoplasma*	1
Grey stem	*Pseudocercosporella capsellae*	3
Herbicide injury		1
Environmental damage		11
Nutrient deficiency		22
Total		165

Table 2. Summary of diseases diagnosed on **ornamental trees and shrubs** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1996.

SYMPTOM/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
ASPEN		
Shoot blight	*Pollaccia* sp.	1
BASSWOOD		
Canker	undetermined	2
LILAC		
Root rot	undertermined	1
Herbicide damage		4
Environmental damage		2
Total		7
JUNIPER		
Canker	undetermined	1
MOUNTAIN ASH		
Canker	*Cytospora* spp.	2
Fireblight	*Erwinia amylovora*	1
Insect injury		1
Total		4
COTONEASTER		
Environmental damage		2
NINEBARK		
Fireblight	*Erwinia amylovora*	1
WILLOW		
Willow blight	*Venturia macularis* sp.	4
Environmental damage		3
Herbicide damage		12
Nutrient deficiency		3
Total		24
SPRUCE		
Needle Cast	*Rhizosphaera kalkoffii*	6
Cytospora canker	*Cytospora kunzei*	4
Snow mold	*Herpotrichia* sp.	2
Damping off	*Fusarium* spp.	2
Herbicide damage		1
Nutrient deficiency		4
Environmental damage		24
Total		43

(cont'd)

SYMPTOM/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES	
PINE			
Environmental damage		2	
Herbicide damage		2	Total 4
POPLAR			
Shoot blight	*Pollacia* sp.	1	
Leaf spot	*Septoria* sp.	1	
Leaf blight	*Linospora tetraspora*	2	
Canker	*Canker* sp.	2	
Environmental damage		3	
Herbicide damage		6	
Nutrient deficiency		2	
Total		17	
OAK			
Environmental damage		2	
CARAGANA			
Septoria leaf spot	*Septoria* sp.	1	
Root rot	undetermined	1	
Environmental damage		1	
Herbicide damage		2	
Nutrient deficiency		1	
Total		6	
BALSAM FIR			
Environmental damage		1	
BIRCH			
Canker	*Cytospora* sp.	1	
Herbicide damage		1	Total 2
ASH			
Anthracnose	*Gloeosporium aridum*	1	
Canker	undetermined	2	
Environmental damage		3	
Insect injury		9	
Herbicide damage		15	
Total		30	
MAPLE			
Anthracnose	*Gloeosporium* sp.	1	
Canker	undetermined	1	
Canker	*Tubercularia* sp.	1	
Environmental damage		3	
Herbicide damage		8	
Total		14	

Table 3. Summary of diseases diagnosed on **potato** crops submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1996.

SYMPTOM/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Early blight	*Alternaria solani*	12
Root rot	Fusarium spp.	5
Root rot	*Rhizoctonia solani*	
Late blight	*Phytophthora infestans*	14
Bacterial soft rot	*Erwinia carotovora* var. *carotovora*	4
Silver scurf	*Helminthosporium solani*	2
Virus	undetermined	1
Black heart		3
Blackleg	*Erwinia carotovora* var. *atroseptica*	2
Common scab	*Streptomyces scabies*	1
Stem rot	*Sclerotinia sclerotiorum*	1
Herbicide damage		7
Environmental damage		7
Total		66

Table 4. Summary of diseases diagnosed on **pulse** crops submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1996.

SYMPTOM/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
FIELD BEAN		
Root rot	*Fusarium* spp.	4
Bacterial blight	*Xanthomonas campestris* pv. *phaseoli*	15
Leaf and Pod spot	*Alternaria* spp.	1
Stem rot	*Rhizoctonia solani*	1
Nutritional deficiency		1
Herbicide injury		4
Environmental damage		2
Virus		1
Seed rot	undetermined	1
Total		28
LENTIL		
Root rot, Seedling blight	*Fusarium* spp.	4
Herbicide injury		1
Stem rot	*Sclerotinia sclerotiorum*	1
Nutrient deficiency		2
Heat canker		2
Anthracnose	*Colletotrichum truncatum*	2
Ascochyta blight	*Ascochyta fabae* f.sp. *lentis*	2
Total		14
FIELD PEA		
Root rot	*Fusarium oxysporum* *Fusarium avenaceum* *Fusarium* spp. *Rhizoctonia*	6
Mycosphaerella blight	*Mycosphaerella pinodes*	8
Powdery mildew	*Erysiphe communis*	3
Herbicide injury		3
Environmental damage		1
Nutrient deficiency		5
Total		26
CHICKPEA		
Leaf & Pod spot	*Ascochyta* sp.	1
Stem rot	*Sclerotinia sclerotiorum*	1
Root rot	*Fusarium* sp.	1
Herbicide injury		1
Total		4
SOYBEAN		
Nutrient deficiency		1

Table 5. Summary of diseases diagnosed on **special crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1996.

SYMPTOM/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
SUGARBEET		
Herbicide injury		1
BUCKWHEAT		
Root rot	*Fusarium* sp.	1
Flower blight	*Alternaria* sp.	1
Total		2
CONE FLOWER		
Aster Yellows	*Aster Yellows phytoplasma*	1
GINSENG		
Root rot	*Fusarium* sp.	1
CORIANDER		
Root rot	*Fusarium* sp.	1
Leaf spot	*Alternaria* sp.	1
Total		2

Table 6. Summary of diseases diagnosed on **turfgrass** samples submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1996.

SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Root rot	*Fusarium* sp.	2
Leaf spot	*Ascochyta* sp.	2
Environmental damage		2
Nutrient deficiency		1
Anthracnose	*Colletotrichum graminicola*	2
Total		9

Table 7. Summary of diseases diagnosed on **vegetable crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1996.

SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
TOMATO		
Leaf mold	*Fulvia fulva*	1
Physiological leaf roll		1
Blossom end rot		2
Anthracnose	*Colletotrichum* sp.	1
Early blight	*Alternaria solani*	2
Nutrient deficiency		3
Herbicidal damage		5
Environmental damage		2
Total		17
CARROT		
Leaf spot	*Alternaria* spp.	2
Bacterial leaf blight		1
Total		3
ONION		
Root rot	*Fusarium* sp.	2
Damping off	*Pythium* sp.	1
Total		3
CAULIFLOWER		
Environmental damage		1
Herbicide damage		1
Insect injury		1
Total		3
CORN		
Nutrient deficiency		4
Herbicide damage		2
Total		6
RED BEET		
Leaf spot	*Cercospora* sp.	1
Storage rot	*Botrytis cinerea*	2
Total		3
CUCUMER		
Scab	*Cladosporium cucurbitacearum*	1
Herbicide damage		1
Total		2
CANTALOUPE		
Environmental damage		1

CROP: Commercial Crops - Diagnostic Laboratory Report

LOCATION: Québec

NAME AND AGENCY:
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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO THE MAPAQ DIAGNOSTIC LABORATORY IN 1996

METHODS: The objective of the MAPAQ diagnostic laboratory is to provide diagnosis and control recommendations for disease problems of commercial crops. The following data reflects diagnoses of samples submitted to the laboratory by extension staff of MAPAQ, the "Régie des assurances agricoles du Québec", the "Institut québécois du développement de l'horticulture ornementale" and by the agricultural industry. Diagnosis is based on visual examination of symptoms and on the use of various laboratory tests to detect and to identify pathogens. The following tests are used in the laboratory; for nematodes, isolation with the Baermann pan and microscope examination; for fungi, isolation on artificial media, microscope examination and pathogenicity testing; for bacteria, isolation on artificial media, classical biochemical tests including API-20E and Biolog®, ELISA and PCR tests; for phytoplasma, PCR tests and for virus, ELISA and double stranded RNA analysis.

RESULTS AND COMMENTS: The crop distribution of samples was: vegetable crops (field and greenhouse) 44%, herbaceous and woody ornamentals 22%, small fruits 17%, cereal crops 5%, field crops 4%, fruit trees 3% and other samples 5%. Tables 1-7 show a summary of the main parasitic and nonparasitic diseases diagnosed by the laboratory for the most representative vegetable crops, greenhouse vegetables, small fruits, herbaceous and woody ornamentals, apple trees, cereals and other crops.

ACKNOWLEDGEMENT: The authors gratefully thank Lise Gauthier, Mario Tésolin and Lise Vézina for technical assistance.

Table 1. Summary of **vegetable crop** diseases diagnosed by the MAPAQ diagnostic laboratory in 1996.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Asparagus	*Botrytis cinerea*	1
	Fusarium wilt and root rot	2
Bean	*Fusarium solani*	2
	Pythium root rot	1
	Rhizoctonia stem and root canker	2
	Sclerotinia sclerotiorum	2
	Pseudomonas syringae (leaf spot)	2
	Boron deficiency	1
	Wind injury	1
Broccoli	*Xanthomonas campestris* pv. *campestris*	2

(cont'd)

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Cabbage	*Alternaria brassicae*	1
	Alternaria brassicicola	10
	Plasmodiophora brassicae	1
	Rhizoctonia solani	2
	Xanthomonas campestris pv. *campestris*	3
	Potyvirus	1
	Black speck	1
	Chilling injury	6
Cantaloup	Alternaria leaf spot	1
	Potyvirus	1
Carrot	*Alternaria dauci*	2
	Cercospora carotae	2
	Fusarium root rot	1
	Geotrichum root rot	1
	Mycocentrospora root rot	1
	Phytophthora root rot	1
	Pythium sp. (cavity spot)	5
	Rhizoctonia crown rot	4
	Meloidogyne sp.	5
	Pratylenchus sp.	1
	Calcium deficiency	4
	Heat canker	2
Cauliflower	*Xanthomonas campestris* pv. *campestris*	1
Celery	*Fusarium oxysporum*	2
	Erwinia carotovora subsp. *carotovora*	1
	Pseudomonas syringae pv. *apii*	1
Chinese cabbage	*Alternaria brassicae*	1
	Fusarium oxysporum	1
	Pythium crown rot	1
Chinese cabbage (cont)	*Rhizoctonia solani*	2
	Pseudomonas soft rot	3
Corn	Pythium root rot	1
	Ustilago zeae	1
Cucumber	Alternaria leaf spot	2
	Fusarium wilt	3
	Phytophthora capsici	1
	Pythium root rot	4
	Rhizoctonia solani	2
	Ulocladium leaf spot	1
	Pseudomonas syringae pv. *lachrymans*	3
	CMV	2
	Potyvirus	3
	Chilling injury	1
Garlic	*Botrytis cinerea*	2
	Potyvirus	1
	Nitrogen deficiency	1

(cont'd)

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Leek	*Alternaria porri*	1
	Botrytis cinerea	1
	Colletotrichum sp. (smudge)	1
	Fusarium basal rot	1
	Pseudomonas syringae	2
Lettuce	*Botrytis cinerea*	3
	Bremia lactucae	2
	Pythium root rot	2
	Rhizoctonia solani	6
	Sclerotinia sclerotiorum	2
	Septoria lactucae	1
	Xanthomonas campestris pv. *vitians*	3
	Potyvirus	1
	Calcium deficiency	2
Onion	*Botrytis cinerea*	8
	Colletotrichum sp. (smudge)	1
	Fusarium basal rot	2
	Penicillium root rot	2
	Erwinia carotovora subsp. *carotovora*	1
	Chilling injury	1
	Hail injury	1
	Rain injury	2
Pea	Aphanomyces root rot	2
	Fusarium oxysporum	2
	Fusarium solani	3
	Pythium root rot	3
	Rhizoctonia solani	2
	Thielaviopsis root rot	1
Pepper	Alternaria fruit rot	3
	Pythium root rot	1
	Sclerotinia sclerotiorum	2
	Pseudomonas leaf spot	8
	Xanthomonas campestris pv. *vesicatoria*	18
	CMV	1
	Oedema	3
Potato	*Alternaria solani* (leaf blight)	1
	Botrytis cinerea	1
	Colletotrichum sp. (black dot)	1
	Fusarium tuber ro	10
	Helminthosporium solani	1
	Phytophthora erythroseptica	10
	Phytophthora infestans	5
	Pythium sp. (leak)	2
	Rhizoctonia solani	11
	Spongospora subterranea	3
	Verticillium sp.	5

(cont'd)

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Potato (cont'd)	*Clavibacter michiganensis* subsp. *sepedonicus*	4
	Erwinia carotovora subsp. *atroseptica*	1
	Erwinia carotovora subsp. *carotovora*	17
	Pseudomonas fluorescens	9
	Pseudomonas marginalis	1
	Pseudomonas viridiflava	1
	Streptomyces spp.	1
	Meloidogyne sp.	1
	Potyvirus	1
	PVX	1
	Calcium deficiency	2
	Growth cracks	1
	Hollow heart	5
	Mechanical injury	2
Pumpkin	*Botrytis cinerea*	1
	Fusarium fruit rot	4
	Phoma fruit rot	2
	Phytophthora capsici	1
	Pythium fruit rot	2
	Rhizoctonia solani	1
	Septoria leaf spot	1
	Pseudomonas syringae pv. *lachrymans*	3
	CMV	1
Radish	Aphanomyces root rot	2
	Peronospora parasitica	2
	Pythium root rot	1
	Rhizoctonia solani	1
	Streptomyces sp.	1
	Potyvirus	1
Rhubarb	*Rhizoctonia solani*	3
	Winter injury	2
Rutabaga	Fusarium root rot	3
	Plasmodiophora brassicae	2
	Pythium root rot	3
	Rhizoctonia solani	2
	Boron deficiency	1
	Growth cracks	1
Squash	*Erysiphe cichoracearum*	1
	Fusarium fruit rot	5
	Phytophthora capsici	2
	Pythium fruit rot	1
	Septoria leaf spot	2
	Erwinia carotovora subsp. *carotovora*	1
	CMV	6
	Potyvirus	6
	Growth cracks	1

(cont'd)

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Tomato	*Fulvia fulva*	1
	Geotrichum fruit rot	1
	Botrytis cinerea	1
	Phytophthora infestans	3
	Pyrenochaeta lycopersici	1
	Rhizoctonia solani	1
	Sclerotinia sclerotiorum	1
	Septoria lycopersici	1
	Pseudomonas syringae pv. *tomato*	6
	Xanthomonas campestris pv. *vesicatoria*	1
	Blotchy ripening	2
	Potassium injury	1
	Puffiness	1
	2,4-D injury	2
Watermelon	Alternaria leaf spot	3

Table 2. Summary of **greenhouse vegetable** diseases diagnosed by the MAPAQ diagnostic laboratory in 1996.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Cucumber	Alternaria leaf spot	1
	Botrytis cinerea	1
	Corynespora leaf spot	1
	Fusarium wilt	2
	Phomopsis sp.	2
	Pythium root rot	5
	Chilling injury	1
	Nitrogen deficiency	1
	Sudden wilt	2
Tomato	*Botrytis cinerea*	10
	Colletotrichum root rot	2
	Erysiphe sp.	1
	Fulvia fulva	1
	Fusarium oxysporum f. sp. *radicis-lycopersici*	8
	Humicola root rot	6
	Phytophthora infestans	4
	Pyrenochaeta lycopersici	7
	Pythium root rot	4
	Sclerotinia sclerotiorum	1
	Septoria lycopersici	2
	Clavibacter michiganensis subsp. *michiganensis*	4
	Erwinia carotovora subsp. *carotovora*	4
	Pseudomonas corrugata	2
	Meloidogyne sp.	1
	ToMV	1
	Blotchy ripening	1
	Boron deficiency	1
	Calcium deficiency	1
	Ethylene injury	1
	Glyphosate injury	1
	Magnesium deficiency	1
	Manganese toxicity	1
	Salt injury	10

Table 3. Summary of **small fruit** diseases diagnosed by the MAPAQ diagnostic laboratory in 1996.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Blueberry	*Botrytis cinerea*	1
	Coryneum canker	2
	Cytospora canker	2
	Exobasidium vaccinii	1
	Godronia cassandrae	2
	Phomopsis sp.	1
	Septoria leaf spot	4
	Agrobacterium tumefaciens	1
	Winter injury	1
Cranberry	*Exobasidium* sp.	1
	Godronia cassandrae	2
	Phyllosticta leaf spot	3
	Rhizoctonia solani	1
	Phytoplasma	1
Strawberry	*Botrytis cinerea*	2
	Colletotrichum fruit rot	1
	Mycosphaerella fragariae	5
	Phytophthora fragariae	29
	Sphaerotheca macularis	5
	Verticillium sp.	3
	Xanthomonas fragariae	2
	Phytoplasma	1
	Black root rot	16
	Boron deficiency	3
	Calcium deficiency	1
	Multiplier disease	2
	Winter injury	10
Raspberry	*Armillaria mellea*	1
	Botrytis cinerea	2
	Coniothyrium fuckelii	1
	Didymella applanata	6
	Elsinoe veneta	5
	Phytophthora root rot	19
	Septoria leaf spot	1
	Agrobacterium tumefaciens	6
	Erwinia amylovora	1
	Rhizoctonia root rot	1
	TRSV	1
	Winter injury	12

Table 4. Summary of **herbaceous and woody ornamental** diseases diagnosed by the MAPAQ diagnostic laboratory in 1996.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Abutilon sp.	Rhizoctonia stem rot	1
Adenium sp.	*Erwinia carotovora* subsp. *carotovora*	1
Aegopodium sp.	Septoria leaf spot	1
Alcea rosea	*Puccinia malvacearum*	2
Alternanthera sp.	Rhizoctonia stem rot	1
Antirrhinum sp.	*Peronospora antirrhini*	1
	Pythium root rot	1
	INSV	1
Artemisia sp.	*Meloidogyne* sp.	1
Caragana sp.	Phytophthora root rot	1
Celosia sp.	Pythium root rot	1
Chrysanthemum sp.	Fusarium root rot	1
	Pythium root rot	1
Crataegus sp.	*Gymnosporangium* sp.	1
Cyclamen persicum	INSV	2
Dianthus sp.	*Colletotrichum* sp.	1
Dracaena sp.	*Colletotrichum* sp.	1
Euphorbia pulcherrima	*Botrytis cinerea*	1
	Fusarium root rot	1
	Pythium root rot	1
Exacum sp.	*Botrytis cinerea*	1
Ficus sp.	*Colletotrichum* sp.	1
Fuchsia x *hybrida*	*Pucciniastrum epilobii*	1
Gladiolus sp.	Fusarium oxysporum	1
Gomphrena sp.	Cercospora leaf spot	1
Hedera helix	*Botrytis cinerea*	1
	Xanthomonas campestris pv. *hederae*	1
Helichrysum sp.	Phytophthora root rot	1
Hemerocallis sp.	*Colletotrichum* sp.	1
Hosta sp.	INSV	1
Hydrangea sp.	Rhizoctonia root rot	1
Impatiens sp.	*Botrytis cinerea*	1
	Pythium root rot	2
	Rhizoctonia root rot	4
	INSV	2
	Potyvirus	1
	Low pH	3
	Salt injury	1
Iris sp.	Heterosporium leaf spot	1
Juniperus sp.	*Kabatina* sp.	1
	Sphaeropsis sp.	1
Kalanchoe sp.	INSV	1
	Potyvirus	1
Lavatera sp.	*Colletotrichum* sp.	1
Lilium sp.	*Botrytis cinerea*	2

(cont'd)

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Limonium sp.	Cercospora leaf spot	1
Lupinus sp.	*Pleiochaeta setosa*	1
	Pythium root rot	1
Pelargonium sp.	*Botrytis cinerea*	1
	Fusarium oxysporum	1
	Pythium root rot	1
	Xanthomonas campestris pv. pelargonii	3
	PFBV	14
	Low pH	2
	Oedema	7
Petunia sp.	*Botrytis cinerea*	1
	Erysiphe cichoracearum	1
	Rhizoctonia root rot	1
	Thielaviopsis root rot	1
	CMV	12
	Potyvirus	4
	Ethylene injury	1
Phalaenopsis sp.	*Acidovorax avenae* pv. *cattleyae*	1
	Rhizoctonia root rot	1
Phlox sp.	*Colletotrichum* sp.	1
	Ditylenchus dipsaci	2
Rhus typhina	Septoria leaf spot	1
Rhododendron sp.	*Cylindrocladium scoparium*	1
	Pestalotiopsis sp.	1
	Seimatosporium sp.	1
Rosa sp.	*Peronospora sparsa*	1
	Sphaerotheca sp.	1
Salvia sp.	Rhizoctonia root rot	1
	Salt injury	1
Schefflera sp.	Manganese toxicity	1
Schlumbergera sp.	*Fusarium oxysporum*	1
Sinningia speciosa	Phytophthora crown rot	1
Sorbus sp.	*Spaeropsis* sp.	1
	Erwinia amylovora	1
Spathiphyllum sp.	Manganese toxicity	1
Syringa sp.	*Fusicoccum* sp.	1
	Phytophthora root rot	2
	Rhizoctonia root rot	1
	Pseudomonas syringae pv. *syringae*	3
Thuja sp.	*Cytospora* sp.	2
	Pestalotiopsis sp.	1
Tulipa sp.	Penicillium bulb rot	1
Valeriana sp.	Pythium root rot	2
Zinnia sp.	Rhizoctonia root rot	1
	Sclerotinia sclerotiorum	1

Table 5. Summary of **apple tree** diseases diagnosed by the MAPAQ diagnostic laboratory in 1996.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Apple	*Botrytis cinerea*	1
	Cytospora sp.	2
	Alternaria alternata (leaf spot)	1
	Nectria cinnabarina	1
	Nectria galligena	1
	Phomopsis mali	2
	Phytophthora root rot	1
	Venturia inaequalis	3
	Verticillium sp.	1
	Erwinia amylovora	3
	Bitter pit	2

Table 6. Summary of **cereal crop** diseases diagnosed by the MAPAQ diagnostic laboratory in 1996

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Barley	*Bipolaris sorokiniana*	11
	Drechslera teres	4
	Fusarium graminearum	1
	Puccinia hordei	7
	Ustilago nuda	1
Oat	*Colletotrichum* sp.	1
	Bipolaris sorokiniana	1
	Puccinia coronata	6
Wheat	*Drechslera tritici-repentis*	1
	Fusarium graminearum	2
Rye	*Claviceps purpurea*	1

Table 7. Summary of diseases diagnosed on **other crops** by the MAPAQ diagnostic laboratory in 1996.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Alfalfa	*Leptosphaerulina briosiana*	1
	Phoma medicaginis	1
	Pseudopeziza medicaginis	1
	Rhizoctonia sp.	1
Basil	*Fusarium oxysporum*	6
	Sclerotinia sclerotiorum	1
	INSV	1
Ginseng	Pythium root rot	1
	Rhizoctonia root rot	1
Rosemary	Pythium root rot	1
Soybean	*Colletotrichum* sp.	2
	Fusarium oxysporum	3
	Peronospora manshurica	1
	Phomopsis sp.	2
	Phytophthora root and crown rot	1
	Pythium root rot	3
	Rhizoctonia solani	3
	Sclerotinia sclerotiorum	3
	Septoria glycines	2
Tobacco	*Thielaviopsis basicola*	1
	Ozone injury	2

CROP: All Crops - Diagnostic Laboratory Report

LOCATION: Prince Edward Island

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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS IN PRINCE EDWARD ISLAND, 1996

METHODS: The P.E.I. Department of Agriculture, Fisheries and Forestry's Plant Health Services group provides diagnosis of, and control recommendations primarily for disease problems of commercial crops produced on P.E.I. The following data lists samples submitted to the laboratory by agriculture extension staff, producers, agri-business and the general public. Diagnoses are based on visual examination of symptoms, microscopic observation and culturing on artificial media.

RESULTS AND COMMENTS: A total of 471 samples were processed during the period October 1995 - November 1996. Results are summarized in Table 1. As many samples were diagnosed with more than one disease, a total of 658 diagnoses are listed in Table 1.

Table 1. Diseases diagnosed on commercial crop samples submitted to the Plant Health Services group, Prince Edward Island Department of Agriculture Fisheries and Forestry, Prince Edward Island, 1996.

CROP	DISEASE	CAUSAL AGENT/ PLANT PATHOGEN	NO. OF TIMES AGENTS WERE IDENTIFIED
VEGETABLES:			
Bean	White mold	*Sclerotinia sp.*	1
	Anthracnose	*Colletotrichum lindemuthianum*	2
	Root rot	*Rhizoctonia spp.*	1
Beet	Scab	*Streptomyces scabies*	2
Brussels sprouts	Leaf spot	*Botrytis cinerea*	1
	Calcium deficiency		1
	White mold	*Sclerotinia sclerotiorum*	1
Cabbage	Blackleg	*Phoma sp.*	1
Cucumber	Damping-off	*Rhizoctonia spp.*	1
	Downy mildew	*Pseudoperonospora cubensis*	1
	Root rot	*Rhizoctonia solani*	2

(continued)

CROP	DISEASE	CAUSAL AGENT/ PLANT PATHOGEN	NO. OF TIMES AGENTS WERE IDENTIFIED
Onion	Basal rot	*Fusarium oxysporum*	1
	Purple blotch	*Alternaria porri*	1
	Sour skin	*Pseudomonas sp.*	1
Pea	Root rot	*Fusarium solani*	1
Potato	Blackleg	*Erwinia sp.*	21
	Bacterial soft rot	*Erwinia spp*.	33
	Black dot	*Colletotrichum coccodes*	1
	Black scurf	*Rhizoctonia solani*	32
	Dry rot	*Fusarium avenaceum*	1
		Fusarium oxysporum	2
		Fusarium solani	6
		Fusarium sp.	17
		Pseudomonas sp.	1
	Early blight	*Alternaria solani*	10
	Early dying	*Rhizoctonia solani*	2
		Fusarium spp.	2
		Verticillium spp.	3
		Colletotrichum sp.	1
		Botrytis cinerea	1
		Erwinia sp.	1
	Gray mold	*Botrytis cinerea*	23
	Late blight	*Phytophthora infestans*	182
	Leak	*Pythium sp.*	2
	Physiological disorders	Blackheart	4
		Burn	14
		Bruising	5
		Chemical damage	6
		Elephant hide	5
		Enlarged lenticels	2
		Greening	3
		Growth cracks	1
		Hollow heart	5
		Jelly end rot	2
		Little tuber	1
		Low temperature tuber injury	15
		Multiple sprouting	2
		Nutritional disorder	4
		Off-type	4
		Skinning	3
		Stem end browning	4
	Pinkeye	*Pseudomonas* sp.	18
	Pink rot	*Phytophthora erythroseptica*	60

(continued)

CROP	DISEASE	CAUSAL AGENT/ PLANT PATHOGEN	NO. OF TIMES AGENTS WERE IDENTIFIED
Potato (cont'd)	Seed-piece decay	*Fusarium* spp.	9
		Erwinia spp.	16
	Scab (common)	*Streptomyces scabies*	13
	Scab (powdery)	*Spongospora subterranea*	4
	Silver scurf	*Helminthosporium solani*	15
	Stem canker	*Rhizoctonia solani*	33
	Virus	Mosaic	3
	White mold	*Sclerotinia sclerotiorum*	14
	Wilt	*Fusarium* spp.	1
		Verticillium spp.	3
		Colletotrichum sp.	2
Squash	White mold	*Sclerotinia sclerotiorum*	1
Tomato	Late blight	*Phytophthora infestans*	2
	Septoria leaf spot	*Septoria sp.*	1
	Spotted wilt virus	TSWV	1
CEREALS:			
Barley	Net blotch	*Pyrenophora teres*	6
	Nutritional disorder		1
	Physiological disorder		1
	Scald	*Rhynchosporium secalis*	1
	Smut	*Ustilago sp.*	1
Wheat	Head blight	*Fusarium sp.*	1
	Scab	*Fusarium avenaceum*	1
SMALL FRUITS:			
Apple tree	Bacterial leaf spot		1
SPECIALITY CROPS:			
Ginseng	Early blight	*Alternaria sp.*	1
	Root rot	*Phytophthora* sp.	3
	Rusty root	*Ramularia sp.*	2
	Seed decay	*Fusarium avenaceum*	4
TOTAL:			**658**

Cereals / Céréales

CROP: Barley, *Hordeum vulgare* L.

LOCATION: Manitoba

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TITLE: FUSARIUM HEAD BLIGHT OF BARLEY IN MANITOBA IN 1996

METHODS: During August 1996, 89 barley fields in southern Manitoba were surveyed for the presence of fusarium head blight (FHB). The 78 six-row and 11 two-row fields were randomly selected along the survey routes. The incidence and severity of FHB was assessed by sampling 50 to 100 heads for disease at 3 locations within each field. Several infected heads were collected from each site and returned to the laboratory. Ten discoloured kernels from one or more heads per field were surface sterilized in 0.3% NaOCl and plated onto PDA to determine the *Fusarium* spp. present.

RESULTS AND COMMENTS: Conditions were generally favourable for the development of FHB in much of Manitoba in 1996. Fusarium head blight was most common and severe in the Red River Valley, as in past years. Disease incidence and severity has usually been low in western parts of the province, but in 1996 FHB was more widespread and severe in the southwest than found previously.

Fusarium head blight was found in 88 of the 89 fields surveyed (98.9%). Positive fields had an average of 20.3% infected heads (range trace to 83.3%); individual heads had an average of 7.4% blighted kernels (range 5.0% to 31.0%). *Fusarium* species, isolated from infected kernels, are listed in Table 1. In contrast to FHB in wheat, where *F. graminearum* usually predominates, in barley both *F. poae* and *F. sporotrichioides* made up a significant proportion of the Fusaria isolated.

TABLE 1. *Fusarium* species found in 89 Manitoba barley fields in 1996.

***FUSARIUM* SPP.**	**FREQUENCY OF FIELDS (%)**	**FREQUENCY FROM KERNELS (%)**
F. graminearum	67.4	51.8
F. poae	60.7	33.5
F. sporotrichioides	38.2	12.5
F. avenaceum	6.7	1.7
F. equiseti	1.1	0.3

CROP: Barley

LOCATION: Manitoba

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TITLE: FOLIAR DISEASES OF BARLEY IN MANITOBA IN 1996

INTRODUCTION AND METHODS: Surveys for foliar diseases of barley in southern Manitoba farm fields were done between Aug 13 and Aug 30 by sampling at 91 (80 six-rowed, 11 two-rowed) sites. At each site, starting a few steps within the field, a diamond-shaped transect 50m per side was followed, and plants along this path were sampled to provide a rating of average disease severity on upper (flag leaf and flag -1) and lower leaf canopies. A five category scale was used: 0 (no visible symptoms), trace (<5% leaf area affected), slight (5-15%), moderate (16-40%) and severe (41-100%). Samples of infected leaves were collected and stored in paper envelopes for subsequent verification of foliar disease incidence, and to identify the pathogen species present by placing surface-sterilized leaf tissue segments with lesions in moist chambers.

RESULTS AND COMMENTS: Conditions in Manitoba were conducive for foliar disease development as a result of normal to above-normal levels of precipitation in most regions and generally warm temperatures in July and August. Flooding in the Red River Valley in April/May resulted in late seeding, and crop development and maturity in that region was delayed by 2-4 weeks. Leaf spots were observed in all fields, with severity levels in about 75% rated as slight or moderate on upper leaves, and moderate to severe on lower ones. The principal pathogenic species isolated, as is typical, were *Pyrenophora teres* (causal agent of net blotch), from 91% of fields, and *Cochliobolus sativus* (spot blotch) from 95%. *Septoria passerinii* (speckled leaf blotch) was found in 7 fields (or 8%, a normal level), while *Rhynchosporium secalis* was detected in only one field. Based on disease severity levels, average yield losses in barley due to foliar diseases in southern Manitoba in 1966 were likely in the range of 5-10%.

CROP: Barley, Oat, Wheat

LOCATION: Manitoba and eastern Saskatchewan

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TITLE: STEM RUSTS OF CEREALS IN WESTERN CANADA IN 1996

INTRODUCTION AND METHODS: Surveys of fields and nurseries of wheat, barley, and oat for incidence and severity of stem rust (*Puccinia graminis* Pers. f. sp. *tritici* Eriks. & E. Henn. and *P. graminis* f. sp. *avenae* Eriks. & E. Henn.) were conducted in Manitoba and eastern Saskatchewan in July and August, 1996. Samples for race identification were obtained from fields and trap nurseries in Manitoba and Saskatchewan.

RESULTS AND COMMENTS: Conditions generally were warm with near average rainfall during the growing season. Cereal crops were planted later than normal, thus conditions were suitable for the development of rust diseases. The initial inoculum levels, however, were very low due to severe drought conditions in the southern plains of the USA. Therefore, the incidence of stem rust on all cereals, including susceptible lines in nurseries and in susceptible wild barley (*Hordeum jubatum* L.) and wild oat (*Avena fatua* L.)was light in Manitoba and there were only traces found in Saskatchewan. All commercial spring wheat and oat cultivars grown in the eastern prairie region are resistant to the prevailing stem rust races. There were no new races of either *P. graminis* f. sp. *tritici* or *P. graminis* f. sp. *avenae* identified that threaten the resistance in these cultivars. All barley cultivars, however, remain vulnerable to race QCCJD of *P. graminis* f. sp. *tritici*. Race QCCJD was common in stem rust samples collected from wheat, cultivated barley, and wild barley in Manitoba, therefore stem rust remains a threat to this crop should suitable conditions occur.

CROP: Barley, Oat and Wheat

LOCATION: Manitoba and Saskatchewan

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TITLE: INCIDENCE AND SEVERITY OF CEREAL SMUTS IN MANITOBA AND SASKATCHEWAN IN 1996

iNTRODUCTION AND METHODS: In July 1995, cereal crops were surveyed for *Ustilago hordei*, *U. nigra*, *U. nuda*, *U. tritici*, *U. avenae* and *U. kolleri* in Manitoba and Saskatchewan. The area was covered by routes from Winnipeg - Estevan - Moose Jaw - Saskatoon - Prince Albert - Melfort - Yorkton - Dauphin - Neepawa - Winnipeg, as well as one day trips north and south of Winnipeg. Fields were selected at random at approximately 15 km intervals, depending on the frequency of the crops in the area. An estimate of the percentage of infected plants (i.e. plants with sori) was made while walking an ovoid path of approximately 100 m in each field. Levels of smut greater than trace were estimated by counting plants in a 1 m^2 area at a minimum two sites on the path. *Ustilago nuda* and *U. nigra* were differentiated by observing germinating teliospores with a microscope.

RESULTS AND COMMENTS: Loose smut (*U. tritici*) of bread wheats was found in 26% of the 164 fields surveyed. In most infested fields only trace levels of infection occurred; the highest level found was 0.5%. In durum wheats, loose smut was more common and found in 71% of the 28 fields surveyed. Again, most fields had trace levels of infection, with 0.3% being the highest found. As has been the case for several years, very few oat fields (10% of 30 fields surveyed) had smut. The levels of infection in the three infested fields surveyed were trace, trace and 5.0%. The highest incidence of smut was found in barley with 70% of the 115 fields surveyed being affected. Incidence was higher in 6-rowed barley (79% of fields) with most fields having levels of infection of 0.1 to 0.5% smut, but fields with 5, 15 and 25% smutted plants were found. In 2-rowed barley, 42% of fields were affected with about one third of these having trace levels of infection; the remainder had levels of 0.1 to 0.5%. False loose smut (*U. nigra*) was not found in the 1996 survey. Covered smut (*U. hordei*) was found in one field of 6-row barley at an infection level of 0.5% and two fields of 2-row barley at infection levels of 0.5 and 1.0%. Covered smut infected plants were associated with loose smut infected plants.

CROP: Barley, Oat and Wheat

LOCATION: Central Alberta

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TITLE: CEREAL DISEASE SURVEY - CENTRAL ALBERTA 1996

INTRODUCTION AND METHODS: Cereal crops were randomly selected approximately every 10 km in Alberta Census District (CD) 8 (north central Alberta). This area encompasses Sylvan Lake on the west and Rimbey on the east and is bordered north and south by Ponoka and Innisfail, respectively. Fields were traversed in an inverted V, with analysis of 5 plants taking place at 3 locations. Leaf diseases were scored on a 0-9 scale where 5 = more than 1 percent leaf area diseased (PLAD) on the upper leaf canopy, 10-25 PLAD on the middle and 25-50 PLAD on the lower leaf canopies. Common root rot (CRR) was assessed on a 0-4 scale where 1 = trace and 4 = severe. Other diseases were rated as a percent of the field affected.

RESULTS AND COMMENTS: The results are presented in the Table below. Forty-one fields of barley were examined, 11 2-row and 30 6-row. Scald (*Rhynchosporium secalis*) and net blotch (*Pyrenophora teres*) were scored higher in 2-row than 6-row fields. This likely is due to the prevalence in CD 8 of the cultivars Harrington (susceptible to scald and net blotch) and Manley (susceptible to scald and intermediate to net blotch). Loose smut (*Ustilago nuda*) was more commonly found on 6-row barley, usually in trace amounts. One field of 6-row barley had 1% loose smut and one field of 2-row barley had 0.5%. CRR was present only at low levels. Bacterial blight (*Xanthomonas campestris*) was found in 50% of the 6-row barley fields. Miscellaneous leaf spots, i.e. spot blotch (*Cochliobolus sativus*) and physiological spots, averaged 4.3 severity in 12 of the 6-row fields. Barley leaf stripe (*Pyrenophora graminea*) was found in one field with 0.5% plants infected.

Eleven wheat fields were examined, all of which had plants with symptoms of Septoria leaf spot (*Septoria* spp.). Tan spot (*P. tritici-repentis*) was not noted this year, and take-all (*Gaeumannomyces graminis*) levels were low. Loose smut (*Ustilago tritici*) was encountered more often than usual in 1996, but only at trace levels. One field was rated as having 5% kernel abortion.

Three fields of oats were examined, all of which had very low disease levels of halo blight *(Pseudomonas coronafaciens*) and physiological blast.

Table 1. Disease incidence and severity in Central Alberta cereal fields in 1996

AVERAGE DISEASE RATING/NUMBER OF AFFECTED FIELDS*

	Scald 0-9	Net Blotch 0-9	CRR 0-4	Loose Smut %	Bacterial Blight %	Leaf Spots 0-9	Covered Smut %	BLS** %
Barley								
2-Row	5.3/9	5.8/6	.4/7	.5/1	tr/3	2.0/1		
6-Row	3.4/23	2.7/17	.5/16	tr/15	tr/15	4.3/12	tr/1	.5/1

	Septoria 0-9	CRR 0-4	Loose Smut %	Take-All %	Leaf Rust %	Powdery Mildew %	Kernel Blast %
Wheat	4.5/11	.7/6	tr/4	tr/3	tr/1	tr/1	5/1

* tr=trace amounts (<1%)
** BLS=Barley leaf stripe

CULTURES: Avoine *Avena sativa*, Orge *Hordeum vulgare*, Blé *Triticum aestivum*

RÉGION: Québec

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TITRE: VUE D'ENSEMBLE DES MALADIES DES CÉRÉALES AU QUÉBEC EN 1996

MÉTHODES: On a visité la plupart des stations expérimentales de céréales au Québec à au moins une occasion entre la mi-juillet et la mi-août. À chaque endroit visité, on a identifié les maladies présentes et on en a évalué l'intensité en tenant compte de tous les cultivars présents à chaque endroit. On a aussi prélevé des échantillons de plantes dans des champs d'agriculteurs à divers endroits de la province pour examen en laboratoire. En général les plantes examinées étaient entre les stades de développement laiteux moyen à pâteux moyen.

RÉSULTATS et COMMENTAIRES: La saison 1996 s'est démarquée très distinctement de la normale sur le plan des précipitations. Les précipitations d'avril étaient deux fois et demi la normale et ont contribué à retarder les opérations de semis. D'autre part les précipitations en juillet ont été le double de la normale et ont ralenti la maturation des céréales.

La fusariose (*Fusarium graminearum* principalement) était présente partout et à un degré d'intensité plus élevé que d'habitude. Elle s'est manifestée même dans les régions où l'on produit peu de blé comme le Lac Saint-Jean. Les rares céréales d'automne au Québec étaient aussi beaucoup plus affectées. Cette forte intensité est confirmée par le développement inhabituel de la maladie chez l'orge et même chez l'avoine. La maladie a eu des répercussions sur le classement du grain pour l'alimentation humaine, avec une proportion de rejets d'au moins un sur trois. En général les lots déclassés restent toutefois acceptables pour l'alimentation animale. Les diminutions de rendement procurées par la fusariose seraient de l'ordre de 10 à 15% et dépasseraient rarement 20% dans des cas spécifiques.

Les pourritures racinaires semblent avoir été particulièrement favorisées par les conditions de la saison. C'est la deuxième fois en trois ans que ces maladies ont un impact sérieux. De surprenantes baisses de rendement enregistrées à plusieurs endroits de la province pourraient leur être attribuables, particulièrement chez le blé et l'orge. Les cultures de blé sur argiles ont été plus durement frappées que celles sur sols légers. Un seul champ sur 12 échantillons était relativement exempt de ces pourritures. À partir d'échantillons prélevés de diverses sources dans la province, on a isolé des cultures de *Bipolaris sorokiniana*, de *Pythium* spp. et de *Fusarium* spp. dont notamment le *F. graminearum*.

Chez le blé, les taches à *Drechslera tritici-repentis* et à *Phaeospheria nodorum* étaient les maladies foliaires les plus répandues. Le *Phaeospheria nodorum* a aussi attaqué les glumes à un degré léger à moyen à Lennoxville. L'intensité de l'oïdium (*Erysiphe graminis*) variait spécifiquement d'un endroit à l'autre. Cette maladie a atteint des degrés élevés chez les cultivars sensibles à Saint-Simon-de-Bagot. La rouille des feuilles (*Puccinia recondita*) était largement distribuée mais son intensité moyenne ne dépassait pas le niveau d'infection léger; les cultivars sensibles ont cependant subi des attaques moyennes à fortes à Saint-Césaire.

Chez l'avoine, la tache ovoïde (*Stagonospora avenae*) était la maladie la plus répandue et la plus intense en moyenne. Tous les cultivars y sont sensibles et aucune région ne lui échappe. La rouille couronnée (*Puccinia coronata*) a profité des conditions favorables de la saison pour se développer plus intensément que d'habitude et sur un plus grand territoire. Cette maladie était plus grave que les autres à Sainte-Anne-de-Bellevue, où c'est coutume, ainsi qu'à Deschambault où elle est moins souvent significative. Les cultivars d'avoine nue se sont révélés en général moins sensibles à la rouille que les cultivars d'avoine vêtue, mais le cultivar AC Ernie était aussi sensible que la moyenne des cultivars d'avoine vêtue.

Chez l'orge, les taches foliaires (*Drechslera teres* principalement et *Bipolaris sorokiniana*) ont proliféré un peu partout, et de façon plus prononcée sur les cultivars à deux rangs. La rouille des feuilles (*Puccinia hordei*) s'est développée aussi un peu partout mais à des degrés divers. Elle était particulièrement intense à Sainte-Anne-de-Bellevue dans le sud-ouest de la province et à Pintendre dans la région de Québec. Les cultivars d'orge à deux rangs étaient moins attaqués par la rouille que ceux à six rangs. La rhynchosporiose (*Rhynchosporium secalis*) était légèrement présente cette année, moins qu'à l'habitude. L'ergot (*Claviceps purpurea*) ne cause plus de dégâts comme auparavant au Lac Saint-Jean, suite à l'écartement des variétés sensibles et à l'adoption de meilleures méthodes culturales.

La jaunisse nanisante (BYDV) s'est manifestée à une faible intensité cette année et les attaques se sont développées tardivement, causant peu de dégâts. Malgré tout la fréquence de distribution était élevée. Les attaques tardives ont fait suite à la multiplication des populations de pucerons vecteurs tard en saison, laissant peu de possibilités au virus de causer des dégâts significatifs. C'est à la station de Lennoxville que l'on en a trouvé le plus, à un degré léger à moyen.

Dans toutes les cultures on n'a retrouvé que de rares cas de rouille de la tige (*Puccinia graminis*), qui étaient de faible intensité. Ceci correspond à la situation habituelle.

La présence de charbons (*Ustilago* spp.) s'est manifesté à un certain degré chez les cultivars sensibles dans toutes les céréales. Les traitements de semences appliqués dans le commerce n'inhibent que partiellement le développement des charbons et il faudrait en examiner les causes.

CROPS: Barley (*Hordeum vulgare*), oats (*Avenae sativa*) and wheat (*Triticum aestivum*)

REGION: Atlantic Provinces

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TITLE: DISEASES OF CEREAL CROPS IN THE ATLANTIC PROVINCES, 1996

METHODS: All cereal growing areas in the region were visited, or reports received from, in the Atlantic Provinces, including Newfoundland where production of cereal crops is being introduced. Diseases encountered, their severity, crops, and specific cultivars where significant problems were encountered were recorded. Weather conditions in 1996 were relatively wet with moderate temperature levels. Conditions were very conducive to the development of many foliar and head diseases.

RESULTS AND DISCUSSIONS:

Barley: The 1996 barley crop was relatively good although disease levels were high in comparison to the previous number of years. Scald (*Rhynchosporium secalis*) and net blotch (*Pyrenophora teres*) were the principal diseases observed throughout the region. The relative severity of the two diseases varied across the region and in fields or trials. Net blotch was the principal disease in much of Nova Scotia and Newfoundland. Scald was relatively severe in New Brunswick. Both diseases were severe in Prince Edward Island, with net blotch being the more severe. Foliar fungicide applications (Tilt at Zadok's Growth Stage 45) proved to be advantageous, particularly in cultivars with high net blotch susceptibility, with yield increases of up to 40% were recorded in research plots on PEI.

Seedling blight (*Cochliobolus sativus* and various *Fusarium* spp.) was observed to be a potential problem in a number of areas, the severity of which was significantly greater than has been observed in the last 5 years. Loose smut (*Ustilago nuda*) was observed in most field however the level of infestation was very small. Powdery mildew (*Erysiphe graminis* f.sp. *hordei*) and stem rust (*Puccinia graminis* f.sp. *tritici*) was present, however only isolated lesions were detected and only in a few fields. These two diseases in general are not a problem in the region, with symptom appearance usually being confined to very late in the season. Fusarium head blight (*Fusarium graminearum*) is an ongoing disease problem in barley and while head infections were moderate to high, based on a small number of head or seed platings, symptom expression was very low and no major effect on yield was evident, given the low level of symptom expression.

In Newfoundland, where a small number of barley fields were viewed, net blotch was the major disease problem observed with severity levels at a low to moderate level.

Wheat: The 1996 wheat harvest in the Maritime Provinces was less successful than the previous year's crop primarily due to an increase in fusarium head blight (*Fusarium graminearum* and other spp*)*. The Atlantic region avoided the seriousness of this disease, as was experienced in Ontario and Quebec. Late planted milling wheat crops were frequently downgraded to animal feed. Prince Edward Island wheat crops were subjected to this downgrading more so than that experienced in Nova Scotia and New Brunswick. Differences in severity of fusarium head blight within the region was attributed to weather conditions from the time of crop heading onwards and the relationship between this stage and planting dates.

Foliar diseases such as leaf and glume blotch (*Phaeospheria nodorum*) predominated as the foliar disease of concern in most wheat crops. Powdery mildew (*Erysiphe graminis f. sp. tritici*) was less frequently found at a serious level. This decline in significance for this disease is attributed to production of cultivars with at least a moderate level of resistance and shifts from milling to feed wheat cultivars which tend to be produced at lower nitrogen fertility levels.

Loose smut (*Ustilago nuda)* was noted infrequently and then only on susceptible cultivars. Application of fungicide seed treatments appear to adequately suppress the significance of such diseases, even on susceptible cultivars.

Ergot (*Claviceps purpurea*) has not been observed on wheat to any significant amount in the past, however there was at least one field of spring wheat produced in Newfoundland in 1996 which apparently did have a relatively high visual level of ergot, although the level was not determined.

Oats: Production of oats in the Atlantic region has declined in hectarage in recent years and fewer crops were examined than in previous years. Speckled leaf blotch (*Stagonospora avenae*) was the only noted foliar disease. BYDV was infrequently noted, only on isolated plants at the boarders of fields.

Applications of foliar fungicides in 1996 was increased, on barley and wheat, compared to previous years but limited to the availability of products. Introduction of new cultivars with improved resistance to such diseases as fusarium head blight, powdery mildew, and net blotch has improved the cereal industry in the region. Based on the 1996 crop year, continued emphasis on control of fusarium head blight and foliar diseases through introduction of more resistant cultivars is having an impact, and continued improvement is highly recommended.

CROP: Barley and Wheat

LOCATION: Manitoba

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TITLE: FLAME CHLOROSIS IN MANITOBA IN 1996

INTRODUCTION AND METHODS: Flame chlorosis (FC), a soil-borne, viruslike disease of spring cereals has been monitored in Manitoba since it was first observed in western Manitoba in 1985 (1).

As noted in earlier reports (2,3,4), FC is readily diagnosed between the seedling and 4-node stages of growth on the basis of striking and characteristic visual symptoms. Specimens of FC plants from fields where the disease was observed or suspected were forwarded promptly to the Plant Pathology Laboratory of Manitoba Agriculture to confirm the diagnosis (2). For specimens which could not be diagnosed with certainty based on visual symptoms and to obtain additional confirmation, tests for FC-specific RNA were carried out by dot-blot assay at the Cereal Research Centre, Agriculture and Agri-Food Canada.

RESULTS AND COMMENTS: In 1996, overall incidence of FC was higher than in 1994 and 1995, but clearly lower than in 1990 - 1992, years in which relatively high FC incidences were reported (1,2,4). There were scattered incidences in western Manitoba and the Red River valley south and east of Winnipeg, consistent with the geographic distribution noted previously (4). In 1996, FC was detected only in barley.

Although general disease incidence was not high in 1996, and most fields with FC had only small numbers of scattered affected plants, an outbreak of FC in one large field 4 km south of Elgin, MB was among the most severe ever observed, and noteworthy for several reasons. Its location was in an area of south-central Manitoba where FC had not been found in previous surveys. Moreover, first accounts of the outbreak emphasized that disease was confined to that portion of the field sown to an unregistered cultivar, Stander (in contrast to the absence of disease in portions of the field sown to Bedford), indicating a seed-transmitted disease most consistent with Leaf Stripe of Barley caused by the seed-borne fungus, *Pyrenophora gramineae*. Careful laboratory inspection and testing of specimens failed to detect P. gramineae but clearly demonstrated that symptoms were characteristic of FC and coincided with abundant FC-RNA (2,5).

Careful re-examination of the affected field and its neighbors, confirmed that the severe outbreak was indeed confined to that portion of the field sown to Stander, but that there were also scattered FC plants in other portions of the field. Since FC has been clearly shown not to be seed-transmitted (3), the apparent co-incidence between FC and Stander barley most likely arose from the fact that the thin Stander seed germinated much more slowly, increasing the likelihood of soil-transmission of the FC viruslike agent (3). Flame Chlorosis should always be tested for when monitoring outbreaks of early-seedling-stage leaf-stripe-like diseases of barley in Manitoba.

REFERENCES

1) Haber, S.and R. G. Platford. 1991. 1990 survey of flame chlorosis in Manitoba. Can. Pl. Dis. Survey 71(1):79-80

2) Haber, S., D.J.S. Barr and R. G. Platford. 1991. Observations on the distribution of flame chlorosis in Manitoba and its association with certain zoosporic fungi and the intense cultivation of cereals. Can. J. Plant Pathol 13(3):241-246.

3) Haber, S., W. Kim, R. Gillespie and A. Tekauz. 1990. Flame Chlorosis: a new soil-borne, virus-like disease of barley in Manitoba, Canada. J. Phytopathology 129(3):245-256.

4) Haber, S., R.G. Platford, L. Duczek and K. Bailey. 1993. 1992 survey of flame chlorosis. Can. Plant Dis. Surv. 73(1):74-75.

5) Haber, S., D.A. Wakarchuk, S.E. Cvitkovitch and G. Murray. 1992. Diagnosis of flame chlorosis, a novel, virus-like disease of cereals by detection of disease-specific double-stranded RNA with digoxigenin-labelled RNA probes. Plant Dis. 76:590-594.

CROP: Oat

LOCATION: Manitoba and eastern Saskatchewan

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TITLE: OAT CROWN RUST IN MANITOBA AND EASTERN SASKATCHEWAN - 1996

INTRODUCTION AND METHODS: Severity of crown rust (caused by *Puccinia coronata* f. sp. *avenae* Eriks.) in wild oat (*Avena fatua* L.) and in commercial oat (*A. sativa* L.) fields and uniform rust nurseries was surveyed from early July to the third week of August in southern Manitoba, and in eastern Saskatchewan in the third week of August. The nurseries were located in Brandon, Emerson, and Morden, MB, and in Indian Head, SK. The resistant materials in the nurseries included the two newly released oat cultivars, AC Assiniboia and AC Medallion (both have crown rust resistance genes *Pc38, Pc39* and *Pc68* combined), and lines with genes *Pc48* and *Pc68* singly or with genes *Pc38, Pc39,* and *Pc48* combined. A total of 113 commercial oat fields in Manitoba and eastern Saskatchewan were surveyed in 1996.

RESULTS AND COMMENTS: Crown rust was later than normal in 1996 and traces of crown rust were found in wild oat and in commercial oat fields in most parts of the Red River Valley in mid July. However, in areas near Morden and Carman where European buckthorn (*Rhamnus cathartica* L.), the alternate host of *P. coronata* f. sp. *avenae*, is present, crown rust was severe, with severities ranging from 40% to 80% in susceptible oat plots and in wild oat. Infected buckthorn provided the initial inoculum to start an early crown rust epidemic in these areas. Subsequent frequent dew periods in late July and August created ideal conditions for rapid buildup of crown rust throughout southern Manitoba. Forty to 90% crown rust severities were commonly observed in commercial oat fields of cultivars (such as Dumont, Robert, Riel, AC Preakness, AC Belmont) with resistance genes *Pc38* and *Pc39*.

As in the previous two years, only trace levels of infections were found in the two newly released cultivars, AC Assiniboia and AC Medallion. These two cultivars have genes *Pc38, Pc39,* and *Pc68* combined. Virulence tests in greenhouse confirmed that single-pustule isolates isolated from these cultivars were virulent to this gene combination. The occurrence of these isolates is a major concern, as they would likely increase significantly after the new cultivars become widely grown.

CROP: Wheat

LOCATION: Manitoba

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TITLE: FUSARIUM HEAD BLIGHT AND LEAF SPOT DISEASES OF SPRING WHEAT IN MANITOBA IN 1996

METHODS: A survey for fusarium head blight (FHB) and leaf spot diseases in spring wheat fields was conducted in southern Manitoba between 31 July and 2 August and 13-15 August 1996. Heads were examined in 138 fields between watery-ripe and medium dough stages of development. The percentage of heads affected with FHB was estimated in each field. Kernels from heads from 55 fields of bread wheat and 3 fields of durum wheat were surface sterilized and incubated on potato dextrose agar under continuous cool white light for 4-5 days to confirm and identify the *Fusarium* species present .

Leaves were collected from 148 fields (130 common, 14 durum, 4 Canada Prairie Spring (CPS)) between heading and soft dough stages of development. Severity of disease on upper and lower leaves was categorized as 0, trace (TR), 1, 2, 3 or 4, with 4 describing dead leaves and 1 lightly affected. Samples of diseased leaf tissue were surface sterilized and placed in moisture chambers for 5-7 days to promote pathogen sporulation and confirm disease identification.

RESULTS AND COMMENTS: Weather conditions favoured FHB and leaf spot development with temperatures close to normal and above average rainfall in July and August. FHB was present in all fields of wheat in southern Manitoba ranging from trace to 80% incidence and 30 to 50% severity. Based on incidence and severity, the FHB Index (a measure of the potential yield loss) averaged from 5 to 20% depending on the region. Of note is that FHB was more severe in western regions of Manitoba, both north and south of the Trans Canada Highway than has been reported in previous years. *Fusarium graminearum* was the principal causal species accounting for 76% of isolations from common and semi-dwarf cultivars (Table 1). Data for durum wheats are sparse as few fields were encountered. Species other than *F. graminearum* accounted for 6% of the isolations, which is an increase over previous years (Table 1).

Only 4 CPS wheat fields were encountered and data have been combined with bread wheat data. Severity levels for leaf spot diseases on the upper leaves of wheat ranged from light (1) to severely diseased (3-4) probably reflecting the range in planting dates after spring flooding. On lower leaves levels were moderate to severe (3-4). High levels of *S. tritici*, speckled leaf blotch, were observed on common and semi-dwarf cultivars, but low levels were found on durum wheat. (Table 2). Incidence of tan spot (caused by *Pyrenophora tritici-repentis*) was high in all wheat types, especially in durums, and spot blotch (caused by *Cochliobolus sativus)* was high in bread and CPS wheat. Incidence of septoria leaf and glume blotch caused by *Septoria nodorum* was moderate in all wheat classes (Table 2) Incidence and severity of *S. avenae* f. sp. *triticea* were low (Tables 2, 3). Severity of tan spot was high on durum wheats, and septoria tritici blotch was moderately high on bread and CPS wheats (Table 3).

Table 1. *Fusarium* species isolated from spring wheat in southern Manitoba in 1996.

FUSARIUM SPP.	**% KERNELS**
graminearum	76.3
avenaceum	2.7
equiseti	2.2
culmorum	0.8
acuminatum	0.1
poae	0.1
sporotrichioides	0.1

Table 2. Frequency of leaf spot diseases identified in 148 wheat fields in Manitoba in 1996.

WHEAT TYPE	**NUMBER OF FIELDS**	**DISEASE/PATHOGEN**				
		Septoria spp.			Tan	Spot
		S. nodorum	*S. tritici*	*S. avenae*	spot	blotch
Common	134	49	71	15	62	70
Semi-dwarf						
Durum	14	41	18	5	100	39

Table 3. Percent of leaf tissue pieces (severity) yielding leaf spot pathogens in 148 wheat fields in Manitoba in 1996.

WHEAT TYPE	**NUMBER OF FIELDS**	**PATHOGEN**				
		Septoria spp.			*P.*	*C.*
		S. nodorum	*S. tritici*	*S. avenae*	*t-r*	*sativus*
Common	134	17	21	1	36	17
Semi-dwarf						
Durum	14	10	4	1	49	12

CROP: Wheat

LOCATION: Manitoba and Saskatchewan

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TITLE: WHEAT STREAK MOSAIC IN SOUTHEASTERN SASKATCHEWAN AND SOUTHWESTERN MANITOBA IN 1996

INTRODUCTION AND METHODS: Wheat streak mosaic (WSM), caused by wheat streak mosaic virus (WSMV) and vectored by the wheat curl mite, *Aceria tulipae* Keifer, appeared for the first time in 1989 as a very serious disease of spring wheat in the eastern Prairies (1). It is now clear that the current CPS and CWRS cultivars are at high risk of severe losses from WSM if they are grown in the vicinity of winter wheat, the over-wintering host of the mite vector. In the most susceptible CWRS cultivars, losses as high as 100% have been observed (2).

Surveys were carried out from mid-June to mid-July on spring and winter wheat fields in southeastern Saskatchewan and southwestern Manitoba; some samples were also obtained in other parts of Manitoba in the course of surveys for other diseases. The proportion of plants with WSM symptoms in surveyed fields was estimated and specimens with and without symptoms collected for testing. Infection with WSMV was
confirmed by transmission (by mechanical inoculation) to test plants, and serologically by enzyme-linked immunosorbent assay (ELISA).

RESULTS AND COMMENTS: In southeastern SK, serious outbreaks of WSM were observed on both winter and spring wheat crops, particularly in the vicinity of Weyburn where winter wheat cultivation is more extensive than elsewhere in eastern Saskatchewan. Twelve of 23 sampled fields were confirmed to have high (>10%) proportions of WSMV-infected plants.

In Manitoba, 9/19 sampled fields were confirmed to have high proportions of WSMV-infected plants. Most of the fields affected with WSM were in western Manitoba within 100 km of Brandon; WSM-affected fields were also found near Dauphin and in the Red River valley in eastern Manitoba, but with lower proportions of diseased plants.

As winter wheat acreages increase in response to the needs for crop diversification and improved sustainability, the extent and intensity of WSM can be expected to increase.

REFERENCES:

1) Haber, S. 1996. Cereal virus disease situation in Manitoba in 1995. Can. Pl. Dis. Surv. 76(1):78.

2) Haber, S. and Townley-Smith, T.F. 1993. Developing tolerance to wheat streak mosaic virus in spring wheats for western Canada. Wheat Newsl. 39: 121-123.

CROP: Wheat, *Triticum aestivum* L.

LOCATION: Saskatchewan

NAME AND AGENCY:
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TITLE: SASKATCHEWAN WHEAT DISEASE SURVEY, 1996

METHODS: A survey for wheat diseases in seven crop sub-districts in south-western, west-central and south-central Saskatchewan was conducted by sampling 92 wheat fields between milk and soft dough growth stages. Sixty-six fields were selected at random, and 26 were part of a leaf spotting disease survey involving six producers in different crop districts (CD). Fifty-six fields were durum (CWAD), and 36 were hard red spring (CWRS) wheat. Forty-nine fields were in the Brown and 43 in the Dark Brown soil zone. Diseases were assessed at least 20 paces in from the edge of the field. Loose smut, ergot, glume discoloration and take-all, as well as damage by the wheat stem maggot, were estimated for percent incidence over the field. Glume discoloration included glume blotch or black chaff, or both. Common root rot was estimated by counting the number of plants, out of a sample of 10 plants, which had lesions covering more than 50% of the subcrown internode. Severity of leaf spotting diseases was assessed on a 0-11 scale (McFadden, 1991). Previous crop type and tillage operations were recorded.

A sample of upper leaves with leaf spot lesions was collected from most fields. To identify the fungi responsible for leaf spots, 1-cm^2 sections from lesioned areas of about 10 leaves were surface disinfested in 0.06% sodium hypochlorite for 1 min, rinsed three times in sterile distilled water, and plated on water agar containing 100 mg/L streptomycin sulfate, and incubated for about 6-7 days under near-UV lights (12h light at 22C, 12h dark at 15C). The percent leaf area covered by each fungus was calculated.

RESULTS: Leaf spots were the most prevalent diseases. They were present in all fields surveyed, 84% of them being moderately to severely infected (score greater than 4) (Table 1). Fields in crop district 3B-S had the lowest leaf spot severity. Across all CD's, the severity of leaf spots was higher in the CWAD (7.8) than in the CWRS (7.3) wheat. It was also higher in the Dark Brown than in the Brown soil zone for CWAD (mean of 8.4 and 7.4 respectively) and CWRS (mean of 8.3 and 5.8, respectively). Across all fields, excluding those in CD 3B-S, the average leaf spot score was 8.7 after fallow, 8.4 after a noncereal crop, and 8.0 for wheat immediately following another wheat crop.

The most common leaf spotting fungus was *Pyrenophora tritici-repentis*, followed by *Septoria nodorum* (Table 1). The two were present in all districts. *P. tritici-repentis* was the only fungus present in all fields, and it was more common in CWAD than in CWRS. *S. nodorum* was more prevalent in CWRS than in CWAD wheat. *S. tritici* and *S. avenae* f. sp. *triticea* were only found in CWRS, and were more common in the Dark Brown than in the Brown soil zone. *Cochliobolus sativus* was present in all CD's, except for 6B and 7A, at trace levels.

The second most prevalent disease was common root rot with 67% of the fields having some severely infected plants (Table 2). There was slightly more common root rot in durum (24%) than in CWRS (22%). There was less common root rot in wheat following a noncereal crop (15.8%) than following another wheat crop (20.5%) or wheat fallow (27.7%).

All other diseases observed were present at very low levels. Take-all was present at trace to <1% in 18% of fields, and it was more prevalent in CWAD (29% of fields) than in CWRS fields (3%). Glume discoloration was reported in 29% of the fields mostly at trace to <1% levels, and it was more widespread in CD's 2B and 6B. Glume discoloration was present in more fields in the Dark Brown (42%) than in the Brown (15%) soil zone. Trace levels of loose smut and wheat stem maggot damage were recorded in 5.6% of the surveyed fields. Ergot was reported in one field. No leaf or stem rust, powdery mildew, viruses or headblight were observed.

REFERENCES:

1. McFadden, W. 1991. Etiology and epidemiology of leaf-spotting diseases in winter wheat in Saskatchewan. Ph.D. Thesis, University of Saskatchewan, Saskatoon. 151pp.

Table 1. Distribution and severity of leaf spotting diseases, and percent leaf spotting fungi on leaf samples collected in fields surveyed in Saskatchewan in 1996.

				LEAF SPOTTING FUNGI (%) /NO. OF FIELDS FROM WHICH FUNGUS WAS RECOVERED				
Crop sub-district	Wheat class	No. fields surveyed	Leaf spots	*Pyrenophora tritici-repentis*	*Septoria nodorum*	*S. tritici*	*S. avenae*	*Cochliobolus sativus*
2B	CWAD	8	9.5/8 (9.0-10.0)[1]	96/8	4/5	0/0	0/0	tr/1
	CWRS	4	9.3/4 (9.0-10.0)	84/4	6/3	9/4	1/2	tr/1
3A-N	CWAD	1	10.0/1 (10.0)	86/1	14/1	0/0	0/0	0/0
	CWRS	2	9.5/2 (8.0-11.0)	27/2	10/2	49/2	15/2	0/0
3B-N	CWAD	19	8.3/19 (3.0-11.0)	98/19	3/8	0/0	0/0	1/2
	CWRS	16	7.3/16 (2.0-10.0)	80/16	9/11	11/10	tr/3	0/0
3B-S	CWAD	8	3.8/8 (1.0-8.0)	93/4[2]	6/3	0/0	0/0	2/1
	CWRS	5	2.4/5 (1.0-4.0)	47/2[3]	52/2	0/0	0/0	1/1
4B	CWAD	12	7.5/12 (6.0-8.0)	94/12	6/9	0/0	0/0	tr/1
	CWRS	1	5.5/1 (5.5)	94/1	6/1	0/0	0/0	0/0
6B	CWAD	2	9.3/2 (9.0-9.5)	96/2	4/2	0/0	0/0	0/0
	CWRS	3	9.2/3 (7.0-10.5)	74/3	11/3	12/2	3/1	0/0
7A	CWAD	6	8.7/6 (7.0-10.0)	89/6	11/5	0/0	0/0	0/0
	CWRS	5	9.0/5 (8.0-10.0)	54/5	3/3	32/5	10/5	0/0
	Mean:							
	CWAD	56	7.8/56 (1.0-11.0)	95/52[4]	8/32	0/0	0/0	4/5
	CWRS	36	7.3/36 (1.0-11.0)	71/33[5]	14/24	22/23	8/13	1/2

[1] Average disease rating on a 0-11 scale (McFadden, 1991)/No.fields affected, lowest and highest score(s) in brackets.
[2] leaf samples collected from 4 fields.
[3] leaf samples collected from 2 fields.
[4] leaf samples collected from 52 fields.
[5] leaf samples collected from 33 fields.

Table 2. Distribution, severity, and prevalence of wheat diseases, other than leaf spots, in fields surveyed in Saskatchewan, in 1996.

		AVERAGE DISEASE RATING/NO.FIELDS AFFECTED					
Crop sub-district	No. fields surveyed	Common root rot	Take-all	Glume discoloration	Loose smut	Ergot	Wheat stem maggot
2B	12	19/5[1]	tr/2	<1/12	tr/2	0/0	0/0
3A-N	3	40/2[2]	0/0	2.7/2	0/0	tr/1	0/0
3B-N	26	14/16[3]	tr/4	tr/2	0/0	0/0	tr/2
3B-S	13	12/6	tr/3	0/0	tr/1	0/0	tr/1
4B	2	15/2	0/0	0/0	0/0	0/0	0/0
6B	5	28/4	tr/1	tr/4	tr/1	0/0	tr/1
7A	11	16/5[4]	tr/3	tr/1	0/0	0/0	0/0

[1] Common root rot was evaluated in 8 fields.
[2] Common root rot was evaluated in 2 fields.
[3] Common root rot was evaluated in 23 fields.
[4] Common root rot was evaluated in 7 fields.

Oilseeds and Special Crops/Oléagineux et cultures spéciales

CROP: Canola

LOCATION: Peace River Region of Alberta

NAME AND AGENCY:
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TITLE: INCIDENCE OF *BOTRYTIS* AND *SCLEROTINIA* ON CANOLA PETALS IN 1996

METHODS: The objective of the survey was to determine the incidence of *Botrytis cinerea* and *Sclerotinia sclerotiorum* on canola petals during the flowering period. From June 28 to July 23, 1996, petals were collected from 38 canola crops. In each crop, canola inflorescences were collected at five different sites. The five sites were a minimum of 50 paces apart. For each of the five sampling sites, petals were picked at random and placed in petri plates on acidified potato dextrose agar as described by Turkington (1). Four petri plates each with four petals were used for each site, giving a total of 80 petals per crop. The petri dishes were placed at room temperature and *Sclerotinia* and *Botrytis* colonies were counted after 3-4 days incubation and again 7-10 days later.

RESULTS AND COMMENTS: *Sclerotinia sclerotiorum* was found on canola petals in all 38 crops. Incidence of *Sclerotinia* ranged from 13-96% (Table 1). *Botrytis cinerea* was found in 27 of the 38 fields sampled (71%). Incidence of *Botrytis* was lower, ranging from 0-34%. The canola crop at location 3 (Manning) with high levels of *Botrytis* was adjacent to alfalfa crops with high levels of *Botrytis cinerea*, which is one of the causal organisms of blossom blight of alfalfa.

ACKNOWLEDGEMENTS: Many thanks to the following people for assisting with the canola petal survey: D. Stevenson, B. Anderson and J. Kramer. Thanks to the Alberta Canola Producers Commission for their financial support.

REFERENCES:

1. Turkington, T.K. 1988. Using ascospore infestation of petals to forecast sclerotinia stem rot of rapeseed. M.Sc. thesis, University of Saskatchewan, Saskatoon, Sask. 121 pp.

Table 1. 1996 Incidence of Sclerotinia and Botrytis on canola petals in the Peace Region. Values are expressed as percentages.

LOCATION	# FIELDS	*SCLEROTINIA*		*BOTRYTIS*	
		Mean	Range	Mean	Range
1	7	80.7	48-96	1.4	0-4
2	5	46.3	13-69	10.3	3-26
3	2	32.1	25-39	21.1	10-34
4	24	50.2	26-83	5.2	0-23
TOTAL	38				

1 = Eaglesham, Falher, Rycroft, Wanham
2 = Grimshaw, Fairview
3 = Manning
4 = Grande Prairie

CROP: Canola

LOCATION: Alberta

NAME AND AGENCY:
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TITLE: BLACKLEG OF CANOLA SURVEY IN ALBERTA - 1996

INTRODUCTION AND METHODS: The provincial survey for virulent blackleg (*Leptosphaeria maculans*) of canola is in its ninth consecutive year. Agricultural fieldmen from each of Alberta's 67 municipalities were asked to participate in the survey. They were requested to give priority to canola crops with shortened or no crop rotations. Crops were sampled as previously described (1). Diagnostic confirmation of virulent blackleg infested samples was provided by the Alberta Environmental Centre (now Alberta Research Council) at Vegreville and laboratories at Fairview and Brooks.

RESULTS AND COMMENTS: A total of 2223 canola crops were surveyed (Table 1). Virulent blackleg was found in 91 crops throughout Alberta. There were 17 municipalities which did not conduct a blackleg survey. In the Peace Region, only 14 crops were found with virulent blackleg compared to 62 in 1995 and 104 in 1994. One major difference is that Westar, which is very susceptible to blackleg and was a very popular cultivar, is no longer grown in the Peace Region. In the other regions of Alberta virulent blackleg was recorded in 11-54 crops, except for the Northwest Region where no virulent blackleg was found. Blackleg was widespread in the Northeast Region; a crop of Pursuit (herbicide) resistant canola suffered almost 30% yield loss. Detailed breakdown of number of fields found infested in various agricultural regions in Alberta is appended at the end of this report.

Table 1. Number of surveyed crops with virulent blackleg in Alberta in 1996.

MUNICIPAL DISTRICT	NUMBER OF CROPS SURVEYED	NUMBER OF CROPS WITH VIRULENT BLACKLEG
Northeast Region	170	54
Northwest Region	82	0
Central Region	276	12
South Region	231	11
Peace Region	1464	14
Total	2223	91

ACKNOWLEGEMENTS: Thanks to the agricultural fieldman and inspectors involved in surveying the canola crops. Thanks to B. Anderson and J. Kramer for assistance with testing for virulence of blackleg in canola specimens. Thanks to the Alberta Canola Producers Commission for their financial support for field surveys and laboratory assistance.

REFERENCES:

1. Kharbanda, P.D., I.R. Evans, L. Harrison, S. Slopek, H.C. Huang, D. Kaminski and J.P. Tewari. 1989. Blackleg of canola survey in Alberta - 1988. Can. Plant Dis. Surv. 69: 55-57.

Appendix. Number of fields found infested with virulent blackleg of canola in Alberta in 1996.

DISTRICT	#CROPS	BLACKLEG
Northeast Region		
County of Beaver #9	23	0
County of Lamont #30	30	4
County of Minburn #27	15	15
County of Smokey Lake #13		No Survey
County of St. Paul #19	21	0
County of Two Hills #21	26	12
County of Vermilion River #24		No Survey
MD* of Bonnyville #87	15	0
MD of Provost #52	25	23
MD of Wainwright #61	15	0
Total	**170**	**54**
Northwest Region		
County of Athabasca #12	15	0
County of Barrhead #11	4	0
County of Lac Ste. Anne		No Survey
County of Leduc #25	15	0
County of Parkland	20	0
County of Strathcona	4	0
County of Thorhild #7		No Survey
MD of Brazeau #77	5	0
MD of Lesser Slave River		No Survey
MD of Sturgeon #90	12	0
MD of Westlock #92	7	0
MD of Woodlands #15		No Survey
MD of Yellowhead #94		No Survey
Total	**82**	**0**
Peace Region		
County of Grande Prairie #1	24	4
MD of Big Lakes #125	18	0
MD of Birch Hills #19	80	0
MD of Clear Hills #21	120	0
MD of East Peace #131	299	0
MD of Fairview #136	125	0
MD of Greenview #16	14	0
MD of Mackenzie #23	47	0
MD of Northern Lights #22	60	0
MD of Peace #135	280	0
MD of Saddle Hills #20	90	0
MD of Smoky River #130	281	10
MD of Spirit River #133	5	0
Fairview Lab	21	0
Total	**1464**	**10**
Central Region		
County of Camrose #22	85	0
County of Flagstaff #29	20	6
County of Mtn View #17		No Survey
County of Paintearth #18	52	1
County of Ponoka #3		No Survey
County of Red Deer #23	27	0
County of Stettler	16	1
County of Wetaskiwin #10	15	0
Lacombe County	26	0
MD of Bighorn #8		No Survey
MD of Clearwater		No Survey
MD of Threehills #48		No Survey
MD of Rocky View #44	30	4
MD of Starland #47	5	0
Total	**276**	**12**
South Region		
County of Foothills #31		No Survey
County of Forty Mile #8	5	0
County of Lethbridge #26	10	0
County of Newell #4	5	0
County of Vulcan #2	60	0
County of Warner #5	4	0
County of Wheatland #16	101	3
MD of Acadia #34		No Survey
MD of Cardston #6		No Survey
MD of Cypress #1	2	0
MD of Pincher Creek #9	2	0
MD of Ranchland #66		No Survey
MD of Taber #14	6	0
MD of Willow Creek #26		No Survey
Special Area #2, Hanna	3	0
Special Area #3, Oyen	15	0
Special Area #4, Consort	18	8
Total	**231**	**11**

*MD = Municipal district

CROP: Field bean

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: DISEASES OF FIELD BEAN IN MANITOBA IN 1996

METHODS: Crops of field bean were surveyed in 18 different locations in Manitoba during the 1996 growing season. The crops surveyed were chosen at random from regions in south-central Manitoba(Figure 1), where most commercial field bean production takes place. The survey was conducted between 9 - 16 August when beans were in the pod-fill stage. Ten plants were sampled at each of five random sites for each crop surveyed. Diseases were identified by the manifestation of symptoms and rated as percentage of plants infected

RESULTS AND DISCUSSION: Six diseases were observed on field bean in Manitoba in 1996 (Table 1). Bacterial brown spot *(Pseudomonas syringae* pv. *syringae)*, Halo blight *(P. syringae* pv*. phaseolicola)* and common bacterial blight *(Xanthomonas campestris* pv.*phaseoli)* were the most commonly observed diseases. They were found in 11, 10 and 6 crops out of 18 surveyed, respectively. The incidence of the three respective diseases was 11.6, 6.2 and 12.0% on average, and ranged from 2-32%. The severity of these diseases was slight, but not measured due to the extensive time requirement for the assessment. White mold (*Sclerotinia sclerotiorum*) was observed in 7 crops. The incidence of white mold was 55% on average and ranged from 11-85%. Six out of the 7 infected crops had white mold incidence greater than 40%. White mold was considered the most damaging disease on field bean in 1996. Rust *(Uromyces appendiculatus)* was observed in 2 crops. The incidence of rust was 15.5% on average and ranged from 14-17%. Severity of rust was considered slight and not assessed in detail. Anthracnose (*Colletotrichum lindemuthianum*) was observed in one crop and had an incidence of 80%. Yield reduction due to anthracnose infection was estimated at least 50% in this crop.

Neither white mold nor anthracnose was observed during the survey period in 1995. The two diseases, however, had an extremely destructive effect on infected crops of field bean in 1996. Effective controls of the these diseases are urgently needed.

Table 1. Prevalence and severity of diseases in 18 field bean crops in Manitoba in 1996.

Disease	No. Crops Affected	Incidence (%) Mean	Range
Bacterial brown spot	11	11.6	6-22
Halo blight	10	6.2	2-13
Common bacterial blight	6	12.0	3-32
White mold	7	54.7	11-85
Rust	2	15.5	14-17
Anthracnose	1	80.0	80.0

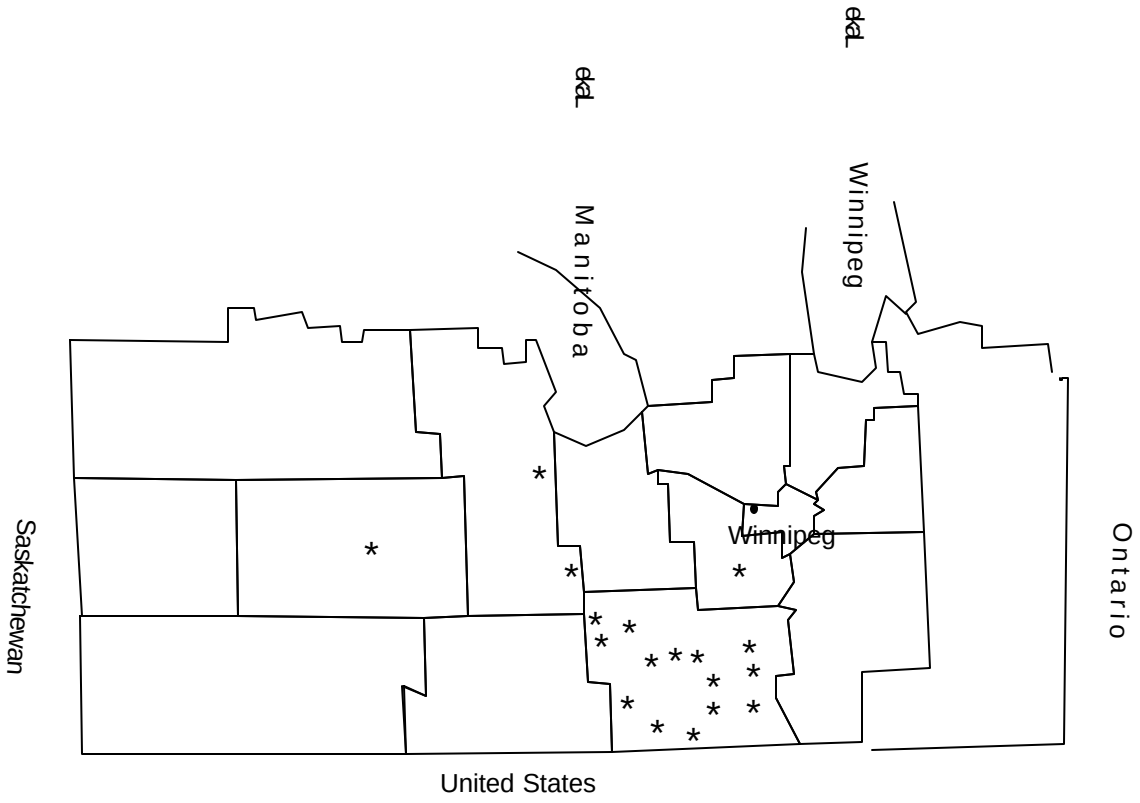

Figure 1. Locations of 18 field bean crops surveyed for diseases in southern Manitoba in 1996.

CROP: Field pea

LOCATION: Manitoba

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TITLE: DISEASES OF FIELD PEA IN MANITOBA IN 1996

METHODS: Crops of field pea were surveyed in 51 different locations in Manitoba during the 1996 growing season. The crops surveyed were chosen at random from regions in south-west and south-central Manitoba (Figure 1), where most field peas were grown. The survey was conducted between 9 - 16 August when peas were in the pod-fill stage. Ten plants were sampled at each of five random sites for each crop surveyed. Diseases were identified by the manifestation of symptoms. Fusarium wilt was rated as percentage of plants infected. The severity of other diagnosed diseases was estimated using a scale of 0 (no disease) to 9 (whole plants were severely diseased).

RESULTS AND DISCUSSION: Six diseases were observed on field pea in Manitoba in 1996 (Table 1). Mycosphaerella blight (*Mycosphaerella pinodes*) was the most common disease, found in all 51 crops surveyed. The overall disease severity score was 4.9 and ranged from 1 to 9. Severe infection by Mycosphaerella blight was observed for 12 crops (Disease scores >6.5) and had caused economically significant damage. Powdery mildew (*Erysiphe pisi)* was the second most prevalent disease, found in 49 crops out of 51 surveyed. Severity score for powdery mildew was 3.1 on average and ranged from 0.4 to 7.5. The two fields free of powdery mildew infection were seeded with resistant cultivars. Downy mildew *(Peronopora viciae)* and bacterial blight (*Pseudomonas syringae* pv. *pisi*), were observed in 18 and 4 of the crops, respectively, and had severity of less than 1.0 on average. Septoria leaf blotch (*Septoria pisi*) was observed in one crop only with severity score of 5.0. Infection of Fusarium wilt *(Fusarium oxysporum* f. sp. *pisi)* was observed in 9 crops and caused an average infection of 7.2% and maximum of 25%. Other diseases such as Sclerotinia rot(*Sclerotiniia sclerotiorum*) and gray mould (*Botrytis cinerea*), which were found in 1994 and 1995, were not observed at the time of this survey.

Powdery mildew is usually found in early July in Manitoba, but was observed in mid-June in 1996. The relatively lower rainfall and heavy dew associated with cool nights in late May and June were considered the main cause for the early and widespread infection. The disease caused significant damage to late seeded and late maturing cultivars. Genetic resistance to powdery mildew is available and easily transfered through breeding. Among field pea cultivars registered in western Canada, Highlight, Tara and AC Tamor are resistant.

Mycosphaerella blight was more prevalent in 1996 compared to 1995. In contrast, Fusarium wilt which was the second most prevalent disease on pea in 1995 was less extensive in 1996. The dynamic in the prevalence of these diseases may have due to the high level of ground moisture and the lack of water stress in 1996.

Table 1. Prevalence and severity of diseases in 51 field pea crops in Manitoba in 1996.

Disease	No. Crops Affected	Disease Severity * Mean	Range
Mycosphaerella blight	51	4.9	1.0-9.0
Powdery mildew	49	3.1	0.4-7.5
Downy mildew	18	0.9	0.3-1.6
Bacterial blight	4	0.6	0.4-1.0
Septoria leaf blotch	1	5.0	5.0
Fusarium wilt (%)	9	7.2%	1-25%

*Fusarium wilt was rated as percent of plants infected; other diseases were rated on a scale of 0 (no disease) to 9 (whole plant severely diseased).

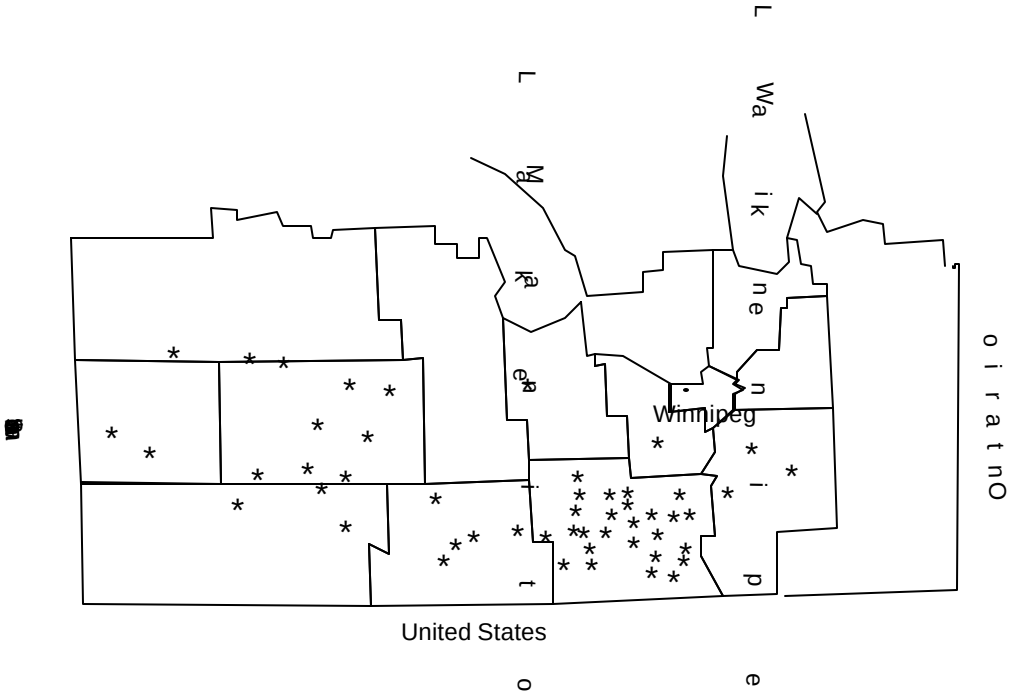

Figure 1. Locations of 51 field pea crops surveyed for diseases in southern Manitoba in 1996.

CROP: Flax

LOCATION: Manitoba

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TITLE: DISEASES OF FLAX IN MANITOBA IN 1996

METHODS: A total of 39 flax crops in southern Manitoba and 4 in southeastern Saskatchewan were surveyed in 1996. Ten crops were surveyed in the last week of July, 15 in the last week of August and 18 in the first week of September. Seven crops were "Solin" flax with low-linolenic acid and yellow seed colour, and 36 crops were normal flax with brown seed colour. Crops were surveyed along preplanned routes in the major areas of flax production. Crops were selected at random. 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, 37 samples of flax plants were submitted for analysis to the Manitoba Agriculture Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Most flax crops surveyed in 1996 had excellent stand and vigour, however, delayed seeding resulted in 1-2 weeks delay in maturity. The growing conditions were generally good throughout the 1996 season.

Pasmo (*Septoria linicola*) was observed in 67% of the 33 crops surveyed in August and September (Table 1). In the infested crops, the incidence of pasmo ranged from 1 to 60% infected plants, and severity from 1 to 40% stem and leaf area affected. Only one crop had 60% infected plants with 10-40% stem and leaf area affected. The incidence and severity of pasmo varies from year to year and region to region depending on prevailing weather conditions towards the end of the season.

Fusarium wilt (*Fusarium oxysporum f.sp. lini*) was observed in 9 of the 10 crops surveyed in the last week of July. The incidence of wilt in these crops was from trace to 1%, and disease severity ranged from 1% to 5%. Only one crop had 5% infected plants at 1-5% disease severity. The incidence and severity of late fusarium wilt at the flowering and green boll stages were not assessed in 1996.

Traces of aster yellows (Phytoplasma) were observed in six flax crops (14% of total). Rust (*Melampsora lini*) was not observed in any of the 43 crops surveyed, nor in the rust-differential flax nurseries planted at Morden and Portage la Prairie.

Of the 37 flax samples submitted to the Manitoba Agriculture Crop Diagnostic Centre, five were affected by pasmo, and two were affected by aster yellows phytoplasma. In addition to diseases, 20 samples were affected by herbicide injury, one by nutrient deficiency, one by mechanical damage, and 11 by other environmental damage.

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

Table 1. Incidence and severity of pasmo in 33 crops and fusarium wilt in 10 crops of flax in southern Manitoba and southeastern Saskatchewan in 1996.

CROPS AFFECTED BY PASMO			CROPS AFFECTED BY FUSARIUM WILT		
No. and % of crops infested	Incidence*	Severity**	No. and % of crops infested	Incidence*	Severity**
11 (33%)	0	0	1 (10%)	0	0
14 (42%)	1-5%	1-5	8 (80%)	1-5%	1-5%
3 (9%)	5-20%	1-10%	1 (10%)	10%	1-5%
4 (12%)	20-40%	5-20%	- -	-	-
1 (3%)	60%	10-40%	- -	-	-

* Incidence = Percentage of infected plants in each field.
** Severity = Percentage of stem and leaf area affected with pasmo and visual estimate of wilt, yellowing of leaves, and plant vigour for fusarium wilt.

CROP: American ginseng (*Panax quinquefolium L.*)

LOCATION: Central and southern Alberta

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TITLE: THE OCCURRENCE OF GINSENG DISEASES IN ALBERTA IN 1996

METHODS: Fifteen ginseng gardens were surveyed from early July to late August, 1996. The number of healthy and diseased plants in a one-meter length of raised bed was recorded. Five areas (four corners and the centre) were surveryed in each garden. Disease incidence (DI) was determined by dividing the number of diseased plants by the total number of plants surveyed and calculating a percentage. Disease severity (DS) ratings were based on a 0 to 4 scale, where 0 = no diseased plants; 1 = a single leaflet affected; 2 = two compound leaves and petioles affected; 3 = three leaves and petioles and stem affected; and 4 = all above ground portions of the plant killed and/or roots affected. An average DS value was determined for each garden using the formula: $[(1xDS_1 + 2xDS_2 + 3xDS_3 + 4xDS_4)]$/total number of plants surveyed.

Diseased roots, crowns, stems and leaves were returned to the laboratory, cut into 5 mm pieces and surface-sterilized in 1% sodium hypochlorite solution for 10 seconds (leaf) to 2 min (stem and root). Samples were then rinsed four times with sterile distilled water and transferred onto petri plates containing potato dextrose agar. The plates were placed on a laboratory bench under ambient light and room temperature for 7 days. Microorganisms were subcultured onto PDA slants for genus and species identification.

Apparently healthy leaves, symptomatic leaves with interveinal chlorosis, and soil samples from two ginseng gardens near Brooks were sent to the Soil and Crop Diagnostic Centre (SCDC) of Alberta Agriculture, Food and Rural Development in Edmonton for elemental analysis. In garden #1, soil samples were collected at three depths (0-15, 15-30 and 30-41 cm) from each of three beds and composited in separate paper bags for each depth. Other soil samples were similarly collected from two sites in garden #2. The samples were air dried for one week, then sent to SCDC. Leaves with symptoms resembling chemical phytotoxicity were also analyzed.

RESULTS AND DISCUSSION: Values of DS and DI varied with location and age of the crop (Table 1). The DI ranged from 0-65.9%, while DS generally was low and ranged from 0.0-0.9. The highest DI (65.9%) occurred in garden #8, a 4-yr-old ginseng planting at the Crop Diversification Centre (CDC)-South. The second highest DI was observed in a 3-year-old garden in central Alberta. Plants grown under a canopy of oak trees at CDC-South (garden #7) had a lower DI than those grown under articifical shading (garden #8) at the same site. DI and DS did not show a positive correlation with crop age. It was not possible to determine whether damping-off and root rot were prevalent in newly emerged seedlings because the survey was started in early July, which was too late in the season. Only low percentages of *Rhizoctonia solani* were found in diseased crowns. *Alternaria* spp. were the predominant organisms isolated from leaf lesions, followed by *Fusarium* spp. and bacteria (Table 2). Alternaria leaf and stem blight was the most common disease on 2- and 3-year old ginseng plants. This disease was manifest as small circular lesions, or in more severe cases, entire leaves and stems were affected. *Fusarium* spp. were the major cause of stem infections, but bacteria and *Alternaria* spp. were also involved. Bacteria were frequently isolated from symptomatic crowns and roots, possibly because of the large amounts of carbohydrate reserves in these plant parts. *Fusarium* spp. were the most common fungi in infected crowns and roots.

Nutrient deficiencies were a problem in some gardens. Leaves with interveinal chlorosis were observed and analysis of symptomatic leaves revealed a severe magnesium deficiency and a mild shortage of zinc. The average magnesium content in the soil collected from one garden with stunted, chlorotic plants was low, especially at the 0-15 cm level, and may have been responsible for the symptoms.

Whitish leaf margins, believed to be the result of fungicide phytotoxicity, were observed on plants in a ginseng garden near Brooks. Records shows that the crop had been sprayed with Dithane M-45 (780 L/ha = 4.2 g/15 L) on July 15, Rovral (1.1 kg/ha) on July 25, and Bravo 500 (2.5 L/ha) on Aug. 9.

ACKNOWLEDGEMENTS: M.A. Briant was involved in the survey at Brooks, S. Graham assisted in the isolation of microorganisms, and S. Eliuk and J.R. Letal conducted leaf tissue and soil analyses. Financial support was provided through a grant from the Alberta Agricultural Research Institute, Edmonton.

Table 1. Disease incidence and severity in 15 ginseng gardens in Alberta in 1996.

GARDEN NUMBER	CROP AGE (YR.)	TOTAL PLANTS SURVEYED	DISEASE SEVERITY (0-4)	DISEASE INCIDENCE (%)
1	3	824	0.7	21.0
2	2	453	0.1	8.5
3	3	352	0.9	47.0*
4	4	409	0.1	6.3
5	1	128	0.5	48.5
6	2	362	0.6	45.3
7	3	448	0.6	37.9*
8	4	98	0.9	65.9
9	1	420	0.0	0.0
10	4	793	0.4	22.7
11	2	288	0.0	2.1
12	1	333	0.1	13.5
13	1	350	0.0	0.0
14	1	111	0.2	16.8
15	3	359	0.2	18.7

* Plants were grown under a tree canopy rather than under shade cloth.

Table 2. Percent isolation of microorganisms from diseased plants collected from 15 ginseng gardens in Alberta in 1996.

PLANT PART	NO. SAMPLES COLLECTED	% MICROORGANISMS ISOLATED (% OF TOTAL ISOLATES)				
		Alternaria spp.	*Fusarium* spp.	*Rhizoctonia* solani	Other fungi	Bacteria
Leaf	45	38.6	30.7	1.1	6.8	2.7
Stem	29	22.7	50.0	0.0	2.3	25.0
Crown	12	14.3	28.6	4.8	9.5	42.8
Root	50	3.3	15.0	0.0	10.0	71.7

CROPS: Lentil, pea, chickpea

LOCATION: Saskatchewan

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TITLE: SEED-BORNE DISEASES OF LENTIL, PEA AND CHICKPEA IN SASKATCHEWAN IN 1996.

METHODS: No systematic survey of commercial lentil, pea or chickpea crops was conducted during the growing season. However, in July and early August casual observations were made by the senior author in many lentil crops and a few pea and chickpea crops, the majority in central and east-central Saskatchewan.

The results of agar plate tests conducted by four companies on commercial seed samples from the 1996 crop in Saskatchewan were summarized. The tests were conducted mainly to detect the pathogens causing ascochyta blight (*Ascochyta fabae* f. sp. *lentis*), anthracnose (*Colletotrichum truncatum*) and botrytis stem and pod rot (*Botrytis cinerea*) of lentil, ascochyta blights (*Mycosphaerella pinodes* and *A. pisi*) of pea, and ascochyta blight (*A. rabiei*) and botrytis blight (*B. cinerea*) of chickpea. Not all lentil samples were tested for *Colletotrichum* and *Botrytis*. Figures for ascochyta blights of lentil and pea were classified according to crop districts [CD] of Saskatchewan (4). It was not possible to determine which of the lentil and chickpea samples came from crops that had been sprayed with the fungicide Bravo (a.i. chlorothalonil) or grown from seed treated with Crown (a.i. thiabendazole + carbathiin).

RESULTS AND COMMENTS: In most areas of Saskatchewan the growing season was marked by excessive rainfall in May, which delayed seeding, normal to above-normal rainfall in June and July and below-normal rainfall in August. Temperatures were normal to below normal from May to July and above normal in August. Many lentil and pea crops were harvested under ideal conditions in August, but those that were not combined until later were exposed to high rainfall in September that caused weathering and quality loss.

Ascochyta blights were common on lentil and pea throughout most areas of cultivation and many lentil crops were sprayed with Bravo. Anthracnose of lentil was found in several areas of the province, including some where it had not been reported before (2, 4) , such as near Cupar [CD 5A], Raymore and Wishart [CD 5B], Elstow, Davidson, Imperial and Strasbourg [CD 6A], and St. Denis [CD 8B]. Botrytis stem and pod rot was observed in rank stands of lentil in several areas by late July, but development was usually arrested by the hot dry weather in August. In the small chickpea acreage planted, ascochyta blight was found in crops of both resistant and susceptible cultivars. Some of the susceptible crops were ploughed down because of severe damage and most crops were sprayed with Bravo.

By early December about 640 lentil and 340 pea seed samples had been tested by the four companies, as well as 20 chickpea samples. Levels of *Ascochyta* infection in lentil ranged up to 35%, with a mean of 2.8% and about 17% of the samples showing no detectable infection. Corresponding figures for pea were 12.5%, 1.6% and about 35%, and for chickpea were 6.9%, 0.7% and about 60%. In crop districts from which substantial numbers of lentil samples were tested, the mean level of *Ascochyta* infection was above the provincial average only in CD 2A, 3B-N, 6B and 7A (Table 1). These are all crop districts with a relatively long history of lentil cultivation. However, districts with a similar history, such as 2B, showed below-average means. The provincial mean level of infection of lentil was below values for the previous five years (1, 3), possibly reflecting the hot dry weather in August and an increased use of Bravo by farmers.

Colletotrichum was detected in only four samples of lentil at a level of 0.25% or less. *Botrytis* was detected in 52% of lentil samples tested. The highest level of infection was 9.0%, and the mean level was 0.8%. These values for *Botrytis* are all lower than in 1995 (3) and probably reflect the hot dry weather in August. In chickpea *Botrytis* levels ranged up to 6.9%, with a mean of 2.3%.

REFERENCES:

1. Morrall R.A.A., Paisley J. and French M. 1994. Seed-borne diseases of lentil in Saskatchewan in 1993. Can. Plant Dis. Survey 74: 101.

2. Morrall R.A.A. and Pedersen E.A. 1991. Discovery of lentil anthracnose in Saskatchewan in 1990. Can. Plant Dis. Survey 71: 105-106.

3. Morrall R.A.A., Reed M., Paisley J., French M. and Rude S.V. 1996. Seed-borne diseases of lentil and pea in Saskatchewan in 1995. Can. Plant Dis. Survey 76: 110-111.

4. 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.

Table 1. Number of samples of lentil and pea seed tested from August to December 1996 by four commercial companies and mean percent infection with *Ascochyta* in relation to Saskatchewan crop districts.

	LENTIL		**PEA**	
Crop District	# samples	Mean % *Ascochyta*	# samples	Mean % *Ascochyta*
1A	31.2	1	0	
1B	2	0	7	3.2
2A	27	2.9	10	1.9
2B	64	2.1	16	0.8
3A-S	16	1.0	4	0.3
3A-N	9	2.8	4	0.6
3B-S	21	2.0	2	0.3
3B-N	134	3.3	5	0.1
4A	5	3.1	2	0.3
4B	4	1.1	-	-
5A	19	1.7	19	2.9
5B	15	2.3	29	1.9
6A	36	1.2	16	0.7
6B	84	3.7	38	1.9
7A	89	3.6	17	1.6
7B	2	0.8	14	2.1
8A	-	-	47	1.7
8B	2	4.3	21	2.2
9A	4	0.4	26	2.8
9B	7	5.9	17	0.6
Unknown	103	2.6	45	0.5
Total	646	2.8	340	1.6

[1] For map of crop districts, see reference 4.

CROP: Sunflower

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 1996

METHODS: A total of 39 sunflower crops in southern Manitoba were surveyed in 1995. Twenty-four crops were oilseed hybrids and 15 were confectionery hybrids. Four crops were surveyed in the last week of July, 15 in the last week of August, and 20 in the first week of September. Crops were surveyed along preplanned routes in the major areas of sunflower production. 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*), rhizopus head rot (*Rhizopus spp.*), and verticillium wilt (*Verticillium dahliae*) were estimated. Disease severity for rust (*Puccinia helianthi*), leaf spots (*Septoria helianthi* and *Alternaria spp*.), and stem infections (*Phoma spp. & Phomopsis spp.*) were measured as percent leaf and stem area infected. A disease index was calculated for each disease in every crop based on disease incidence or disease severity (Table 1).

In addition, 17 samples of sunflower plants were submitted for analysis to the Manitoba Agriculture Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Most sunflower crops surveyed in 1996 had excellent stand and vigour, however, delayed seeding resulted in 1-3 weeks delay in maturity. The growing conditions were generally good throughout the 1996 season.

Sclerotinia wilt/basal stem infection was prevalent in 62% of the crops surveyed, with incidence ranging from trace to 10% infected plants (Table 1). Sclerotinia head rot and mid-stem breakage caused by ascospore infections were prevalent in 64% of the crops surveyed towards the end of the season, with incidence ranging from trace to 10% infected plants in most crops. Only two crops near Carman had 20-30% sclerotinia stem breakage. The ratio of head rot to mid-stem breakage varied among fields but mid-stem breakage was more frequently encountered than head rot in 1996, which is in contrast with the 1995 survey report (1). There was no evidence of head rot caused by *Rhizopus* or *Botrytis* in crops surveyed in 1996.

Verticillium wilt was prevalent in 31% of the crops surveyed, with incidence ranging from trace to 5% infected plants (Table 1). The prevalence and incidence of verticillium wilt in 1996 was lower than in 1995 but comparable to levels prior to 1995 (1).

Downy mildew was observed in 33% of the crops surveyed, with incidence ranging from trace to 5% infected plants (Table 1). Delayed seeding and above normal soil temperatures at the seedling stage resulted in low incidence of downy mildew. The incidence of downy mildew in 1996 and 1995 was low in comparison with 1994 (1, 2), due perhaps to the above normal temperatures and normal soil moisture conditions at the seedling stage in 1995 and 1996.

Rust was prevalent in 75% of the crops surveyed, with incidence ranging from trace to 40% leaf area infected (Table 1). Although rust prevalence in 1996 was similar to that in 1995, rust severity was higher in 1996 than in 1995 (1). Rust severity was at 10-40% leaf area infected in 10 sunflower crops near Carman and Deloraine.

Leaf spots caused by *Septoria helianthi* and *Alternaria spp*. were observed in most of the crops surveyed at trace to 5% leaf area infected. Stem lesions caused by *Phomopsis spp. and Phoma spp*. were observed in most of the crops surveyed towards the end of the season, with incidence ranging from trace to 10% infected stems.

Of the 17 samples submitted to the Manitoba Agriculture Crop Diagnostic Centre, three were infected with *Pythium spp*. In addition to diseases, 11 samples were found to be affected by herbicide injury, two by nutrient deficiency, and one by other environmental damage.

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

REFERENCES

1. Rashid, K.Y. and R.G. Platford. 1996. Diseases of sunflower in Manitoba in 1995. Can. Plant Dis. Surv. 76:120-122.

2. Rashid, K.Y. and R.G. Platford. 1995. Diseases of sunflower in Manitoba in 1994. Can. Plant Dis. Surv. 75:158-159.

Table 1. Prevalence and intensity of sunflower diseases in southern Manitoba in 1996.

DISEASE	NO. AND % OF CROPS INFESTED	DISEASE INDEX* MEAN	RANGE
Sclerotinia wilt	24 (62%)	0.7	T-2
Sclerotinia head rot/mid-stem	25 (64%)	1.0	T-3
Verticillium wilt	12 (31%)	0.7	T-1
Downy mildew	13 (33%)	0.6	T-1
Rust	29 (75%)	1.0	T-4
Phoma/Phomopsis stem lesion	20 (100%)$	0.5	T-1
Alternaria/septoria leaf spot	19 (100%)$	0.6	T-1
Stand	39	1.2	1-2
Vigour	39	1.3	1-2

* Disease index is based on a scale of 1 to 5:
Trace= < 1%,
1= 1% 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 rhizopus head rot; and on disease severity measured as percent leaf area infected for rust and leaf spots, and percent stem infections for phoma. Indexes for stand and vigour are based on 1-5 scale (1= very good and 5= very poor).

$ Only 20 crops were surveyed for *phoma/Phomopsis* stem lesion, and 19 crops for *Alternaria/Septoria* leaf spot.

Forage Legumes / Légumineuses fourragères

CROP: Alfalfa

LOCATION: Alberta, Saskatchewan, Manitoba

NAME AND AGENCY:
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TITLE: SURVEY OF BLOSSOM BLIGHT OF ALFALFA ON THE CANADIAN PRAIRIES IN 1996.

METHODS: The presence of *Botrytis cinerea* and *Sclerotinia sclerotiorum,* the causal agents of blossom blight, was assessed in alfalfa seed fields in Alberta, Saskatchewan and Manitoba throughout the flowering period. In most areas, flowering was 2-3 weeks later than normal because of cool, wet conditions in early spring, so sampling dates were from early to late July. In general, the oldest floret from each of four racemes was plated onto acidified potato dextrose agar, without surface sterilization, at 10 sites per field. In northern Alberta, five racemes were collected from each of six sites per field and four florets per raceme were plated. In most instances, grower co-operators collected and plated the samples, and mailed them to a central laboratory for assessment. The samples were incubated on the laboratory bench, and the incidence of pathogens was assessed after about 10 days. Fungi were identified by microscopic examination of cultural characteristics, and identify was confirmed by isolation into pure culture where required.

RESULTS AND COMMENTS: In southern Alberta, flower infection levels remained low throughout the season; *S. sclerotiorum* was the dominant pathogen in the few fields that did show substantial infection (Table 1). In the north (Peace River), pathogen incidence started out higher and increased during the flowering period. Both *B. cinerea* and *S. sclerotiorum* occurred at high levels in some fields during flowering, but the incidence of *B. cinerea* was generally lower in the north than was observed in 1995 (Gossen et al 1996).

In Saskatchewan and Manitoba, pathogen incidence was generally low at early bloom, but mean incidence increased during the study period, so that by late bloom incidence was moderate to high in most regions (Table 1). As in northern Alberta, both pathogens occurred at high levels in individual fields, but *B. cinerea* was generally the dominant pathogen when mean incidence was high. It is interesting to note that, across the prairie region, it was rare for both pathogens to occur at high levels in a single field (data not shown). This pattern may have important implications for disease management, since many fungicides are not effective against both pathogens.

REFERENCES

Gossen, B.D., Harrison, L.M., Holley, J. and Smith, S.R. 1996. Survey of blossom blight of alfalfa on the Canadian prairies in 1995. Can. Plant Dis. Surv. 76: 123-125.

ACKNOWLDGEMENT: Thanks to the Canadian Seed Growers Association, Saskatchewan Alfalfa Seed Producers Association, ADF, MII and AARI. for funding this work.

Table 1. Incidence (mean % and *range*) of *Botrytis cinerea* (Bc) and *Sclerotinia sclerotiorum* (Ss) in/on alfalfa flowers at early, mid, and late bloom in the grainbelt of western Canada in 1996.

LOCATION	NO OF FIELDS	EARLY BLOOM BC	EARLY BLOOM SS	MID BLOOM BC	MID BLOOM SS	LATE BLOOM BC	LATE BLOOM SS
Alberta							
Southcentral	12	4	15	12	13	4	11
		0-8	*3-50*	*3-30*	*0-48*	*0-8*	*0-53*
Peace River	13	17	22	40	24	34	17
		8-44	*6-63*	*3-75*	*4-64*	*0-70*	*4-47*
Total	25						
MEAN		**11**	**19**	**26**	**19**	**19**	**14**
Saskatchewan							
Northwest	3	25	23	24	33	30	12
		7-44	*8-36*	*0-40*	*5-69*	*8-51*	*5-18*
Northcentral	4	15	18	41	35	54	15
		4-31	*1-33*	*15-93*	*10-58*	*18-100*	*9-21*
Northeast	9	8	13	8	17	58	28
		3-20	*0-38*	*0-33*	*0-58*	*20-99*	*3-63*
Central	3	11	26	9	8	7	8
		0-19	*0-67*	*0-26*	*0-13*	*7*	*8*
Southeast	4	6	21	14	28	67	28
		3-10	*4-53*	*10-20*	*8-59*	*31-93*	*7-63*
Total	23						
MEAN		**12**	**18**	**19**	**25**	**53**	**22**
Manitoba							
Eastern	2	5	0	nd	nd	58	23
		5	*0*	nd	nd	*15-100*	*5-40*
Southern	2	13	9	nd	nd	69	54
		5-20	5-13	nd	nd	*38-100*	*30-78*
Interlake	2	2	4	nd	nd	35	44
		0-3	*0-8*	nd	nd	*18-52*	*33-55*
Total	6						
MEAN		**7**	**4**	**nd**	**nd**	**54**	**40**

nd = not done.

Tree fruits and nuts / arbres fruitiers et noix

CROP: Sweet cherry

LOCATION: British Columbia

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TITLE: DETECTION OF CHERRY MOTTLE LEAF IN BRITISH COLUMBIA

INTRODUCTION AND METHODS: Cherry mottle leaf (CML) is a disease caused by a clostero-like virus (1,2). The virus has a rather broad host range among *Prunus* spp., but acute symptom expression is limited to sweet cherry (*Prunus avium* L.), and the degree of symptom development depends on the virus isolate and on the cherry cultivar (3). 'Bing' is typically used as woody indicator for CML, but it has been observed that 'Canindex1' responds to infection with symptoms very similar to those that develop in 'Bing' including narrow rugose leaves (Eastwell, *unpublished observation*). Poor terminal growth of infected trees results in a rosetted appearance that becomes progressively worse during the growing season (3). Severe isolates of *Prunus* necrotic ringspot ilarvirus can result in leaves with a strap-like appearance resembling CML infection, but in the case of ilarvirus infection, the symptoms become less intense or nonexistent as the season progresses.

'Canindex1', which displays characteristic symptoms in response to CML, is used routinely as the indicator host for little cherry disease (LCD). Surveys for LCD are conducted annually in the two major cherry production areas of British Columbia, the Okanagan and Kootenay Valleys. Trees are identified as being potentially infected with LCD if the fruit is small and has irregular shape and light colour. To confirm the presence of LCD, budwood is collected and used to bud-inoculate 'Canindex1' trees and the indicator trees are observed for 2 years. The LCD survey and indexing on 'Canindex1' is used as a means of estimating the occurrence of CML in the commercial sweet cherry production areas of British Columbia. CML status of 'Canindex1' trees is confirmed by bud-inoculation to 'Bing'.

RESULTS AND COMMENTS: Prior to 1992, CML was rarely detected in samples from the Okanagan Valley while a very limited number of orchards had CML-infected trees in the Kootenay Valley. In recent years, buds from orchard trees exhibiting small, light coloured fruit have induced characteristic CML symptoms on 'Canindex1'. The results of these observations are summarized in Table 1. For comparison, the number of samples that resulted in the development of symptoms of LCD infection are also presented. Of the 17 trees identified positive for CML, four were indexed on 'Bing'; the results confirmed CML in each case. Based on symptom expression of 'Canindex1', eight trees infected with CML were concurrently infected with LCD.

The CML-infected trees represent samples from 14 orchards dispersed throughout the two valleys. In addition to orchards where CML was detected through indexing for LCD survey, two orchards with a high frequency of CML infection were confirmed in the Okanagan Valley as a result of grower inquiries. Furthermore, many infected trees likely remain undetected as a result of the cultivar specificity of symptom expression. The number of orchard trees that are known to be infected with CML is small but significant. The wide and expanding distribution of CML is cause for concern.

Table 1. Incidence of CML and LCD in cherry trees. Budwood was collected between 1992 and 1995 from sweet cherry trees bearing small, light-coloured fruit during the normal harvest period.

	OKANAGAN VALLEY	KOOTENAY VALLEY	TOTAL
Trees indexed on 'Canindex1':	142	370	512
'Canindex1' developing CML symptoms:	6	11	17
'Canindex1' developing LCD symptoms:	60	169	229

REFERENCES:

1. James, D. 1996. Cherry mottle leaf - the fulfilment of Koch's postulates. Proceedings: International Symposium: Rose rosette and other eriophyid mite-transmitted plant disease agents of uncertain etiology. Iowa State University, USA. pp.17-20.

2. James, D. and Mukerji, S. 1993. Mechanical transmission, identification, and characterization of a virus associated with mottle leaf in cherry. Plant Disease 77:271-275.

3. Németh, M. 1986. Virus, mycoplasma and rickettsia diseases of fruit trees. Akadémiai Kiadó, Budapest, 840 pp.

CROP: Sweet Cherry

LOCATION: British Columbia

NAME AND AGENCY:
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TITLE: LITTLE CHERRY DISEASE CONTROL SURVEY IN BRITISH COLUMBIA IN 1996

METHODS: Sweet cherry orchards of the central Okanagan Valley are inspected during the first two weeks of July by plant pathologists from the British Columbia Ministry of Agriculture, Fisheries & Food. The location of trees displaying fruit symptoms suggestive of little cherry disease are noted, and budwood for woody indexing is collected from these trees in the third week of August.

Cherry trees in the southern portion of the Kootenay Valley, encompassing the communities of Creston, Erickson, Canyon, Lister and Wynndel, are inspected by representatives of the Regional District of Central Kootenay during the third week of July. The following week, orchards with possible little cherry disease infected trees are inspected by plant pathologists from Agriculture & Agri-Food Canada and from the British Columbia Ministry of Agriculture, Fisheries & Food.

Determination of the little cherry disease-status of cherry trees is based on visual inspection: the characteristic symptoms of little cherry disease include small triangular fruit, insipid flavour and delayed coloration. Budwood is collected from symptomatic trees when the fruit symptoms are mild, or when the little cherry disease symptoms are accompanied by other obvious signs of stress such as winter injury, nutritional deficiency, water deficiency or other virus infections. At least two budsticks are collected from different areas of the tree. Four buds from each tree are T-budded onto individual 'Canindex1' trees in their second to fourth leaf, and/or onto mature fruiting 'Lambert' trees. Trees are observed for two years for the appearance of little cherry disease symptoms: premature reddening of the 'Canindex1' foliage and typical fruit symptoms of 'Lambert'.

RESULTS AND COMMENTS: The number of infected trees identified in the Kootenay Valley survey has been stable over recent years (Table 1). Most of the newly reported infections are the result of expanding the survey into previously uninspected plantings of cherry, including residential properties. Significant spread of little cherry disease continues only in discrete areas. Little cherry disease was first reported in the Kootenay Valley in 1933, and rapidly spread throughout much of the valley. From 145 ha in 1955, cherry plantings dwindled to less than 20 ha. There are now over 41 ha of newly planted cherry orchards in addition to the older plantings. Production is up from a low of 27000 kg in the 1970's to 115000 kg in 1995, 84000 kg in 1996 (a low yield due to inclement spring weather conditions) and a potential production of 136000 kg for 1997 based on young trees coming into production (R. Hallman, *personal communication*). The 1994 pack-out of 16000 kg represents the first year of commercial packing line operation for cherries since its closure in 1979.

The survey of cherry orchards in the Okanagan Valley continues to indicate significant presence of little cherry disease (Table 2). A review of the areas where diseased samples were found indicates that the disease is present in all central areas of the Okanagan Valley that are surveyed, from Oyama to Penticton. Future surveys will determine the distribution of little cherry disease in other areas of the Okanagan Valley.

Table 1. Recent survey results for little cherry disease in British Columbia.

YEAR OF SURVEY	TREES INSPECTED	POSITIVE BY FIELD INSPECTION	WOODY INDEXING RESULTS			TOTAL NUMBER OF TREES INFECTED
			TREES INDEXED	POSITIVE ON 'CANINDEX1'	POSITIVE ON 'LAMBERT'	
I. South Kootenay Valley:						
1993	4366	22	160	90	10	113[a]
1994	5201	11	49	24	9	36
1995	6050	47	95	22	2	69[b]
1996	6125	9	116	Na[c]	NA	NA
II. Central Okanagan Valley:						
1993	NA	7	33	13	0	20
1994	NA	4	45	25	0	25
1995	NA	1[d]	32	5	0	6
1996	NA	2	22	NA	NA	NA

[a] Since little cherry disease-status of some trees is determined by more than one method, the total number of infected trees will be lower than the sum of positive samples from each indexing method.

[b] Twenty-six positive trees were identified in orchards that were inspected for the first time.

[c] NA = data not available.

[d] Confirmed by reverse transcribed polymerase chain reaction assay.

There were no individual submissions in the following sections.
See Diagnostic Laboratory Reports.

Vegetables / légumes

Small fruits and berries / petits fruits et baies

Ornamentales / plantes ornementales

Turfgrass / gazon

Forest trees / arbres forestiers

Author index follows.

Author Index to Volume 77 / Inex des auteurs (volume 77)