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

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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 1998 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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CONTENTS

Diagnostic Laboratories / Labatoires diagnostiques

CROP: Commercial Crops - Diagnostic Laboratory Report

LOCATION: British Columbia

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TITLE: **DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO THE BCMAF PLANT DIAGNOSTIC LABORATORY IN 1998.**

METHODS: The BCMAF 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 the Ministry extension staff, growers, agribusinesses, 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: abiotic problems such as nutritional stress; pH imbalance; water stress; poor sample; physiological response to growing conditions; environmental and 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 BCMAF Plant Diagnostic Laboratory in 1998.

CROP	**CAUSAL AGENT/DISEASE**	**NO. OF SAMPLES**
Cucumber	*Pythium* sp. crown and root rot	1
	Pythium sp. root rot	1
	Fusarium oxysporum f.sp.radicis-cucumerinum crown rot	1
Lettuce	*Pythium* sp. root rot	1
Pepper	*Erwinia carotovora* bacterial soft rot	3
	Botrytis cinerea stem rot	1
	Pythium sp. root rot	5
	Verticillium sp. fruit rot (calyx end)	2
	Fusarium solani fruit rot	1
	Pepper Mild Mottle Virus fruit and leaf mottling	1
Tomato	*Pythium* spp. root rot	2
	Fusarium oxysporum f. sp. *radicis-lycopersici* (**cv. Trust**) crown and root rot	1
	Cucumber Mosaic Virus wrinkled leaflets	1
	Fulvia fulva leaf spot	1
	Alternaria alternata leaf spot	1
TOTAL DISEASED SAMPLES		23
TOTAL SUBMISSIONS		52

Table 2. Summary of diseases diagnosed on **floriculture** (including herbacious perennial) samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Aloe vera	*Pythium/Phytophthora* sp. root rot	1
Aphelandra	*Erwinia carotovora* subsp. *carotovora* stem-end rot	1
	Botrytis cinerea foliar blight	1
Cactus	*Fusarium* sp. foliar blight	1
	Erwinia sp. Erwinia blight	1
	Pythium/Phytophthora sp. root rot	1
Cineraria	Impatiens Necrotic Spot Virus (INSV)	1
Cyclamen	*Erwinia carotovora* subsp. *carotovora* crown rot	1
Daffodil	*Rhizoctonia solani* bulb rot	1
Dahlia	*Entyloma calendulae f. dahliae* white smut	2
Delphinium	*Erysiphe* sp. powdery mildew	2
	Fusarium oxysporum vascular wilt	1
Dendranthema sp.	*Erysiphe cichoracearum* powdery mildew	1
Dianthus	*Puccinia* sp. rust	1
Dieffenbachia	*Colletotrichum gloeosporioides* anthracnose	1
Dracaena	*Pythium* sp. root rot	1
Euphorbia pulcherrima	*Pythium* sp. root rot	1
Epipremnum aureum	*Erwinia carotovora* stem rot	1
Fuchsia	*Botrytis cinerea* foliar blight	1
Galantis nivalis	*Rhizoctonia solani* crown & root rot	1
Gladiolus	Cucumber Mosaic Virus (suspected)	1
Helianthus	*Pseudomonas syringae pv. helianthi* leaf spot	1
Hibiscus	*Pythium/Phytophthora* sp. root rot	1
Impatiens	INSV	1
	Rhizoctonia solani crown rot	1
Lavandula	*Phoma sp.* crown rot	1
Lily	*Rhizoctonia solani* bulb rot	1
	Phytophthora/Pythium sp. root rot	1
Lobelia	*Alternaria* sp. foliar blight	1
	Sclerotinia sp. crown rot	1
Orchid	INSV	1
Paeonia sp.	*Pythium/Phytophthora sp.* crown & root rot	1
	Cladosporium sp. leaf blotch	1
Pelargonium x *hortorum*	*Xanthomonas campestris* pv. *pelargonii* bacterial blight	2
	Sclerotinia sclerotiorum stem rot	1
	Botrytis cinerea foliar blight	1
	Pythium sp. root rot	2
Petunia	*Alternaria* sp. leaf spot	1
Phalaenopsis	*Pythium/Phytophthora* sp. root rot	1
Phlox	*Peronospora* sp. downy mildew	2
	Pyrenochaeta sp. stem blight	1

cont'd.

Table 2. cont'd.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Primula aucaulis	*Pythium/Phytophthora* sp. crown rot	1
Saintpaulia	*Pythium/Phytophthora* sp. crown rot	1
Scabiosa	*Erysiphe polygoni* powdery mildew	2
Tagetes	*Pythium* sp. root rot	1
Tulipa	*Botrytis tulipae* botrytis blight	1
Viola	*Ramularia* sp. leaf spot	1
	Thielaviopsis basicola root rot	1
TOTAL DISEASED SAMPLES		54
TOTAL SUBMISSIONS		156

Table 3. Summary of diseases diagnosed on **small fruit** samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Blackberry	*Botrytis cinerea* fruit rot	2
	Elsinoe veneta anthracnose	1
Blueberry	*Botrytis cinerea* fruit rot	3
	Colletotrichum gloeosporioides fruit anthracnose	1
	Phomopsis vaccinii stem canker	2
	Godronia cassandrae stem canker	4
	Monilinia vaccinii-corymbosi mummy berry	4
	Pseudomonas syringae bacterial blight	6
	Phytophthora spp. crown and root rot	3
Cranberry	*Pythium* sp. root rot	1
	Colletotrichum gloeosporioides bitter rot	3
	Allantophomopsis sp. black tip rot	3
Raspberry	*Didymella applanata* spur blight	1
	Colletotrichum sp. anthracnose	1
	Phytophthora fragariae crown & root rot	5
	Phytophthora sp. root rot	8
	Agrobacterium rhizogenes B crown gall	2
	Clethridium corticola ascospora dieback	1
Saskatoon	*Gymnosporangium nelsonii* rust	1
	G. inconspicuum rust	2
	Entomosporium mespili leaf & fruit spot	2
Strawberry	*Mycosphaerella fragariae* leaf spot	1
	Phytophthora fragariae red stele	5
	Rhizoctonia sp. crown & root rot	1
TOTAL DISEASED SAMPLES		59
TOTAL SUBMISSIONS		122

Table 4. Summary of diseases diagnosed on **specialty and minor crop** samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Angelica sinensis	*Rhizoctonia solani* root rot	1
Basil	*Pythium* sp. root rot	1
	Botrytis cinerea stem canker	1
	INSV mottled leaves	1
	Fusarium oxysporum wilt	1
Feverfew	*Pythium/Phytophthora* sp. root rot	1
Ginseng	*Alternaria panax* foliar blight	6
	Cylindrocarpon destructans rusty root lesions	3
	Pythium/Phytophthora sp. root rot	4
	Rhizoctonia solani root rot	1
Hemp	*Alternaria* sp. leaf spot	1
Skullcap	*Pythium/Phytophthora* sp. root rot	1
St. John's wort	*Thielaviopsis basicola* root rot	1
Specialty horseradish	*Phoma lingam* leaf spot	2
TOTAL DISEASED SAMPLES		25
TOTAL SUBMISSIONS		40

Table 5. Summary of diseases diagnosed on **tree fruit** samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Apple	*Venturia inaequalis* scab	2
	Nectria galligena European canker	5
	Cytospora sp. (Valsa) canker	4
	Phytophthora sp. crown & root rot	9
	Nectria cinnabarina twig blight	2
	Cryptosporiopsis curvispora anthracnose	6
	Agrobacterium rhizogenes B crown gall	2
	Cryptosporiopsis perennans perennial canker	1
	Basidiomycete white rot	1
	Erwinia amylovora B fireblight	17
Apricot	*Monilinia* sp. brown rot	1
	Wilsonomyces carpophilus shot hole	1
Cherry	*Pseudomonas syringae* bacterial blight	1
	Wilsonomyces carpophilus coryneum blight	2
Peach	*Coryneum* sp. coryneum blight	1
	Leucostoma sp. stem canker	2
	Ceratocystis fimbriata canker	1
Pear	*Nectria cinnabarina* twig blight	1
	Erwinia amylovora B fire blight	1
	Nectria galligena European canker	5
TOTAL DISEASED SAMPLES		65
TOTAL SUBMISSIONS		115

Table 6. Summary of diseases diagnosed on **field vegetable** samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Broccoli	*Peronospora parasitica* downy mildew	1
Brussels sprout	*Rhizoctonia* sp. wire stem	1
Carrot	*Phytoplasma* aster yellows	2
Cauliflower	*Erwinia carotovora* soft rot	1
Celeriac	*Phoma* sp. crown rot	1
Cucumber	*Thielaviopsis basicola* root rot	1
Garlic	*Rhizoctonia* sp. bulb rot	2
Leek	*Alternaria porri* purple blotch	1
Melon	*Pythium/Phytophthora* sp. root rot	1
Onion	*Pythium* sp. damping off	1
	Sclerotium cepivorum white rot	2
	Urocystis sp. smut	1
Pepper	Tomato spotted wilt virus-L (TSWV-L) stunted plants	1
	Xanthomonas campestris pv. *vesicatoria* bacterial spot	1
Potato	*Phytophthora infestans* late blight	5
	Streptomyces scabies common scab	3
	Erwinia carotovora subsp. *carotovora* soft rot	2
	Erwinia carotovora subsp. *atroseptica* black leg	4
	Verticillium sp. wilt	4
	Botrytis cinerea leaf blight	1
	Leaf Roll Virus	1
	PVY	1
	Pythium ultimum leek	1
Rutabaga	*Rhizoctonia solani* crown & root rot	1
Tomato	Clavibacter michiganensis subsp. michiganensis-bacterial canker	2
	TSWV-L	2
	Verticillium sp. wilt	1
TOTAL DISEASED SAMPLES		45
TOTAL SUBMISSIONS		103

Table 7. Summary of diseases diagnosed on **woody ornamental** samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Abies	*Pythium/Phytophthora* sp. root rot	1
Abies balsamea	*Phytophthora* sp. root rot	1
Acer	*Phytophthora* sp. root rot	1
	Discula sp. anthracnose	1
	Verticillium sp. wilt	2
Acer circinatum	*Phytophthora* sp. root rot	1
Acer japonicum	*Discula* sp. anthracnose	1
Andromeda polifolia	*Phytophthora/Pythium* sp. root rot	1
Araucaria araucana	*Phomopsis* sp. twig dieback	1
Arctostaphylos	*Phytophthora* sp. root rot	1
Azalea	*Pythium/Phytophthora* sp. root rot	2
	Exobasidium sp. leaf gall	1
Buddleia	*Phoma* sp. leaf spot	1
	Peronospora sp. (suspect) downy mildew	1
Cedrus	*Seiridium cardinale* coryneum blight	3
	Sirococcus sp. tip blight	1
	Phomopsis sp. twig dieback	1
Cedrus atlantica	*Phomopsis* sp. twig blight	1
	Sirococcus sp. twig blight	1
Cedrus deodora	*Sirococcus & Sclerophoma* spp. twig blight	2
Chaenomeles sp.	*Entomosporium mespili* leaf blight	1
Chamaecyparis	*Phytophthora* sp. root rot	5
Clematis	*Ascochyta clematidina* stem rot	2
Cornus alba	*Phytophthora* sp. root rot	1
Cornus sp.	*Phytophthora* sp. root rot	1
Cyperus	*Phytophthora sp.* root rot	4
Euonymus	*Cytospora* sp. twig blight	1
	Phytophthora sp. crown & root rot	1
Gaultheria shallonia	*Phytophthora* sp. root rot	1
Ginkgo biloba	*Phytophthora/Pythium* sp. root rot	1
Gleditsia	*Phytophthora* sp. root rot	1
Hippophae rhamnoides	*Verticillium dahliae* wilt	1
Hydrangea	*Phoma* sp. leaf spot	1
Juniperus	*Phytophthora* sp. crown & root rot	3
	Phytophthora sp. root rot	5
	Kabatina juniperi foliar blight	1
	Lophodermium juniperi foliar blight	1
	Phomopsis sp. foliar blight	3
Kerria japonica	*Phytophthora* sp. root rot	1
Leucothoe	*Peronospora* sp. downy mildew	1
Magnolia sp.	*Phytophthora* sp. root rot	2

cont'd.

Table 7. Cont'd.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Mahonia sp.	*Phytophthora* sp. root rot	1
	Phyllosticta sp. leaf blight & *Gloespoprium* sp. anthracnose	1
Malus	*Nectria cinnabarina* twig blight	1
	Phomopsis sp. canker	1
	Erwinia amylovora B fire blight	3
Malus zumi	*Cytospora* sp. stem canker	1
Paeonia (tree)	*Cladosporium* sp. leaf spot & stem lesions	1
Picea mariana	*Phytophthora* sp. root rot	1
Picea pungens	*Sirococcus* sp. tip blight	1
Picea sp.	*Phytophthora* sp. root rot	1
Pinus mugo	*Lophodermium seditiosum* needle blight	1
Pinus strobus	*Phytophthora* sp. root rot	1
Pinus sp.	*Phytophthora* sp. root rot	1
	Phytophthora sp. crown rot	1
	Lophodermium pinastri needle cast	1
Populus	*Cytospora* sp. stem canker	1
	Septoria sp. leaf spot & canker	1
Prunus padus	*Phytophthora/Pythium* sp. root rot	1
Prunus spp.	*Monilinia* sp. brown rot	2
	Pseudomonas syringae bacterial blight	1
	Wilsonomyces carpophilus shot hole	2
	Coccomyces sp. leaf spot	1
Pseudotsuga menziesii	*Pythium/Phytophthora* sp. root rot	1
	Rhizosphaera kalkhoffii needle blight	1
Rhododendron	*Phytophthora* sp. root rot	9
	Phomopsis sp. stem canker/dieback	3
	Phytophthora sp. foliar blight	1
	Colletotrichum sp. anthracnose	2
	Glomerella cingulata anthracnose	2
	Lembosina aulographoides associated with canker	1
Rosa	Pythium/Phytopthora sp. crown & root rot	2
	Peronospora sparsa downy mildew	7
	Rose Mosaic Virus	1
	Coniothyrium fuckelii stem canker	2
Salix	*Cytospora* sp. canker	1
Sorbus sp.	*Erwinia amylovora* B fire blight	1
Symphoricarpos sp.	*Botrytis cinerea* foliar blight	1
Taxus	*Phytophthora* sp. root rot	2
Thuja	*Phomopsis* sp. twig dieback	1
	Seiridium cardinale twig blight	1
Thuja occidentalis	*Phytophthora* sp. root rot	3
	Phytophthora sp. crown & root rot	1
Thuja pyramidalis	*Phytophthora* sp. root rot	1
Ulmus	*Tubercularia* sp. canker	1
TOTAL DISEASED SAMPLES		133
TOTAL SUBMISSIONS		300

<u>Correction Note</u>:

Watermelon Mosaic Virus 2 was reported in wisteria in BC in 1996 (CPDS Vol. 76:1). This was an incorrect identification based on ELISA testing. Subsequent genetic analysis by Dr. Don Mackenzie formerly at AAFC, Sidney and inoculation studies by Dr. Janice Elmhirst at BCMAF have confirmed that while there is a potyvirus in these wisteria plants, it is not WMV2. Please correct previous listings.

Table 8. Summary of diseases diagnosed on **turfgrass** samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CAUSAL AGENT/DISEASE	**Green***	**Sod***	**Lawn***
Pythium spp. root rot	41	2	2
Pythium sp. damping off	1	1	
Gaeumannomyces graminis take-all patch	1		
Ascochyta spp. foliar blight	1		
Microdochium nivale fusarium patch	7	1	1
Typhula incarnata grey snow mold	1		
Colletotrichum graminicola anthracnose	5	2	4
Rhizoctonia solani brown patch	2		
Rhizoctonia cerealis yellow patch	3	1	2
Laetisaria fuciformis red thread			1
Basidiomycete fairy ring	2		1
Algae			1
*Sclerophthora macrospora*** downy mildew	8		
Puccinia graminis rust		2	1
Curvularia sp. foliar blight	1		1
Spermospora sp. foliar blight	1		
TOTAL DISEASED SAMPLES	<u>74</u>	<u>9</u>	<u>14</u>
TOTAL SUBMISSIONS	100	18	16

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

** Symptoms do not match description of downy mildew in the literature and the oospore size was larger than described for *S. macrospora*.

Table 9. Summary of diseases diagnosed on **field crop** samples submitted to the BCMAF Plant Diagnostic Laboratory in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Alfalfa	*Pseudopeziza medicaginis* leaf spot	1
	Phytophthora/Pythium sp. root rot	1
Timothy	*Colletotrichum* sp. anthracnose	1
	Cladosporium sp. purple eye spot	1
TOTAL DISEASED SAMPLES		4
TOTAL SUBMISSIONS		7

CROP: Commercial Crops - Diagnostic Laboratory Report

LOCATION: Alberta

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TITLE: SUMMARY OF CROP DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO BROOKS DIAGNOSTICS LTD. FROM ALBERTA IN 1998.

Methods: Brooks Diagnostics Ltd. (BDL), is a private plant health clinic which offers a full range of services in diagnosing plant health problems from a variety of crops including agricultural, horticultural crops, greenhouses, nurseries, golf courses, parks and interiorscapes to name a few. The clinic applies state-of-the-art technologies such as Enzyme-Linked Immunosorbent Assay (ELISA) and others for specialized diagnostic requirements, as well as using conventional procedures for general diagnostic requirements. Submissions to BDL are from a wide variety of sources including farmers, extension specialists, scientists, agribusinesses, growers and the general public.

Results: Disease identifications from various crop categories are summarized in Tables 1-12, and are organized according to the region of submission. These data are taken from submissions to the clinic from January 1 to November 30, 1998. BDL also received samples associated with insect damage or for plant and weed identification. These, as well as submissions from regions other than Alberta, are not included in this report. Brooks Diagnostics Ltd. also undertook several contract surveys. These include a survey of alfalfa diseases in five alfalfa plots in North Western Alberta, and a survey of wheat diseases in central Alberta. These data are incorporated into Table 3 and Table 1, respectively.

Table 1. Summary of diseases diagnosed on **Cereal Crop** samples submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOM	CAUSAL AGENT
	Southern Alberta	
Barley	Spot blotch	*Cochliobolus sativus*
	Common root rot	*Fusarium* spp.
Wheat	Foot rot & crown rot	*Fusarium* spp.
	Sooty mould	*Cladosporium* spp.
		Alternaria alternata
	Spot blotch &	*Fusarium* spp.
	Seedling blight	*Cochliobolus sativus*
	Root rot	*Rhizoctonia solani*
	Septoria leaf and glume blotch	*Phaeosphaeria nodorum*
	Silver top	*Fusarium poae*
	Twisting and leaf rolling	Drought
	South Central Alberta	
Barley	Spot blotch	*Cochliobolus sativus*
	Common root rot	*Fusarium* spp.
Wheat	Browning root rot	*Pythium* sp.
	Fusarium crown and root rot	*Fusarium* spp.
	Take all	*Gaeumannomyces graminis*
	Eye spot	*Pseudocercosporella* spp.
	Root rot	*Cochliobolus sativus*
	North Central Alberta	
Barley	Dieback	Drought
	Root rot	*Fusarium* spp.
		Rhizoctonia solani
	Spot blotch	*Cochliobolus sativus*
	Common root rot	*Fusarium* spp.
	Scald	*Rhynchosporium secalis*
	Tan spot	*Pyrenophora tritici-repentis*
	Spot blotch	*Cochliobolus sativus*
Wheat	Root rot & foot rot	*Fusarium* sp.
		Rhizoctonia solani
	Septoria leaf and glume blotch	*Phaeosphaeria nodorum*
	Browning root rot	*Rhizoctonia solani*
	Seedling blight & damping-off	*Pythium* spp.
		Fusarium spp.
		Cochliobolus sativus

Table 1. cont'd. Summary of diseases diagnosed on **Cereal Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOM	CAUSAL AGENT
	North Eastern Alberta	
Barley	Moldy heads	*Cladosporium* spp.
	Spot blotch	*Cochliobolus sativus*
		Rhizoctonia spp.
Wheat	Silver top	*Fusarium* poae

Table 2. Summary of diseases diagnosed on **Field Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOM	CAUSAL AGENT
	Southern Alberta	
Field pea	Root rot	*Fusarium* sp.
	South Central Alberta	
Field pea	Downy mildew	*Peronospora viciae*
	Root rot	*Fusarium* sp.
		Pythium spp.

Table 3. Summary of diseases diagnosed on **Forage Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	**DISEASE & SYMPTOM**	**CAUSAL AGENT**
	Southern Alberta	
Alfalfa	Leaf spot	*Stemphylium botryosum*
	Crown & root rot	*Fusarium roseum*
		Rhizoctonia solani
	Spring blackstem and leaf spot	*Phoma medicaginis*
	Fusarium root rot	*Fusarium* sp.
	Brown root rot	*Plenodomus meliloti*
	Pythium root rot	*Pythium* spp.
Timothy Grass	Tip dieback, crown & root rots	*Fusarium solani*
		Pythium spp.

Table 4. Summary of diseases diagnosed on **Fruit Trees** submitted to Brooks Diagnostics Ltd. in 1998

HOST	**DISEASE & SYMPTOM**	**CAUSAL AGENT**
	Southern Alberta	
Apple	Fire blight	*Erwinia amylovora*
Saskatoon	Rust	*Gymnosporangium* spp.
	Cytospora canker	*Leucocytospora leucostoma*
	North Eastern Alberta	
Apple	Fire blight	*Erwinia amylovora*
Chokecherry	Fire blight	*Erwinia amylovora*

Table 5. Summary of diseases diagnosed on **Greenhouse Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOM	CAUSAL AGENT
	Southern Alberta	
Begonia	Root & stem rot	*Fusarium* spp.
		Rhizoctonia solani
		Pythium spp.
Cucumber	Crown & root rot, damping-off	*Pythium* spp.
		Rhizoctonia solani
Geranium	Gray mold	*Botrytis cinerea*
	Leaf malformation	Suspect herbicide damage
	Verticillium wilt	*Verticillium dahliae*
	Damping off & root rot	*Pythium* sp.
		Rhizoctonia solani
	Geranium rust	*Puccinia pelargonii-zonalis*
Petunia	Unnatural colouring	Nitrogen & iron deficiency
Tomato	Stem & root rot	*Pythium* sp.
		Fusarium sp.
	South Central Alberta	
Christmas cactus	Root & stem rot	*Erwinia* spp.
		Fusarium spp.
Cineraria	Leaf mottling & ring spots	Tomato spotted wilt virus (TSWV) & Impatiens necrotic spot virus (INSV)*
Cyclamen	Leaf malformation mottling and twisting	TSWV & INSV *
	Wilt & dieback tuber rot	*Erwinia carotovora*
Geranium	Bacterial blight	*Xanthomonas campestris* pv. *pelargonii*
	Stem & root rot	*Pythium* spp.
		Fusarium spp.
	Ring spots	Pelargonium ringspot virus
Kalanchoe	Ring spots	TSWV & INSV *
	North Central Alberta	
Geranium	Oedema	Moisture stress
	Root rots	*Fusarium* spp.
		Pythium spp.
	Pseudomonas leaf spot	*Pseudomonas cichorii*
	Stem & root rot	*Fusarium* spp.
		Pythium sp.

Table 5. cont'd. Summary of diseases diagnosed on **Greenhouse Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOM	CAUSAL AGENT
	North Central Alberta	
Tomato	Necrotic patches & chlorosis	Environmental stress
	Dieback	Physiological stress
	Root discolouration	*Pythium* spp.
	Root rots	*Fusarium* spp.
	North Western Alberta	
Begonia	Root & stem rot	*Fusarium* sp.
		Pythium sp.
		Rhizoctonia solani
	Mottling, yellowing leaf malformation	TSWV & INSV
Geranium	Bacterial blight	*Xanthomonas campestris* pv. *pelargonii*
	Root rot	*Pythium* spp.
		Rhizoctonia spp.
	North Eastern Alberta	
Geranium	Blackleg	*Pythium* spp.
	Stem & root rot	*Fusarium* spp.
		Pythium sp.
	Peace River Region	
Tomato	Fiddleheading, fruit & leaf malformation, shoe stringing	Tobacco mosaic virus*

* Disease confirmed by serological methods

Table 6. Summary of diseases diagnosed on **Vegetable Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOMS	CAUSAL AGENT
	Southern Alberta	
Potato	Bacterial ring rot	*Clavibacter michiganensis* subsp. *sepedonicus* *
	Pink rot	*Phytophthora erythroseptica*
	Early blight	*Alternaria* solani
	Powdery scab	*Spongospora subterranea*
	Common scab	*Streptomyces scabies*
	Black scurf	*Rhizoctonia solani*
	Soft rot	*Erwinia carotovora* subsp. *carotovora*
	Dry rot	*Fusarium* spp.
	Leak	*Pythium ultimum*
	Vascular discoloration	Frost injury
	Stem end browning	Physiological stress
	Rot at vascular ring	*Fusarium solani*
	Late blight	*Phytophthora infestans* +
	South Central Alberta	
Potato	Leaf mottling, deformation & mosaic	Potato virus Y*
	North Central Alberta	
Potato	Dry rot	*Fusarium* spp.
	Soft rot	*Erwinia carotovora* subsp.*carotovora*
	Fusarium storage rot	*Fusarium* spp.
	Black scurf	*Rhizoctonia solani*
	Brown rot	*Pseudomonas solanacearum*
	Tubers rotting at stem end	Overdose of Reglone *Fusarium solani* dry rot Free-living nematodes
	North Western Alberta	
Potato	Late blight	*Phytophthora infestans* +
	Dry rot	*Fusarium* spp.

* Disease confirmed by serological methods
+ Disease confirmed as US 8 A2 mating type by Dr. Fouad Daayf, CFIA Charlottetown, PEI

Table 7. Summary of diseases diagnosed on **Woody Ornamental Plants** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOMS	CAUSAL AGENT
	Southern Alberta	
Birch	Dieback and chlorosis	Heat stress
Chokecherry	Fire blight	*Erwinia amylovora*
	Dieback and chlorosis	Mineral deficiencies
Hydrangea	Wilting, dieback and chlorosis	*Pseudomonas solanacearum*
Lilac	Blight and cankering,	*Pseudomonas syringae*
Mountain Ash	Fire blight	*Erwinia amylovora*
Mayday	Trunk rot, dieback	*Armillaria* spp.
Poplar	Leaf and shoot blight	*Venturia populina*
	Leaf twisting, rolling, yellowing, tip burning & malformation	Herbicide damage & viral
Rose	Leaf twisting, rolling, yellowing, tip burning & malformation	Suspect herbicide injury
	South Central Alberta	
Apple	Fire blight	*Erwinia amylovora*
Cherry	Fire blight	*Erwinia amylovora*
Chokecherry	Cytospora canker	*Cytospora* spp.
	Fire blight	*Erwinia amylovora*
Mountain Ash	Fire blight	*Erwinia amylovora*
Nanking Cherry	Fire blight	*Erwinia amylovora*
Poplar	Leaf cupping, twisting & malformation	Suspect herbicide damage
	North Western Alberta	
Mayday	Black knot	*Apiosporina morbosa*
	Nectria canker	*Nectria cinnabarina*
	Fire blight	*Erwinia amylovora*

Table 8. Summary of diseases diagnosed on **Oilseed Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOM	CAUSAL AGENT
	Southern Alberta	
Canola	Root rot & damping-off	*Fusarium solani*
	Wire stem	*Rhizoctonia solani*
	Blackleg	*Leptosphaeria maculans*
	South Central Alberta	
Canola	Wire stem	*Rhizoctonia solani*
	Leaf purpling	Sulfur deficiency
	Blackleg	*Leptosphaeria maculans* *
	Leaf and stem spot	Hail damage
	North Central Alberta	
Canola	Leaf purpling	Suspect hebicide damage
Mustard	Crown and root rot	*Fusarium* spp.
	North Eastern Alberta	
Canola	Yellowing, crinkling	Herbicide injury
	Leaf malformation	
	Black spot	*Alternaria* spp.
	Leaf spot	Herbicide damage
	Downy mildew	*Peronospora parasitica*
	North Western Alberta	
Canola	Blackleg	*Leptosphaeria maculans*

* Disease confirmed as virulent strain

Table 9. Summary of diseases diagnosed on **Turfgrass** submitted to Brooks Diagnostics Ltd. in 1998.

LOCATION	DISEASE & SYMPTOMS	CAUSAL AGENT
	Southern Alberta	
Fairway	Pink snow mold	*Microdochium nivale*
	Pythium blight	*Pythium* spp.
Green	Pink snow mold	*Microdochium nivale*
	Pythium blight	*Pythium* spp.
	Melting out & leaf blight	*Drechslera poae*
	Fusarium patch	*Fusarium poae*
		Fusarium graminearum
		Fusarium equiseti
	Brown patch	*Rhizoctonia solani*
	South Central Alberta	
Green	Pink snow mold	*Microdochium nivale*
	Pythium blight	*Pythium* spp.
	Brown patch	*Rhizoctonia* spp.
	Anthracnose	*Colletotrichum graminicola*
	Cottony snow mold	*Coprinus psychromorbidus*
	Melting out & leaf spot	*Drechslera poae*
	Fusarium patch	*Fusarium poae*
		Fusarium graminearum
		Fusarium culmorum
		Fusarium avenaceum
	North Central Alberta	
Green	Pink snow mold	*Microdochium nivale*
	Pythium blight	*Pythium* spp.
	Downy mildew	*Sclerophthora macrospora*
	Brown patch	*Rhizoctonia solani*
	Cottony snow mold	*Coprinus psychromorbidus*
Fairway	Fusarium patch	*Fusarium graminearum*
		Fusarium culmorum
	Brown patch	*Rhizoctonia solani*
Sod	Pink snow mold	*Microdochium nivale*
	Leaf and crown rot	*Bipolaris sorokiniana*

Table 9. Cont'd. Summary of diseases diagnosed on **Turfgrass** submitted to Brooks Diagnostics Ltd. in 1998.

LOCATION	DISEASE & SYMPTOMS	CAUSAL AGENT
	North Eastern Alberta	
Green	Pink snow mold	*Microdochium nivale*
	Pythium blight	*Pythium* spp.
	Gray snow mold	*Typhula* spp.
	North Western Alberta	
Fairway	Pythium blight	*Pythium* spp.
Green	Pink snow mold	*Microdochium nivale*
	Pythium blight	*Pythium* spp.
	Red Thread	*Laetisaria fuciformis*
	Peace River	
Meadow Fescue	Pink snow mold	*Microdochium nivale*
Green	Silver top	*Fusarium poae*

Table 10. Summary of diseases diagnosed on **Specialty Crops** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOMS	CAUSAL AGENT
	North Central Alberta	
Echinacea	Root rot	*Fusarium* sp.
		Rhizoctonia sp.
		Pythium sp.

Table 11. Summary of diseases diagnosed on **Shelterbelt Trees** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOMS	CAUSAL AGENT
	Southern Alberta	
Cotoneaster	Fire blight	*Erwinia amylovora*
Elm	Botryodiplodia canker	*Botryodiplodia hypodermia*
Pine	Brown spot needle blight	*Mycosphaerella dearnessii*
Spruce	Browning of needles	Environmental stress & nutrient imbalance
	South Central Alberta	
Birch	Dieback	Heat stress
Green Ash	Leaf wilt, cupping, twisting & malformation	Suspect herbicide damage
Juniper	Twig blight	*Phomopsis juniperovora*
Lodgepole pine	Needle blight	*Dothistroma septospora*
Poplar	Stem cankering, leaf damage twig dieback	Bacterial wet wood
Spruce	Needle drop and chlorosis	Nutrient imbalnce & winter damage
	Canker	*Leucostoma kunzei*
Scots pine	Needle blight	*Dothistroma pini*
	North Central Alberta	
Elm	Twig blight	*Fusarium* sp.
Spruce	Needle browning & yellowing	Winter kill, sooty mold, lichens nutrient imbalance & soil problem
	Elytroderma needle cast	*Elytroderma deformans*

Table 11. Cont'd. Summary of diseases diagnosed on **Shelterbelt Trees** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	**DISEASE & SYMPTOMS**	**CAUSAL AGENT**
	North Western Alberta	
Elm	Wilt & dieback & canker	*Dothiorella ulmii*
Maple	Anthracnose	*Gloeosporium* sp.
Spruce	Needle browning	Environmental stress
Willow	Dieback	*Cytospora chrysosperma*
	North Eastern Alberta	
Spruce	Needle browning	Environmental stress
	Peace River District	
Mountain ash	Fire blight	*Erwinia amylovora*
Poplar	Venturia leaf and shoot blight	*Venturia populina*

Table 12. Summary of diseases diagnosed on **Ornamental Plants** submitted to Brooks Diagnostics Ltd. in 1998.

HOST	DISEASE & SYMPTOM	CAUSAL AGENT
	Southern Alberta	
Lilac	Leaf distortion, cupping, malformation	Suspect herbicide (glyphosate) damage
Pansy	Leaf and petal spot	*Alternaria* spp.
Peony	Anthracnose	*Gloeosporium* sp.
	Leaf blotch and stem spot	*Cladosporium paeoniae*
Poppy	Leaf discolouration and blight	*Xanthomonas campestris* pv. *papavericola*
	Bacterial Blight	
	North Central Alberta	
Lily	Leaf spot	*Fusarium* spp.
		Nutritional imbalance

CROP: Commercial Crops and Woody Ornamental Plants - Diagnostic Laboratory Report

LOCATION: Saskatchewan

NAME AND AGENCY:
G. Holzgang
Saskatchewan Agriculture and Food
3085 Albert St.
Regina, Saskatchewan S4S 0B1

TITLE: **DISEASES DIAGNOSED ON COMMERCIAL CROPS AND WOODY ORNAMENTAL PLANTS SUBMITTED TO THE SASKATCHEWAN AGRICULTURE AND FOOD CROP PROTECTION LABORATORY IN 1998**

METHODS: The Crop Protection Laboratory performs pathogen diagnostics and provides recommendations for disease control. The data below are from the samples submitted to the laboratory by Saskatchewan Agriculture and Food's extension agrologists, agri-business and growers. Disease diagnosis is based on visual examination of symptoms, microscopic examination and culturing of pathogens onto artificial media.

RESULTS AND COMMENTS: Summaries of the disease diagnoses are contained in Tables 1 - 7. Woody ornamental submissions were mostly affected by environmental impacts, chemical injury and insect pests, with the exceptions being; black knot (*Dibotryon morbosum*) on mayday and sooty blotch on crabapple.

Table 1. Diseases diagnosed on **cereal crops** submitted to the Saskatchewan Agriculture and Food Crop Protection Laboratory in 1998.

CROP	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
Wheat	Barley yellow dwarf virus	3
	Xanthomonas translucens	1
	Seedling blight/common root rot/prematurity blight due to *Fusarium* spp. and *Cochliobolus sativus*	33
	Environmental stress (e.g. frost, drought)	17
	Fusarium head blight	15
	Herbicide injury	15
	Pyrenophora tritici-repentis	7
	Septoria nodorum	8
	Septoria tritici	9
	Sooty molds (*Alternaria* spp. predominantly)	7
Barley	*Ascochyta tritici*	1
	Barley yellow dwarf virus	1
	Common root rot (*Fusarium* spp. and *Cochliobolus sativus*)	3
	Environmental stress (e.g. frost, drought)	7
	Fusarium head blight	3
	Pseudomonas syringae	1
	Pyrenophora teres	5
	Rhynchosporium secalis	1
	Ustilago sp.	2
Oat	Barley yellow dwarf virus	4
	Crown rust/*Puccinia coronata*	1
	Pyrenophora avenae	2
Triticale	Fusarium head blight	1

Table 2. Diseases diagnosed on **forage crops** submitted to the Saskatchewan Agriculture and Food Crop Protection Laboratory in 1998.

CROP	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
Alfalfa	*Peronospora trifoliorum*	1
	Phoma medicaginis	1
	Stemphylium botryosum	1
Grasses	Crown/root rot due to *Fusarium* sp.	1
	Herbicide injury	1
	Puccinia recondita	1

Table 3. Diseases diagnosed on **fruit crops** submitted to the Saskatchewan Agriculture and Food Crop Protection Laboratory in 1998.

CROP	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
Apple	*Erwinia amylovora*	1
	Herbicide injury	1
Chokecherry	*Podosphaera clandestina*	1
Pincherry	Herbicide injury	2
Saskatoon	*Entomosporium mespili*	1
	Herbicide injury	1
	Phoma sp.	1
Strawberry	Root rot due to *Cylindrocarpon destructans, Fusarium* sp. and *Pythium* sp.	1

Table 4. Diseases diagnosed on **greenhouse crops** submitted to the Saskatchewan Agriculture and Food Crop Protection Laboratory in 1998.

CROP	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
Cucumber	Fusarium root rot/nutrient problems	1
Geranium	Nutrient deficiency	1
Larch	Fusarium root rot	1
Tomato	*Fusarium* sp.	1
Wolf willow	Bacterial soft rot	1

Table 5. Diseases diagnosed on **oilseed crops** submitted to the Saskatchewan Agriculture and Food Crop Protection Laboratory in 1998.

CROP	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
Canola	*Alternaria* sp.	2
	Environmental stress	6
	Root rot due to *Fusarium* sp.	7
	Heat canker	1
	Herbicide injury	12
	Leptosphaeria maculans	8
	Nutrient deficiency	1
	Root rot	3
	Sclerotinia sclerotiorum	1
Flax	Chlorosis	1
	Environmental stress	3
	Fusarium sp.	1
	Hail	2
	Herbicide injury	5
	Pythium sp.	1
	Rhizoctonia solani	1
	Root rot	2
Sunflower	Environmental stress	1
	Hail	2

Table 6. Diseases diagnosed on **special crops** submitted to the Saskatchewan Agriculture and Food Crop Protection Laboratory in 1998.

CROP	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
Canaryseed	Fusarium root rot	1
	Septoria triseti	5
	Sooty molds (*Alternaria* spp., *Cladosporium* spp.)	1
Caraway	Ascochyta/Phoma	2
Chickpea	*Ascochyta rabiei*	1
	Botrytis cinerea	2
	Fusarium stem/root rot	2
	Fusarium root rot	2
	Sclerotinia sclerotiorum	1
Coriander	*Alternaria* sp.	3
	Fusarium flower rot	3
Echinacea	Phytoplasma	1
	Sclerotinia sclerotiorum	1
Fenugreek	*Pseudomonas* sp.	1
Lentil	*Ascochyta lentis*	7
	Botrytis cinerea	4
	Colletotrichum sp. (anthracnose)	14
	Environmental stress	3
	Fusarium root rot	6
	Hail	1
	Heat canker	1
	Herbicide injury	6
	Root rot	8
Pea	Ascochyta sp.	1
	Environmental stress	3
	Herbicide injury	3
	Mycosphaerella pinodes	1
	Nutritional disorder	1
	Powdery mildew	1
	Root rot	1
	Sclerotinia sclerotiorum	1

Table 7. Diseases diagnosed on **vegetable crops** submitted to the Saskatchewan Agriculture and Food Crop Protection Laboratory in 1998.

CROP	CAUSAL AGENT/PLANT PATHOGEN	NO. OF SAMPLES
Corn	*Ustilago maydis*	1
Potato	*Erwinia carotovora*	2
	Environmental stress	1
	Fusarium sp. (dry rot)	1
	Fusarium root rot	1

CROP: Diagnostic Laboratory Report

LOCATION: Manitoba

NAME AND AGENCY:

R.G. Platford[1] and M. Desjardins[2]
[1] Manitoba Agriculture, Soils and Crops Branch, Box 1149, Carman, Manitoba R0G 0J0

[2] Crop Diagnostic Centre, Manitoba Agriculture, 545 University Crescent, Winnipeg Manitoba R3T 5S6

TITLE: 1998 MANITOBA CROP DIAGNOSTIC CENTRE LABORATORY SUBMISSIONS

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: Summaries of diseases diagnosed on plants in different crop categories are presented in Tables 1-10.

Table 1. Summary of diseases diagnosed on **cereal crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	**SYMPTOM/DISEASE**	**CAUSAL AGENT**
Barley	Net blotch	*Pyrenophora teres*
	Common root rot	*Fusarium* spp. *Cochliobolus sativus*
	Fusarium head blight	*Gibberella zeae, Fusarium* spp.
	Loose smut	*Ustilago nuda*
	Barley yellow dwarf	Barley yellow dwarf virus (BYVD)
	Septoria leaf spot	*Septoria* spp.
	Damping off	*Fusarium* spp.
	Bacterial leaf blight	Xanthomonas translucens
	Seedling blight	*Cochliobolus sativus*
	Physiological leaf spot	
	Environmental injury	
	Herbicide injury	
	Nutrient deficiency	
Oats	Barley yellow dwarf	Barley yellow dwarf virus (BYDV)
	Bacterial blight	*Pseudomonas syringae*
	Leaf spot	*Septoria avenae*
	Rust	*Puccinia coronata* f.sp. *avenae*
	Seedling blight	*Fusarium* sp.
	Leaf blotch	*Septoria avenae f. sp. avenae*
	Common root rot	*Fusarium graminearum*
	Environmental injury	
	Herbicide injury	
	Mechanical injury	
	Nutrient deficiency	
Rye	Bacterial leaf spot	*Xanthomonas campestris*
	Speckled leaf spot	*Septoria secalis*
	Fusarium head blight	*Fusarium* spp.
	Tan spot	*Pyrenophora tritici-repentis*
	Environmental injury	
	Herbicide injury	
Wheat	Septoria leaf blotch	*Septoria* spp.
	Head blight	*Fusarium* spp.
	Common root rot	*Fusarium* spp. *Cochliobolus sativus*
	Tan spot	*Pyrenophora tritici-repentis*
	Bacterial leaf blotch	*Pseudomonas syringae*

Table 1. Cont'd.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Wheat cont'd	Barley yellow dwarf	Barley yellow dwarf virus (BYDV)
	Black head mold	
	Damping off	*Fusarium* spp.
	Downy mildew	*Sclerophthora macrospora*
	Ergot	*Claviceps purpurea*
	Glume blotch	*Leptosphaeria nodorum*
	Leaf rust	*Puccinia recondita*
	Physiological leaf spot	
	Seedling blight	*Fusarium* spp.
	Powdery mildew	*Erysiphe graminis f. sp. tritici*
	Wheat streak mosaic	Wheat Streak Mosaic Virus (WSMV)
	Herbicide injury	
	Environmental injury	
	Mechanical injury	
	Nutrient deficiency	

Table 2. Summary of diseases diagnosed on **forage crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	**SYMPTOM/DISEASE**	**CAUSAL AGENT**
Alfalfa	Root rot	*Fusarium* spp.
	Black stem	*Phoma medicaginis*
	Cercospora leaf spot	*Cercospora zebrina*
	Common leaf spot	*Pseudopeziza medicaginis*
	Downy mildew	*Peronospora trifoliorum*
	Physiological leaf spot	
	Stemphylium leaf spot	*Stemphylium botryosum*
	Stem rot	*Sclerotinia sclerotiorum*
	Nutrient deficiency	
	Environmental injury	
	Herbicide injury	
Sweet Clover	Fusarium wilt	*Fusarium* spp.
Trefoil	Downy mildew	*Peronospora trifoliorum*
	Root rot	*Fusarium* spp.
	Stemphylium leaf spot	*Stemphylium botryosum*

Table 3. Summary of diseases diagnosed on **fruit crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Apple	Fire blight	*Erwinia amylovora*
	Canker	*Cytospora* sp.
	Apple scab	*Venturia inaequalis*
	Frogeye leaf spot	*Botryosphaeria obtusa*
	Wood rot	
	Sunscald	
	Winter injury	
	Nutrient deficiency	iron chlorosis
Crabapple	Apple scab	*Venturia inaequalis*
	Fire blight	*Erwinia amylovora*
	Canker	*Cytospora* sp.
	Wood rot	
Apricot	Silver leaf	*Stereum purpureum*
Cherry	Environmental injury	
	Blast	*Pseudomonas syringae*
Chokecherry	Botryosphaeria canker	*Botryosphaeria* spp.
Currant	Rust	*Puccinia caricina*
	Downy mildew	*Plasmopara ribicola*
	Anthracnose	*Drepanopeziza ribis*
	Powdery mildew	*Sphaerotheca mors-uvae*
Raspberry	Anthracnose	*Elsinoe veneta*
	Spur blight	*Didymella applanata*
	Fruit rot	*Botrytis cinerea*
	Cane blight	*Leptosphaeria coniothyrium*
	Downy mildew	*Peronospora rubi*
	Phytophthora root rot	*Phytophthora* spp.
	Verticillium wilt	*Verticillium* spp.
	Nutrient deficiency	
	Physiological injury	
Saskatoon	Brown rot	*Monilinia amelanchieris*
	Cankers	*Cytospora* spp.
	Fire blight	*Erwinia amylovora*
	Fusarium root rot	*Fusarium* spp.

Cont'd...

Table 3. Cont'd.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Saskatoon cont'd	Environmental injury	
	Nutrient deficiency	
Strawberry	Crown rot, root rot	*Fusarium* spp., *Pythium* spp.
	Fruit rot	*Botrytis cinerea*
	Hainesia leaf spot	*Hainesia lythri*
	Powdery mildew	*Sphaerotheca macularis*
	Slime mold	
	Nutrient deficiency	
	Environmental injury	
	Winter injury	

Table 4. Summary of diseases diagnosed on **grass crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Bent grass	Fusarium blight	*Fusarium* spp.
	Melting out	*Drechslera* spp.
	Dollar spot	*Sclerotinia homeocarpa*
	Pythium blight	*Pythium* spp.
Golf fairway	Fusarium blight	*Fusarium* sp.
	Pythium blight	*Pythium* sp.
	Brown patch	*Rhizoctonia solani*
Lawn	Snow mold	Low temperature basidiomycete
Timothy	Brown leaf stripe	*Cercosporidium graminis*
	Purple spot	*Heterosporium phlei*
	Environmental injury	
	Nutrient deficiency	
Turf	Root rot	*Fusarium* spp.
	Fusarium blight	*Fusarium* spp.
	Snow mold	Low temperature basidiomycete
	Nutrient deficiency	
	Anthracnose	*Colletotrichum graminicola*

Table 5. Summary of diseases diagnosed on **oilseed crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Canola	Blackleg	*Leptosphaeria maculans*
	Downy mildew	*Peronospora parasitica*
	Black spot	*Alternaria* spp.
	Seedling blight, Damping off	
	Rhizoctonia solani, Fusarium spp.	
	Stem rot	*Sclerotinia sclerotiorum*
	Pythium root rot	*Pythium* spp.
	Fusarium root rot	*Fusarium* spp.
	Herbicide injury	
	Environmental injury	
	Nutrient deficiency	
	Mechanical injury	
Flax	Fusarium root rot	*Fusarium* spp.
	Pasmo	*Septoria linicola*
	Fusarium wilt	*Fusarium oxysporum* f. sp. *lini*
	Damping off	*Pythium* spp. *Fusarium* spp.
	Oedema	
	Environmental damage	
	Herbicide injury	
Sunflower	Sclerotinia wilt	*Sclerotinia sclerotiorum*
	Fusarium root rot	*Fusarium* spp.
	Downy mildew	*Plasmopara halstedii*
	Herbicide injury	

Table 6. Summary of diseases diagnosed on **shrubs and shade and shelterbelt trees** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	**SYMPTOM/DISEASE**	**CAUSAL AGENT**
Amur Cherry	Canker	*Cytospora* spp.
Ash	Anthracnose	*Gloeosporium aridum*
	Environmental damage	
	Herbicide damage	
Balsam fir	Canker	*Cytospora* spp.
	Needle cast	*Lophodermium* sp.
	Environmental damage	
	Herbicide damage	
Cotoneaster	Canker	*Cytospora* spp.
Dogwood	Septoria leaf spot	*Septoria cornicola*
Elm	Dutch elm disease	*Ophiostoma ulmi*
	Canker	*Cytospora* spp.
	Black spot	*Gnomonia ulmea*
	Verticillium wilt	*Verticillium* sp.
	Environmental damage	
	Nutrient deficiency	
Forsythia	Root rot	*Fusarium* spp.
Juniper	Canker	
	Phomopsis tip blight	*Phomopsis juniperovora*
Lilac	Root rot	
	Powdery mildew	*Microsphaera penicillata*
Maple	Canker	*Cytospora* spp.
	Sooty mold	Imperfect fungi
	Environmental injury	
	Herbicide injury	
	Nutrient deficiency	
Mountain Ash	Fire blight	*Erwinia amylovora*
	Nutrient deficiency	

cont'd

Table 6. Cont'd.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Oak	Anthracnose	*Gloeosporium quercinum*
	Environmental damage	
	Herbicide injury	
Pine	Needle cast	*Lophodermium* sp.
	White pine blister rust	*Cronartium ribicola*
	Herbicide damage	
Poplar	Shoot blight	*Pollacia* sp.
	Leaf spot	*Septoria* sp.
	Canker	*Cytospora* sp.
	Leaf rust	*Melampsora medusae*
	Herbicide damage	
	Nutrient deficiency	
Russian olive	Canker	*Cytospora chrysosperma*
Spruce	Needle cast	*Lophodermium* sp.
	Cytospora canker	*Leucostoma kunzei*
	Nutrient deficiency	
	Environmental damage	
Willow	Herbicide damage	
	Nutrient deficiency	

Table 7. Summary of diseases diagnosed on **ornamental plants** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Aster	Stem rot	*Pythium* sp.
	Verticillium wilt	*Verticillium* spp.
Braciecomb	Root rot	*Fusarium* spp.
Burning bush	Root rot	*Rhizoctonia* spp.
Canna lily	Root rot	*Fusarium* spp.
Carnations	Botrytis flower blight	*Botrytis* spp.
	Root rot	*Fusarium* spp.
	Root rot	*Pythium* spp.
Daffodil	Root rot	*Fusarium* spp.
Dahlia	Stem rot	*Sclerotinia sclerotiorum*
Day lily	Botrytis	*Botrytis* spp.
	Bacterial soft rot	*Erwinia* sp.
Delphinium	Powdery mildew	*Erysiphe* sp.
	Storage rot	
Impatiens	Botrytis flower blight	*Botrytis* spp.
Nasturtium	Nutrient deficiency	
Pansy	Environmental damage	
Phlox	Root rot	
Poppy	Root rot	*Pythium* spp
Scabiosa	Root rot	*Pythium* sp.
Zinnia	Alternaria leaf spot	*Alternaria* spp.

Table 8. Summary of diseases diagnosed on **potato crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Potato	Early blight	*Alternaria solani*
	Root rot	*Fusarium* spp.
	Root rot	*Rhizoctonia solani*
	Late blight	*Phytophthora infestans*
	Fusarium wilt	*Fusarium* spp.
	Verticillium wilt	*Verticillium dahliae*
	Bacterial ring rot	*Clavibacter michiganensis* subsp.
sepedonicus	Bacterial soft rot	*Erwinia carotovora* subsp. *carotovora*
	Black dot	*Colletotrichum coccodes*
	Virus	undetermined
	Black heart	Physiological stress
	Blackleg	*Erwinia carotovora* subsp. *atroseptica*
	Scab	*Streptomyces scabies*
	Gray mold	*Botrytis cinerea*
	Stem rot	*Sclerotinia sclerotiorum*
	Leak	*Pythium* spp.
	Net necrosis	Virus
	Pink rot	*Phytophthora erythroseptica*
	Environmental damage	

Table 9. Summary of diseases diagnosed on **special field crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
American vetch	Rust	*Uromyces* spp.
Buckwheat	Seedling blight, damping off	
Canary seed	Flame chlorosis	Flame Chlorosis Virus (FCV)
	Fusarium head blight	*Fusarium* spp.
	Herbicide injury	
Caraway	Aster yellows	Aster yellows phytoplasma
Corn	Common smut	*Ustilago maydis*
	Nutrient deficiency	
	Environmental injury	
	Herbicide injury	
Echinacea	Aster yellows	Aster yellows phytoplasma
	Fusarium root rot, Crown rot	*Fusarium* spp.
Fababean	Fusarium root rot	*Fusarium* spp.
Field bean	Root rot	*Fusarium* spp.
	Bacterial blight	*Xanthomonas campestris* pv. *phaseoli*
	Halo blight	*Pseudomonas syringae* pv. *phaseolicola*
	Rust	*Uromyces phaseoli*
	White mold	*Sclerotinia* spp.
	Herbicide injury	
	Environmental damage	
Field pea	Ascochyta	*Ascochyta* spp.
	Root rot	*Fusarium oxysporum*
		Fusarium avenaceum
		Fusarium spp., *Rhizoctonia* spp.
	Mycosphaerella blight	*Mycosphaerella pinodes*
	Sclerotinia	*Sclerotinia spp.*
	Environmental damage	
Hemp	Sclerotinia stem rot	*Sclerotinia sclerotiorum*
	Septoria leaf spot	*Septoria* sp.
	Nutrient deficiency	
	Environmental injury	
	Herbicide injury	

cont'd...

Table 9. Cont'd.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Lentil	Root rot, seedling blight	*Fusarium* spp.
	Stem rot	*Sclerotinia sclerotiorum*
	Anthracnose	Colletotrichum truncatum
	Ascochyta blight	*Ascochyta lentis*
Lathyrus spp.	Rust	*Uromyces fabae*
Mustard	Alternaria leaf spot	*Alternaria* spp.

Table 10. Summary of diseases diagnosed on **vegetable crops** submitted to the Manitoba Agriculture Crop Diagnostic Centre in 1998.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT
Carrot	Herbicide injury	
Celery	Nutrient deficiency	
Corn	Environmental injury	
Cucumber	Scab	*Cladosporium cucumerinum*
Onion	Root rot	*Fusarium* sp.
	Smudge	*Colletotrichum circinans*
	Smut	*Urocystis magica*
Pepper	Early blight	*Alternaria* spp.
	Bacterial soft rot	*Erwinia carotovora* subsp.
	Root rot	*Fusarium* spp.
Red beet	Storage rot	*Botrytis cinerea*
Shallot	Blue mold	*Penicillium* sp.
	Pink root	*Phoma terrestris*
Squash	Environmental injury	
Tomato	Leaf spot	*Septoria* spp.
	Environmental injury	

CROP: Commercial Crops - Diagnostic Laboratory Report

LOCATION: Ontario

NAMES AND AGENCY:
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TITLE: DISEASES DIAGNOSED ON CROP SAMPLES SUBMITTED TO THE UNIVERSITY OF GUELPH PEST DIAGNOSTIC CLINIC IN 1998

METHODS: The Pest Diagnostic Clinic provides diagnosis and identification of plant diseases, nematodes, insects, weeds, and other pest problems. The service is offered to OMAFRA crop advisors, to employees of other public agencies, to growers and agricultural businesses and to the general public. Diagnoses are made by visual and microscopic examination of the samples. Isolation on selective media, the Biolog® bacterial identification system, pathogenicity tests and ELISA are used to assist in the diagnosis of some of the samples.

RESULTS AND COMMENTS: In 1998 the Pest Diagnostic Clinic received 1775 samples including nematodes. About 53% of the samples submitted were for disease diagnosis. The majority of the disease samples were ornamentals, including both woody and herbaceous plants growing outdoors, in atria and in greenhouses. OMAFRA with other public agencies, and horticultural businesses including growers, submitted the bulk of the samples received for disease diagnosis by the clinic in 1998. The remaining disease samples were submitted by homeowners. A summary of the disease diagnoses is presented in the following tables (1-6).

Table 1. Summary of diseases diagnosed on **field, forage and special crop** samples submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Alfalfa	*Phoma medicaginis*	1
	Pseudopeziza medicaginis	1
	Leptosphaerulina briosiana	1
	Uromyces striatus	1
Barley	*Ustilago hordei*	1
	Fusarium root rot	1
Coriander	Physiological leaf scorch	1
Corn	Fusarium stalk rot	3
	Root rot	1
	Physiological leaf scorch	1
Echinacea	Root and crown rot	1
Ginseng	*Cylindrocarpon* spp.	3
	Other root rots	3
	Physiological root discolouration	1
Okra	*Verticillium albo-atrum*	1
Parsley	Damping-off	1
Sage	Physiological scorch	1
Timothy	Physiological scorch	1
Trefoil	Powdery mildew	1
Tobacco	Physiological leaf spot	1
Wheat	*Septoria tritici*	2
	Tilletia controversa	6
	Tilletia tritici	2
	Gaeumannomyces graminis var. *tritici*	1
	Fusarium graminearum	1
	Sooty molds	4
	Barley Yellow Dwarf Virus (BYDV)	2
	Wheat Spindle Streak Mosaic Virus (WSSMV)	1
	Soil-Borne Wheat Mosaic Virus (SBWMV)	1
	Physiological disorders	2

Table 2. Summary of diseases diagnosed on **legume** samples submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Faba bean	*Alternaria* sp.	1
Pea	Damping-off	1
Soybean	*Septoria glycines*	2
	Sclerotinia sclerotiorum	1
	Physiological disorders	4
White bean	Dieback	1

Table 3. Summary of diseases diagnosed on **vegetable** samples submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Asparagus	*Puccinia asparagi*	1
Bok choy	*Rhizoctonia solani*	1
	Physiological disorders	2
Broccoli	*Xanthomonas campestris* pv. *campestris*	1
	Physiological dieback	1
Cabbage	*Alternaria brassicae*	2
	Alternaria brassicicola	1
	Alternaria leaf spot	1
	Xanthomonas campestris pv. *campestris*	3
	Turnip Mosaic Virus (TuMV)	1
	Potyvirus	1
	Physiological disorder	1
Carrot	*Rhizoctonia solani*	1
	Forking	1
	Other physiological disorder	1
Cauliflower	*Alternaria brassicicola*	1
	Xanthomonas campestris pv. *campestris*	1
	Physiological disorders	2
Crucifer	*Xanthomonas campestris* pv. *campestris*	2
Cucumber	Fusarium root rot	2
	Pythium root rot	2
	Phomopsis sclerotioides	2
	Phomopsis cucurbitae	1
	Melon Necrotic Spot Virus (MNSV)	2
	Papaya Ringspot Virus (PRSV)	1
	Physiological disorders	2
Eggplant	*Verticillium dahliae*	1
Garlic	*Alternaria porri*	1
	Rhizoctonia sp.	1
	Physiological disorders	3

contd....

Table 3. (Cont'd). Summary of diseases diagnosed on **vegetable** samples submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Horseradish	*Alternaria brassicae*	1
	Albugo candida	1
Lettuce	Physiological disorders	3
Onion	Fusarium rot	1
	Aspergillus niger	1
Pepper	Fusarium fruit rot	1
	Tobacco Etch Virus (TEV)	1
	Crown rot	1
	Erwinia carotovora subsp. *carotovora*	1
	Physiological disorders	4
Potato	*Erwinia carotovora* subsp. *carotovora*	1
	Fusarium dry rot	4
	Rhizoctonia sp.	2
	Helminthosporium solani	2
	Streptomyces scabies	3
	Physiological disorders	3
Spinach	Fusarium wilt	1
	Damping-off	1
Squash	*Septoria cucurbitacearum*	1
	Fusarium rot	1
Tomato	*Xanthomonas campestris* pv. *vesicatoria*	1
	Pseudomonas syringae pv. *tomato*	2
	Pyrenochaeta lycopersici	4
	Pythium sp.	1
	Septoria lycopersici	3
	Botrytis cinerea	1
	Rhizopus stolonifer	1
	Verticillium sp.	1
	Geotrichum sp.	1
	Tomato Spotted Wilt Virus (TSWV)	1
	Dicamba injury	1
	Blossom end rot	1
	Other physiological disorders	14

Table 4. Summary of diseases diagnosed on **fruit** samples submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Apple	*Botryosphaeria obtusa*	3
	Glomerella cingulata	1
	Venturia inaequalis	1
	Virus disease	1
	Physiological disorders	11
Apricot	Winter injury	1
Blueberry	Virus disease	1
	Physiological disorder	1
Cherry	Winter injury	1
	Other physiological disorders	3
Current	Physiological disorder	1
Malus sp.	*Phomopsis mali*	1
Nectarine	Physiological disorder	1
Peach	*Glomerella cingulata*	1
	Monilinia sp.	1
	Physiological disorders	2
Pear	*Glomerella cingulata*	1
	Gymnosporangium sp.	2
	Monilinia sp.	1
	Venturia pirina	2
Plum	*Dibotryon morbosum*	1
Raspberry	*Erwinia amylovora*	1
	Didymella applanata	1
	Leptosphaeria coniothyrium	1
	Physiological disorder	1
Strawberry	*Gloeosporium* sp. (fruit anthracnose)	2
	Virus disease	1
	Physiological disorders	9

Table 5. Summary of diseases diagnosed on **turfgrass** samples submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Annual bluegrass	*Colletotrichum graminicola*	1
	Curvularia sp.	1
	Magnaporthe poae	2
	Microdochium nivale	2
	Rhizoctonia solani	3
	Physiological disorders	7
Creeping bentgrass	*Colletotrichum graminicola*	3
	Gaeumannomyces graminis	4
	Microdochium nivale	1
	Rhizoctonia solani	3
	Rhizoctonia sp.	1
	Physiological disorders	13
Fescue	*Colletotrichum graminicola*	1
	Physiological disorders	2
Kentucky bluegrass	*Drechslera* sp.	3
	Erysiphe graminis	1
	Leptosphaeria korrae	13
	Puccinia sp.	1
	Rhizoctonia solani	1
	Sclerotinia homoeocarpa	2
	Physiological disorders	13
Turfgrass*	*Colletotrichum graminicola*	3
	Drechslera sp.	2
	Fusarium sp.	1
	Laetisaria fuciformis	1
	Magnaporthe poae	1
	Microdochium nivale	2
	Pythium sp.	1
	Red thread	1
	Physiological disorders	15

* Turf samples for which grass species were not identified.

Table 6. Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Adonia palm	Physiological disorder	1
Ajuga sp.	*Pythium* sp.	1
	Rhizoctonia sp.	1
	Physiological scorching	1
Alyssum	Rhizoctonia crown rot	1
	Physiological disorder	1
Alstroemeria	Impatiens Necrotic Spot Virus (INSV)	2
Alternanthera	*Pythium* sp.	2
	Crown rot	1
Ash	*Apiognomonia errabunda*	1
	Gloeosporium aridum	1
	Xylaria polymorpha	1
	Phenoxy herbicide injury	1
	Other physiological disorders	5
Aster	Virus disease	1
Asplenium	Virus disease	1
Azalea	Physiological leaf spot	1
Begonia	*Botrytis* sp.	1
	Fusarium sp.	1
	Impatiens Necrotic Spot Virus (INSV)	2
	Rhizoctonia sp.	2
Bidens	Physiological leaf spot	1
Birch	Physiological disorders	3
Brassaia sp.	Cymbidium Mosaic Virus (CyMV)	1
	Odontoglossum Ring Spot Virus (ORSV)	1
Burning bush	Fusarium canker	1
	Tubercularia ulmea	1
	Physiological disorder	1

Cont'd...

Table 6. Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1998. (Cont'd).

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Cactus	Virus disease	1
	Physiological disorders	2
Calluna sp.	Physiological disorder	1
Caragana	Septoria leaf spot	1
Carnation	*Fusarium oxysporum*	1
Calla lily	*Erwinia carotovora* subsp. *carotovora*	10
Cedar	Crown rot	1
	Gymnosporangium juniper-virginianae	1
	Tip blight	1
	Physiological disorders	5
Chestnut	*Diplodia* sp.	1
	Kernel dry rot	1
	Physiological disorder	1
Chokecherry	*Dibotryon morbosum*	1
	Leucostoma cincta	1
	Virus diseases	4
	Physiological disorder	1
Chrysanthemum	*Fusarium oxysporum*	1
	Fusarium sp.	1
	Tomato Spotted Wilt Virus (TSWV)	1
	Physiological disorder	1
Christmas cactus	Virus disease	1
	Oedema	1
	Physiological disorder	1
Clematis	*Phoma* sp.	1
	Rhizoctonia solani	1
	Physiological disorders	3
Clerodendrum	Impatiens Necrotic Spot Virus (INSV)	1

Cont'd...

Table 6. (Cont'd). Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1998.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Columbine	*Pythium* sp.	1
Common hackberry	Physiological disorder	1
Corylus sp.	Physiological canker	1
Crabapple	Erwinia amylovora	1
	Physiological disorder	1
Cyclamen	*Fusarium oxysporum* f.sp. *cyclaminis*	1
	Impatiens Necrotic Spot Virus (INSV)	1
	Physiological disorder	1
Cypress	Physiological disorder	1
Daisy	Impatiens Necrotic Spot Virus (INSV)	1
	Physiological leaf scorch	1
Delphinium	*Verticillium* sp.	1
Dianthus sp.	*Fusarium* sp.	1
Dogwood	*Discula* sp.	1
	Physiological disorders	4
English ivy	*Phytophthora* sp.	1
Epidendrum sp.	*Gloeosporium affine*	1
Euphorbia sp.	*Pythium* sp.	1
Euonymous	*Fusarium* sp.	1
	Gloeosporium sp.	2
	Environmental stress	1
	Other physiological disorders	8
Exacum sp.	Impatiens Necrotic Spot Virus (INSV)	2
Fern	Impatiens Necrotic Spot Virus (INSV)	1

Cont'd...

Table 6. (Cont'd). Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1997.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Fig	Physiological disorder	1
Fir	Physiological disorders	4
Flowering almond	Physiological disorder	1
Forsythia	Physiological disorder	1
Freesia	*Fusarium* sp.	1
Fuchsia	*Pucciniastrum epilobii*	1
Gaillardia	Impatiens Necrotic Spot Virus (INSV)	1
Gazania	*Pythium/Fusarium* sp.	1
	Rhizoctonia sp.	1
Geranium	*Xanthomonas campestris* pv. *pelargonii*	4
	Botrytis cinerea	2
	Pythium sp.	1
	Oedema	3
	Yellow-net Vein Virus	1
	Pelargonium Flower Break Virus (PFBV)	1
	Root rot	1
	Ethylene injury	1
	Other physiological disorders	6
Gladiola	Cucumber Mosaic Virus (CMV)	3
	White Break Mosaic Virus (WBMV)	3
Hawthorn	*Gymnosporangium globosum*	1
Hemlock	Physiological disorders	2
Hickory	*Gnomonia caryae*	1
Hydrangea	*Botrytis cinerea*	1
	Oidium sp.	1

Cont'd...

Table 6. (Cont'd). Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1997.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Impatiens	Impatiens Necrotic Spot Virus (INSV)	5
	Ethylene injury	1
Ivy	Impatiens Necrotic Spot Virus (INSV)	1
Juniper	*Gymnosporangium* sp.	1
	Kabatina juniperi`	5
	Phomopsis juniperovora	1
	Phytophthora sp.	1
	Physiological disorders	3
Kalanchoe	*Botrytis cinerea*	1
	Fusarium rot	1
	Impatiens Necrotic Spot Virus (INSV)	2
	Physiological disorders	3
Kiwi	*Phytophthora* sp.	1
Lady-slipper	Physiological disorders	2
Larch	Bud blast	1
	Other physiological disorder	1
Lilac	*Microsphaera syringae*	1
	Virus disease	1
	Physiological disorders	9
Lily	*Pythium* sp.	1
Linden	Phenoxy herbicide injury	1
Liquidambar sp.	Physiological disorder	1
Lobelia	Tip necrosis	1
Lonicera sp.	Physiological disorder	1
Lysimachia sp.	*Botrytis cinerea*	1
	Physiological disorder	1
Maple	*Discula* sp.	4

cont'd...

Table 6. (Cont'd). Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1997.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Maple cont'd	*Fusarium* sp.	1
	Kabatiella apocrypta	8
	Microsphaera penicillata	7
	Rhytisma acerinum	1
	Herbicide injury	1
	Sun scald	1
	Other physiological disorders	18
Oak	*Apiognomonia quercina*	6
	Wood rot	1
Olive tree	Physiological disorder	1
Orchid	Odontoglossum ring spot virus (ORSV)	1
	Cymbidium mosaic virus (CMV)	1
	Physiological disorders	4
Pansy	*Pythium* sp.	1
Peony	Crown canker	1
Phlox	*Fusarium* sp.	1
	Pleospora sp.	1
Pine	*Cronartium ribicola*	1
	Endocronartium harknessii	1
	Sphaeropsis sapinea	9
	Physiological disorders	10
Poinsettia	Virus diseases	2
Poplar	*Marssonina* sp.	1
Primula	Impatiens Necrotic Spot Viurs (INSV)	1
	Pythium sp.	1
Privet	Physiological disorder	1
Ranunculus	Impatiens Necrotic Spot Virus (INSV)	1

cont'd ...

Table 6. (Cont'd). Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1997.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Rose	*Peronospora sparsa*	3
	Botrytis cinerea	2
	Marssonina rosae	1
	Fusarium sp.	1
Rose	Virus disease	1
	Other physiological disorders	5
Scaevola	*Pythium* sp.	1
	Verticillium sp.	1
Senecio sp.	*Rhizoctonia* sp.	1
Sedum sp.	*Fusarium* sp.	1
	Pythium sp.	1
Serviceberry	*Gymnosporangium nidus-avis*	1
Snapdragon	*Peronospora antirrhini*	1
	Impatiens Necrotic Spot Virus (INSV)	2
Spathiphyllum	*Erwinia carotovora* subsp. *carotovora*	1
Spruce	*Chrysomyxa* sp.	1
	Isthmiella crepidiformis	1
	Leucostoma kunzei	1
	Rhizosphaera kalkhoffii	4
	Winter injury	2
	Drought	1
	Other physiological disorders	18
Sycamore	*Apiognomonia veneta*	2
Syngonium	*Xanthomonas campestris* pv. *dieffenbachiae*	1
Thuja sp.	Winter injury	2
Tuliptree	*Rhytisma liriodendri*	1

cont'd...

Table 6. (Cont'd). Summary of diseases diagnosed on **ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 1997.

CROP	CAUSAL AGENT/DISEASE	NO. OF SAMPLES
Viburnum	Herbicide injury	1
Vinca	*Phoma exigua* var. *exigua*	2
	Physiological disorder	1
Walnut	Physiological dieback	2
Willow	*Leucostoma niveum*	1
	Venturia saliciperda	1
	Physiological disorder	1
Wisteria	Physiological leaf scorch	1
Yew	Physiological disorder	1

CROP: Diagnostic Laboratory Report - All Crops

LOCATION: Prince Edward Island

NAME AND AGENCY:
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Research and Laboratories
Plant Health Services
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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS IN PRINCE EDWARD ISLAND, 1998

METHODS: The PEI Department of Agriculture and Forestry's Plant Health Services group provides diagnosis of, and control recommendations primarily for disease problems of commercial crops produced on PEI. 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 578 samples were processed during the period June 1998 - November 1998. Results are summarized in Table 1.

Table 1. Diseases diagnosed on **commercial crop** samples submitted to the Plant Health Services group, Prince Edward Island Department of Agriculture and Forestry, Prince Edward Island, 1998.

CROP	DISEASE	CAUSAL AGENT/ PLANT PATHOGEN	NO.OF TIMES AGENTS WERE IDENTIFIED
Vegetables:			
Bean	Virus	Mosaic	1
Beet	Leaf spot	*Alternaria* sp.	1
Cabbage	Blackleg	*Phoma lingam*	3
Carrot	Root rot	*Pythium* sp.	2
	Crown rot	*Fusarium avenaceum*	2
		Fusarium oxysporum	1
	Leaf blight	*Alternaria* sp.	1
	White mold	*Sclerotinia sclerotiorum*	1
Cauliflower	Physiological disorder		1
Cucumber	Physiological disorder		2
Pea	Root rot	*Aphanomyces* sp.	1
	Leaf spot	*Mycosphaerella pinodes*	1
	Damping-off		1
Potato	Early blight	*Alternaria* sp.	1
		Alternaria solani	10
	Gray mold	*Botrytis cinerea*	32
	Late blight	*Phytophthora infestans*	178
	Dry rot	*Fusarium* avenaceum	6
		Fusarium solani	3
		Fusarium sp.	4
	Pink rot	*Phytophthora erythroseptica*	110
	Black dot	*Colletotrichum coccodes*	4
	White mold	*Sclerotinia sclerotiorum*	15
	Seed piece decay	*Fusarium* spp.	4
		Erwinia spp.	5
		Rhizoctonia spp.	2
	Stem-end rot	*Colletotrichum coccodes*	1
		Erwinia sp.	2
		Rhizoctonia sp.	1
		Verticillium sp.	3
	Soft rot	*Erwinia spp.*	66
		Pseudomonas sp.	2

Cont'd...

Table 1. Cont'd.

CROP	DISEASE	CAUSAL AGENT/ PLANT PATHOGEN	NO.OF TIMES AGENTS WERE IDENTIFIED
Potato cont'd	Black scurf	*Rhizoctonia solani*	48
	Stem canker	*Rhizoctonia solani*	28
	Silver scurf	*Helminthosporium solani*	1
	Scab	*Streptomyces scabies*	92
	Powdery scab	*Spongospora subterranea*	5
	Pinkeye	*Pseudomonas* spp.	41
	Blackleg	*Erwinia* spp.	17
	Virus	Leafroll	1
		Mosaic	5
	Physiological disorders	Chemical damage	6
		Mechanical damage	11
		Stem end browning	4
		Heat stress	1
		Chilling injury	3
		Nutritional disorder	3
		Wind damage	1
		Skinning	1
		Chemical damage	2
		Internal brown centre	2
		Burn	16
		Frost damage	12
		Black heart	4
		Hollow heart	5
		Enlarged lenticels	5
		Little tuber	1
		Greening	1
		Growth cracks	5
		Jelly end rot	28
		Elephant hide	2
	Leak	*Pythium* sp.	1
	Wilt	*Fusarium* spp.	3
		Verticillium spp.	15
	Early dying syndrome	*Rhizoctonia solani*	3
		Fusarium spp.	2
		Verticillium spp.	7
		Colletotrichum sp.	3
	Net necrosis		3
Soybean	Pod and stem blight	*Phomopsis* sp.	1

Cont'd...

Table 1. Cont'd.

CROP	DISEASE	CAUSAL AGENT/ PLANT PATHOGEN	NO.OF TIMES AGENTS WERE IDENTIFIED
Tomato	Corky root	*Pyrenochaeta* sp.	1
	Early blight	*Alternaria solani*	1
	Late blight	*Phytophthora infestans*	1
	Leaf spot	*Alternaria* sp.	1
	Root rot	*Colletotrichum coccodes*	1
	Wilt	*Fusarium* sp.	1
Cereals:			
Barley	Net blotch	*Pyrenophora teres*	1
	Nutritional disorder		1
Oats	Covered smut	*Ustilago* sp.	1
Wheat	Common bunt	*Tilletia caries*	1
	Sooty mold	*Alternaria* sp.	1
	Storage mold	*Aspergillus* sp.	1
Speciality crops:			
Cannabis	Fusarium canker	*Fusarium avenaceum*	1
		Fusarium oxysporum	1
	Gray mold	*Botrytis cinerea*	1
	Hemp canker	*Sclerotinia sclerotiorum*	1
	Leaf spot	*Alternaria* sp.	1
	White mold	*Sclerotinia sclerotiorum*	1
Ginseng	Damping-off	*Cylindrocarpon* sp.	1
		Fusarium sp.	1
		Rhizoctonia sp.	1
	Leaf and stem blight	*Alternaria* sp.	1
	Phytophthora root rot	*Phytophthora cactorum*	1
Tobacco	Frog eye	*Cercospora* sp.	1
	Storage mold	*Penicillium* sp.	1
		TOTAL:	**881**

Cereals West / Céréales - Ouest

CROP: Barley

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: FUSARIUM HEAD BLIGHT OF BARLEY IN MANITOBA IN 1998

INTRODUCTION AND METHODS:
A) **Survey.** Fifty-nine barley fields in southern Manitoba were surveyed for the presence of fusarium head blight (FHB) between July 20 and August 3, 1998. The 56 six-rowed and 3 two-rowed fields were selected randomly along the survey routes. The incidence and average severity of FHB in each field were assessed by sampling 50 to 100 barley heads at each of 3 locations for disease. Infected heads were also collected from each site. Ten discoloured kernels from each of five heads per field were subsequently surface sterilized in 0.3% NaOCl and plated onto potato dextrose agar to determine the *Fusarium* species present.

B) **FHB Severity Comparison.** For this survey, as in previous years, FHB severity (the average portion of spikes with visual symptoms) was estimated while in each field. In 1998, for 34 of the fields surveyed, 10 additional heads with visible FHB symptoms were collected from three locations (total of 30) and stored in plastic bags at -20C. These were subsequently used to count the number of infected kernels.

RESULTS AND COMMENTS:
A) **Survey**. Conditions were generally favourable for the development of FHB in Manitoba in crops that were seeded early (late April/early May; about 75% of the acreage) as most precipitation occurred throughout June coinciding with crop heading/flowering. July and August were relatively dry and warm, except in some western regions where heavy rains were common all summer.

All barley fields surveyed were affected by FHB. Fusarium head blight was as severe in western regions (Brandon, Hamiota, Rivers) as in the Red River Valley, a trend first noted in 1997. An average 37.5% heads (range 2 - 97%) were visibly affected, while the proportion of blighted kernels per head averaged 17.8% (range 5 - 60%). Based on these values of incidence and severity, the average FHB Index was calculated as 6.7%. As such, FHB was estimated to have caused yield losses in barley of 5-6%. This is 2-3X the disease level/loss estimated in 1997 and the highest disease level observed in barley to date. This was also the second consecutive year that an increase in the level of FHB was observed in barley in Manitoba.

The *Fusarium* species isolated from infected kernels, are listed in Table 1. *Fusarium graminearum* predominated in 1998, and appeared to displace other species, particularly *F. poae* and *F. sporotrichioides*, which were more commonly found in barley in previous years.

B) **FHB Severity Comparison**. For the 34 fields in which the two severity estimates were done, the average estimated severity was 15.6%, while that calculated in the laboratory was 20.9%. In general, severity estimates done in farm fields were underestimated at lower levels of disease (<10% FHB) and overestimated at high ones (>30%). Severity of FHB, and the resulting FHB Index and estimated disease losses, generally may be underestimated in barley during field surveys as most fields have FHB severity levels near 10%.

Table 1. *Fusarium* species isolated from Manitoba barley in 1998.

***FUSARIUM* SPP.**	**FREQUENCY OF FIELDS (%)**	**FREQUENCY FROM KERNELS (%)**
F. graminearum	78	95.6
F. poae	27.1	2.2
F. avenaceum	13.6	1.1
F. sporotrichioides	11.9	0.9
F. equiseti	1.7	0.1

CROP: Barley

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: FOLIAR DISEASES OF BARLEY IN MANITOBA IN 1998

INTRODUCTION AND METHODS: In 1998, surveys for foliar diseases of barley in Manitoba were done by sampling 59 farm fields (6 two-rowed, 53 six-rowed) during the period July 20 to August 03 when most crops were at the milky to soft dough stage of growth. The fields were sampled at regular intervals along the survey routes, depending on availability. Disease incidence and severity were recorded by averaging their occurrence on approximately 10 plants sampled along a diamond-shaped transect of about 50 m per side, beginning near the field edge. Readings were taken on both the upper (flag and penultimate leaves) and lower leaf canopies, using a six category disease severity scale: 0 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Infected leaves with typical symptoms were collected from each site, dried and stored in paper envelopes, and were subsequently used to isolate and identify the causal agents. This was done by placing surface sterilized leaf tissue pieces in moist chambers for 3-7 days.

RESULTS AND COMMENTS: Conditions in 1998 were initially favourable for development of foliar diseases in Manitoba, due to above normal rainfall in June during early to mid-stage cereal crop development. However, generally dry and warm-hot conditions for the remainder of the growing season (except in some western regions where moisture remained plentiful to excessive) curtailed continued disease development while accelerating crop maturity, and severe levels of leaf spotting were therefore rare. As observed before, the previous field history, i.e., evidence of barley stubble from the year before, had a significant bearing on levels of disease observed.

All barley fields surveyed were affected by foliar disease in the lower and upper leaf canopies. Disease levels in the upper canopy were nil, trace or very slight in 2% of fields, slight in 58%, moderate in 30%, and severe or leaves senesced in 10%. Respective categories in the lower canopy were recorded for 0%, 10%, 31%, and 59% (mainly due to senesced leaves) of fields. On this basis, foliar diseases in barley appeared to have caused minimal damage in 1998; on average this likely resulted in yield losses of <5%.

Pyrenophora teres and *Cochliobolus sativus*, causal agents of net blotch and spot blotch, respectively, were the predominant fungi isolated from infected leaf tissue, and were found in most fields (90-93%). *Septoria passerinii* (speckled leaf blotch) was recovered from 22% of fields, while *Rhynchosporium secalis* was detected in one field (2% of the total). In Manitoba, spot blotch is favoured by warm temperatures, and speckled leaf blotch by drier conditions; therefore both diseases were somewhat more prevalent in barley in 1998.

CROP: Barley and Oat

LOCATION: Saskatchewan

NAME AND AGENCY:
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[3]Plant Sciences Department, University of Saskatchewan, Saskatoon, SK, S7N 5A8.

TITLE: LEAF DISEASES OF BARLEY AND OAT IN SASKATCHEWAN IN 1998

INTRODUCTION AND METHODS: A survey for leaf diseases of barley and oat was conducted between the milk and dough stages of growth in fields randomly selected from each crop district (CD) in Saskatchewan. Fields sampled were 65 for barley and 45 for oat. In each field, 10 flag and 10 penultimate leaves were collected at random and air dried at room temperature. Percent leaf area covered by crown/ leaf rust or leaf spots was recorded for each leaf, and an average percent infection calculated for each CD. Plating of surface disinfested leaf pieces on water agar for identification and quantification of leaf spotting pathogens was done in over half the field samples.

RESULTS AND COMMENTS: Leaf spotting diseases were found in most barley fields sampled (Table 1). Highest infection levels were found in some crop districts in the south, central-east and -west (CDs 1A, 2B, 3BS, 5A, 7A). Most oat crops also had leaves with symptoms, but severities were in general lower than for barley. Crown rust was found in about a third of the oat fields sampled, although at low levels, except for two fields in the southeast (CD 1A), where its severity was high.

The most common leaf spotting pathogen in barley was *Pyrenophora teres* (net blotch) (Table 2). *Cochliobolus sativus* (spot blotch) was more common, and present at higher levels, than *Septoria* spp. (septoria leaf blotch complex). The highest levels of *C. sativus* were in the south-east (CDs 1A, 2A, 2B, 5A). *Septoria* spp. were present at higher levels in the south-east, and central- and north-west (CDs 1A, 1B, 7B, 9B). Scald was found in six fields at low levels, except for two fields in CD 3BN where the infection was severe (data not presented). *Pyrenophora avenae* (leaf blotch) was the most common pathogen isolated from oat leaves, followed by *Septoria* spp. *Cochliobolus sativus* was only found in a few oat fields in the south-east.

We gratefully acknowledge the participation of Saskatchewan Agriculture and Food extension agrologists in this survey, and financial support by the Agriculture Development Fund.

Table 1. Distribution and severity of leaf spotting diseases and crown/leaf rust in **barley** and **oat** in Saskatchewan fields surveyed at early milk-dough stages in 1998.

	BARLEY		OAT			
	Leaf spots		Leaf spots		Crown rust	
CROP DISTRICT	#fields affected/ surveyed	Mean severity[1] (%)	#fields affected/ surveyed	Mean severity (%)	#fields affected/ surveyed	Mean severity
1A	4/4	41	3/4	5	2/4	severe
1B	2/2	7	2/2	23	1 /2	slight
2A	2/2	8	2/2	5	2/2	slight to moderate
2B	5/5	45	6/6	2	1/6	trace
3A-N	0/1	-	-	-	-	-
3A-S	2/2	2	1/1	<1	0/1	-
3B-N	2/2	14	2/2	4	0/2	-
3B-S	2/2	28	-	-	-	-
4B	2/2	21	2/2	1	0/2	-
5A	4/4	36	2/2	23	0/2	-
5B	7/7	9	4/4	9	3/4	trace
6A	4/4	9	3/3	9	2/3	trace
6B	3/3	9	2/4	3	2/4	trace
7A	2/2	28	1/1	<1	0/1	-
7B	2/2	19	1 /2	3	0/2	-
8A	8/9	9	4/4	9	0/4	-
8B	4/4	3	2/2	0	0/2	-
9A	4/4	3	1 /2	3	1 /2	trace
9B	4/4	6	2/2	1	1 /2	slight
Total/ Mean:	63/65	17	40/45	6	15/45	

[1] percent flag leaf area infected.

Table 2. Estimate of percent leaf area of **barley** and **oat** colonized by leaf spotting pathogens in Saskatchewan fields surveyed in 1998.

	LEAF SPOTTING FUNGI[1]							
	BARLEY				**OAT**			
CROP DISTRICT	**# fields**	***P. teres***	***Septoria* spp.**	***C. sativus***	**# fields**	***P. avenae***	***Septoria* spp.**	***C. sativus***
1A	4	38/4[2]	22/3	37/4	3	92/3	-	13/1
1B	2	54/2	20/2	13/2	2	76/2	6/2	27/1
2A	2	63/2	2/1	31/2	2	100/2	-	-
2B	5	81/5	5/2	21/4	6	92/6	11/2	-
3A-S	2	77/2	14/1	10/1	1	100/1	-	-
3B-N	2	19/2	-	-	1	50/1	50/1	-
3B-S	2	93/2	14/1	-	-	-	-	-
4B	2	90/2	10/2	-	2	67/2	67/1	-
5A	4	30/3	11/4	65/4	2	97/2	1/1	6/1
7A	2	93/2	-	14/1	1	75/1	-	-
7B	2	82/2	29/1	-	-	-	-	-
9B	4	40/3	68/2	9/3	2	41/2	52/2	-
Total/Mean:	33	62/31	19/19	30/21	22	83/22	28/9	15/3

[1] pathogens present at an average of less than 10% were not included.

[2] average percent leaf area/number of fields where it occurred.

CROP: Barley, Oat and Wheat

LOCATION: Manitoba and eastern Saskatchewan

NAME AND AGENCY:
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TITLE: STEM RUSTS OF CEREALS IN WESTERN CANADA IN 1998

INTRODUCTION AND METHODS: Surveys of fields and nurseries of barley, oat and wheat for incidence and severity of stem rust (*Puccinia graminis* Pers. f. sp. *tritici* Eriks. & Henn. and *P. graminis* f. sp. *avenae* Eriks. & Henn.) were conducted in July and August, 1998. Samples for race identification were obtained from fields and trap nurseries in the region.

RESULTS AND COMMENTS: Infections of barley or wheat on susceptible lines in nurseries by *Puccinia graminis* in 1998 were somewhat higher than in 1997, but still remained at low levels. Although environmental conditions generally were conducive to rust development early in the summer, crop development was generally earlier than normal, limiting the opportunity for stem rust development. All oat and spring wheat cultivars recommended for Manitoba and Saskatchewan are resistant to stem rust, and there was no expectation of rust occurrence in commercial production. On susceptible wild barley (*Hordeum jubatum* L.) or wild oat (*Avena fatua* L.), low to moderate levels of infection developed during late summer-early fall.

For *P. graminis* f. sp. *tritici*, no new races were found that threaten currently used resistance sources. Race QCCJ, which attacks barley, has become much less frequent. For *P. graminis* f. sp. *avenae*, an important development occurred in that relatively frequent infections were noted on AC Assiniboia in some areas of Manitoba. This cultivar depends on gene *Pg13* for stem rust resistance, as do all other cultivars in Manitoba. Isolates of stem rust collected from AC Assiniboia and other commercial fields and from wild oat from several locations in Manitoba were identified as NA67, which is virulent to all stem rust resistance genes (*Pg2*, *Pg9*, and *Pg13*) used in Manitoba cultivars. Of all collections of *P. g. avenae* in Manitoba, 20% were race NA67, thus this race could pose a serious threat to oat cultivation in the rust area of the prairies.

CROP: Barley and Wheat

LOCATION: Saskatchewan

NAME AND AGENCY:

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TITLE: THE INCIDENCE OF FUSARIUM HEAD BLIGHT IN BARLEY, COMMON WHEAT AND DURUM WHEAT GROWN IN SASKATCHEWAN DURING 1998.

INTRODUCTION AND METHODS: The incidence of fusarium head blight (FHB) was assessed in 68 barley, 107 common wheat (Canada Western Red Spring and Canada Prairie Spring) and 35 durum wheat fields covering 19 crop districts (CD) across Saskatchewan (Fig. 1). Heads from 50 plants, at milk to dough stages, were sampled randomly from cereal fields and sent to the Crop Protection Lab, Regina, for disease assessment, pathogen isolation and identification. Disease severity was the percentage of glumes or spikelets bleached or discolored/head. A disease index (percent number of heads affected x mean severity of infection/100) was determined for each field. An average FHB index for infected fields in each CD, and for CDs grouped by soil zone (Zone I in Brown, II in Dark Brown and III in Black/Grey soil), was calculated. Kernels from heads with FHB symptoms were surface sterilized in 0.53% NaOCl for 1 minute and plated on potato dextrose agar for identification of *Fusarium* spp.

RESULTS AND COMMENTS: FHB was more commonly found in 1998 than in 1997 (1). Rain at the end of June-beginning of July in most areas in Saskatchewan contributed to the development of this disease. FHB was found in most crop districts surveyed, although mainly at low levels. The number of fields where FHB was detected was 59% for barley, 53% for common wheat and 60% for durum wheat (Table 1). The average FHB index for infected fields was the lowest in barley, and lower in durum than in common wheat. The highest FHB levels were found in eastern districts (CDs 1A, 1B, 5A, 5B, 6A) and in the northwest (CD 9B). Overall, the number of fields infected, and the average FHB index for those fields, was lowest in Zone I (Brown soil) in the southwest, and highest in Zone III (Black/Grey soil).

Fusarium poae was isolated from most fields of all crops, especially barley (Table 2). Present in fewer fields was *F. graminearum,* followed by *F. sporotrichioides*; *F. avenaceum* and *F. culmorum* were found in less than 10% of all fields surveyed. *Fusarium poae* was isolated from more barley kernels than all other *Fusarium* spp. combined; *F. graminearum* was more common in kernels of common and durum wheat than in those of barley.

We gratefully acknowledge the participation in the survey of Saskatchewan Agriculture and Food extension agrologists, and financial support by the Agriculture Development Fund.

References:

1. Celetti M.J., M.R., Fernandez, G. Holzgang, G. Hughes, H.L. Campbell, and R.E. Knox, 1998. The incidence of fusarium head blight in spring wheat, durum and barley grown in Saskatchewan during 1997. Can. Plant Dis. Surv. 77:77-78. (http://res.agr.ca/lond/pmrc/report/repmenu.html)

Fig. 1. Crop districts (indicated by numbers and letters) surveyed in Saskatchewan in 1998 and soil zones (from southwest to northeast: Brown, Dark Brown, Black, Grey).

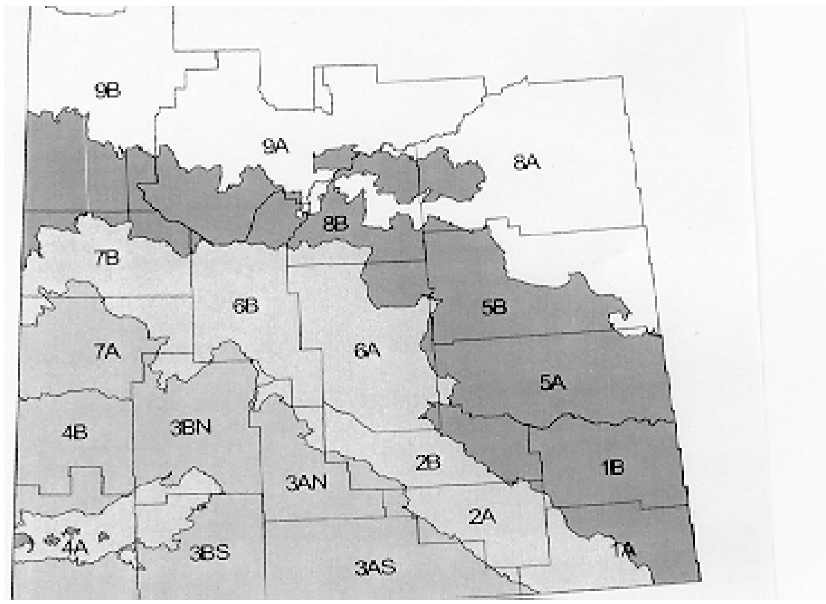

Table 1. Incidence of fusarium head blight (FHB) and FHB index in **barley, common wheat and durum wheat fields** sampled in Saskatchewan in 1998.

		BARLEY		COMMON WHEAT		DURUM WHEAT	
SOIL ZONE	**CROP DISTRICT**	**# fields affected/ total fields**	**FHB Index**	**# fields affected/ total fields**	**FHB Index**	**# fields affected/ total fields**	**FHB Index**
Zone I	3A-N	0/1	-	-	-	-	-
	3A-S	0/2	-	0/1	-	1/1	0.2
	3B-N	0/2	-	0/6	-	1/3	0.1
	3B-S	0/2	-	1/4	2.8	0/2	-
	4B	1/2	0.1	2/4	0.5	0/2	-
	7A	0/2	-	0/4	-	1/3	0.2
	Total/Mean:	1/11	0.1	3/19	1.3	3/11	0.2
Zone II	1A	2/4	1.9	4/8	2.1	3/4	5.9
	2A	2/2	0.3	1/4	2.8	2/2	0.7
	2B	2/5	0.4	5/11	2.3	4/6	0.3
	6A	2/4	0.5	6/10	3.2	2/3	6.8
	6B	2/2	0.6	2/5	0.6	1/3	2.2
	7B	2/4	0.3	4/7	2.2	1/1	1.3
	Total/Mean:	12/21	0.7	22/45	2.4	13/19	2.9
Zone III	1B	2/2	0.4	4/4	1.5	2/2	1.9
	5A	4/4	1.5	4/4	8.7	-	-
	5B	5/7	0.7	7/9	8.6	-	-
	8A	8/10	0.5	5/7	0.3	-	-
	8B	1/3	1.5	1/4	0.8	1/1	0.0
	9A	4/4	0.4	2/5	0.9	-	-
	9B	4/6	8.0	9/10	1.4	2/2	3.1
	Total/Mean:	28/36	1.8	32/43	3.7	5/5	2.0
Overall total/mean:		41/69	1.4	57/107	3.0	21/35	2.3

Table 2. Frequency of *Fusarium* species by fields and number and kernels of **barley, common and durum wheat.**

***FUSARIUM* SPP.**	**FREQUENCY IN FIELDS (%)**			**FREQUENCY IN KERNELS (%)**		
	Barley	**Common wheat**	**Durum wheat**	**Barley**	**Common wheat**	**Durum wheat**
F. poae	82.9	50.9	52.4	69.0	35.6	37.2
F. graminearum	19.5	31.6	38.1	9.8	27.4	34.2
F. sporotrichoides	22.0	22.8	28.6	16.7	15.3	18.6
F. avenaceum	2.4	10.5	4.8	0.4	6.2	2.0
F. culmorum	2.4	14.0	0.0	0.8	8.1	0.0

CROP: Barley and Wheat

LOCATION: Central Alberta

NAME AND AGENCY:
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TITLE: CENTRAL ALBERTA CEREAL DISEASE SURVEY - 1998

INTRODUCTION AND METHODS: Cereal crops were selected at random approximately every 10 km along a survey route in Alberta Census District (CD) 8 (north-central Alberta). This area encompasses Sylvan Lake on the west and Bashaw 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 disease severity was scored on a 0-9 scale, with a ‘5' rating equal to 1% disease in the upper leaf canopy, 10-25% in the middle canopy and 25-50% in the lower canopy. 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 1. Central Alberta had a relatively humid and warm summer that accelerated maturity and reduced yields. Thirty-five barley fields were examined, 12 two-rowed and 23 six-rowed. The leaf diseases scald (*Rhynchosporium secalis*), net blotch (*Pyrenophora teres*) and spot blotch (*Cochliobolus sativus*) were scored somewhat higher in the 2-rowed vs. 6-rowed barley fields. Common root rot (*C. sativus* and *Fusarium* spp.) was noted in a high percentage of the fields examined, possibly because of the dry spring, leading many farmers to seed crops deeper than normal. This resulted in long sub-crown internodes, the plant part used for CRR rating. Loose smut (*Ustilago nuda*) was noted in 7 two-rowed barley fields, an increase over 1997 when it was not observed. Covered smut (*Ustilago hordei*), bacterial blight (*Xanthomonas campestris*) and ergot (*Claviceps purpurea*) were noted at trace levels in 1, 3 and 2 field(s), respectively. Take-all (*Gaeumannomyces graminis*) was observed for the first time at trace levels in 2 fields. Scald was noted on barley heads at trace levels in one two-rowed field.

All 11 of the wheat fields examined had plants with symptoms of septoria leaf blotch (*Septoria* spp.), with an average score of 4.7. Tan spot *(P. tritici-repentis*) was noted at low levels in only 3 fields in the western portion of the region, a lesser level than in 1997. Common root rot was present at low levels in 10 fields, while take-all was recorded at trace levels in 6 fields. Loose smut (*U. tritici*), stem melanosis (*Pseudomonas cichorii* and copper deficiency*)* and ergot (*Claviceps purpurea*) were noted in 3, 2 and 1 field(s), respectively. One field had 5% glume blotch (*Septoria* spp.) and 4 fields were noted with a high level of empty heads, possibly due to the generally moist, warm growing conditions. Leaf rust *(Puccinia recondita*) was not observed for the second consecutive year.

Table 1. Disease incidence and severity in central Alberta **cereal** fields in 1998.

AVERAGE DISEASE RATING/NUMBER OF AFFECTED FIELDS*

Barley	No. Fields	Scald 0-9	Net 0-9	Spot 0-9	CRR 0-4	L. Smut %	C.Smut %	Take-all %	BB %
2-rowed	12	4.5/10	5.6/8	5.2/6	1.2/11	tr/7	0	tr/1	tr/1
6-rowed	23	4.3/16	3.9/17	4.4/12	1.1/20	tr/6	tr/1	tr/1	tr/2

Wheat	No. Fields	Septoria 0-9	Tan Sp. 0-9	St.Mel. 0-9	CRR 0-4	L. Smut %	Ergot %	Take-all %	Gl. Bl. %
	11	4.7/11	3/3	3/2	0.6/10	tr/3	tr/1	tr/6	5/1

*Abbreviations: tr=trace (<1%); Net=net blotch; Spot=spot blotch; CRR=common root rot; L. Smut=loose smut; C. Smut=covered smut; BB=bacterial blight; Tan Sp.=tan spot; St. Mel.=stem melanosis; Gl. Bl.=glume blotch.

CROP: Oat

LOCATION: Manitoba and eastern Saskatchewan

NAME AND AGENCY:
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TITLE: CROWN RUST OF OAT IN WESTERN CANADA IN 1998

INTRODUCTION AND METHODS: Surveys for oat crown rust (caused by *Puccinia coronata* Cda f. sp. *avenae* Eriks.) incidence and severity were conducted in southern Manitoba from late June to mid-August, and in eastern Saskatchewan in mid-August. Crown rust collections were obtained from wild oat (*Avena fatua* L.) and commercially grown oat in farm fields, and from susceptible and resistant oat lines grown in uniform rust nurseries. The nurseries were located at Brandon, Emerson, and Morden, MB, and at Indian Head, SK. The resistant materials in the nurseries included the newly released oat cultivars, AC Assiniboia and AC Medallion (both have crown rust resistant genes *Pc38, Pc39,* and *Pc68* combined), and lines with genes *Pc48* and *Pc68* singly or with genes *Pc38, Pc39,* and *Pc48* combined. Virulence phenotypes of single-pustule isolates established from the rust collections were identified, using 16 single-gene backcross lines (*Pc38, Pc39, Pc40, Pc45, Pc46, Pc48, Pc50, Pc51, Pc52, Pc54, Pc56, Pc58, Pc59, Pc62, Pc64, Pc68*) as the primary differential hosts. Single-gene lines with *Pc94* and *Pc96* were included in the differential sets as supplemental differentials.

RESULTS AND COMMENTS: Oat crown rust was more severe and widespread in Manitoba in 1998 than in recent years. Traces of crown rust infections were first found in commercial oat fields during the last week of June. The disease increased rapidly in the following weeks, particularly in areas where local conditions were conducive for its development. By late July up to 80% of crown rust severities were commonly found in cultivars with resistance genes *Pc38* and *Pc39*, i.e. Dumont, Riel, Robert. Only trace levels of infections were found in the two newly released cultivars, AC Assiniboia and AC Medallion. In 1998, crown rust also was more severe and widespread in eastern Saskatchewan than for many years. Wild oat with crown rust severities ranging from slight to 80% were found west of Regina and Weyburn.

To date, 200 single-pustule isolates of *P. coronata* f. sp. *avenae* established from the collections obtained in Manitoba and Saskatchewan in 1998 have been evaluated for their virulence phenotypes using the 18 differential hosts. As in recent years, the prairie rust population is predominated by isolates with virulence to genes *Pc38* and *Pc39*. Cultivars such as Dumont, Robert, Riel, Belmont, AC Marie and AC Preakness, were susceptible to these isolates, because these cultivars rely mainly on these two genes for crown rust resistance. The resistance of the two newly released cultivars, AC Assiniboia and AC Medallion, which have genes *Pc38, Pc39*, and *Pc68* combined, is effective against the prevalent isolates, since the frequency of virulence to *Pc68* is still at trace levels in the Canadian prairie region. Genes *Pc48, Pc94,* and *Pc96* are being used in the breeding program at The Cereal Research Centre to develop oat cultivars with new crown rust resistance gene combinations. Several isolates were found to have virulence to the gene combination *Pc38, 39, 48,* and to gene *Pc96* and other *Pc* genes in 1998. Gene *Pc94*, derived from *A. strigosa*, continues to be highly effective to all *P. coronata* f. sp. *avenae* isolates in Canada as it has been since 1992.

CROP: Wheat

LOCATION: Saskatchewan

NAME AND AGENCY:

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TITLE: LEAF DISEASES OF COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 1998

INTRODUCTION AND METHODS: A survey for leaf diseases of common and durum wheat was conducted between the milk and dough stages of growth in fields randomly selected from each crop district (CD) in Saskatchewan. Fields sampled were 97 for hard red spring and Canada Prairie Spring wheats and 33 for durum wheat. In each field 10 flag and 10 penultimate leaves were collected at random, and air dried at room temperature. Percent leaf area covered by leaf rust or leaf spots was recorded for each leaf, and an average percent infection calculated for each CD. Plating of surface disinfested leaf pieces on water agar for identification and quantification of leaf spotting pathogens was done for over half the field samples.

RESULTS AND COMMENTS: Leaf spot diseases were found in all fields surveyed (Table 1). Infection levels for individual fields ranged from 'trace' to 'severe'. For common wheat, average leaf spot severity was highest in eastern areas (CDs 1A, 1B, 2B, 5A). For durum wheat, the highest leaf spot severities were seen in southern areas (CDs 1A, 1B, 2A, 2B, 3BS). Leaf rust was found in about a third of the common wheat fields surveyed; the highest levels were in CDs 1A, 1B, 3AS and 5A. Leaf rust was found in only one durum wheat field in CD 1A at trace levels.

The most prevalent leaf spot disease in common wheat was tan spot (*Pyrenophora tritici-repentis*), both in the number of fields where it was present and in the percent leaf area infected (Table 2). This was followed by the septoria leaf spot complex (*Septoria tritici*, *S. nodorum* and *S. avenae* f. sp. *triticea*). Spot blotch (*Cochliobolus sativus)* was the least frequent. The *Septoria* spp. were more commonly isolated in some western and eastern districts (CDs 3BN, 5A, 7B, and 9B). In durum wheat, *P. tritici-repentis* also was the most common leaf spot pathogen (Table 3), and more so than in common wheat. *Cochliobolus sativus* was found at higher frequencies and severities than *S. avenae* f. sp. *triticea*. *Septoria nodorum* and *S. tritici* were found in only four fields, mostly at low levels (data not presented).

We gratefully acknowledge the participation of Saskatchewan Agriculture and Food extension agrologists in this survey, and financial support from the Agriculture Development Fund.

Table 1. Distribution and severity of leaf spot diseases and leaf rust in common and durum **wheat** in Saskatchewan fields surveyed at early milk-dough stages in 1998.

	COMMON WHEAT				DURUM WHEAT	
	Leaf spots		Leaf rust		Leaf spots	
CROP DISTRICT	#fields affected/ surveyed	Mean severity[1] (%)	#fields affected/ surveyed	Mean severity	#fields affected/ surveyed	Mean severity (%)
1A	8/8	39	5/8	slight to moderate	4/4	65
1B	4/4	27	3/4	slight to moderate	2/2	35
2A	4/4	21	0/4	-	2/2	34
2B	11/11	26	2/11	trace	6/6	25
3A-S	1/1	19	1/1	slight to moderate	1/1	1
3B-N	5/5	10	0/5	-	3/3	18
3B-S	4/4	7	0/4	-	2/2	30
4B	4/4	8	0/4	-	2/2	6
5A	4/4	61	2/4	slight to moderate	-	-
5B	9/9	19	6/9	trace	-	-
6A	8/8	20	5/8	slight	3/3	9
6B	7/7	9	4/7	trace	4/4	3
7A	4/4	16	0/4	-	3/3	6
7B	7/7	11	0/7	-	1/1	7
8A	5/5	19	0/5	-	-	-
8B	4/4	9	1/4	trace	-	-
9A	4/4	9	2/4	trace	-	-
9B	4/4	13	0/4	-	-	-
Total/Mean:	97/97	19	31/97		33/33	22

[1] percent flag leaf area infected.

Table 2. Estimate of the percentage of upper canopy leaf area of common **wheat** colonized by leaf spot fungi in Saskatchewan fields surveyed in 1998.

		LEAF SPOT FUNGI[1]				
CROP DISTRICT	**# fields**	***P. tritici-repentis***	***S. nodorum***	***S. tritici***	***S. avenae* f.sp. *triticea***	***C. sativus***
1A	8	78/8[2]	7/6	12/4	7/2	7/8
1B	4	63/4	6/1	22/3	1/1	18/4
2A	4	79/4	2/1	20/3	4/1	8/2
2B	11	77/11	6/2	21/9	11/3	4/4
3A-S	1	94/1	5/1	-	-	-
3B-N	5	47/5	12/2	49/4	28/1	-
3B-S	4	57/4	9/1	21/4	10/3	9/1
4B	4	75/4	21/4	13/1	-	3/2
5A	4	21/4	10/2	45/3	49/3	6/2
6A	1	68/1	10/1	22/1	-	-
7A	4	85/4	9/1	17/3	-	-
7B	4	25/2	11/2	65/4	56/1	13/1
9B	4	22/3	55/4	29/2	54/1	3/1
Total/Mean:	58	64/55	17/28	29/41	23/16	8/25

[1] pathogens present at an average of less than 10% were not included.
[2] percent leaf area colonized by fungus/number of fields where it occurred.

Table 3. Estimate of the percentage of leaf area of durum **wheat** colonized by leaf spot fungi in Saskatchewan fields surveyed in 1998.

		LEAF SPOT FUNGI[1]		
CROP DISTRICT	**# FIELDS**	***P. tritici-repentis***	***S. avenae* f.sp. *triticea***	***C. sativus***
1A	4	97/4[2]	-	6/1
1B	2	70/2	9/2	22/2
2A	2	99/2	1/1	1/1
2B	6	93/6	2/1	7/2
3A-S	1	100/1	-	-
3B-N	3	100/3	-	-
3B-S	2	95/2	1/1	-
4B	2	59/2	19/1	38/1
7A	3	83/3	5/1	15/1
7B	1	77/1	-	-
Total/Mean:	26	89/26	6/7	15/8

[1] pathogens present at an average of less than 10% were not included.
[2] percent leaf area colonized by fungus/number of fields where it occurred.

CROP: WHEAT

LOCATION: MANITOBA

NAME AND AGENCY:
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TITLE: 1998 SURVEY OF FUSARIUM HEAD BLIGHT IN SPRING WHEAT IN MANITOBA

INTRODUCTION AND METHODS: A survey for fusarium head blight (FHB) in spring wheat fields was conducted in southern Manitoba between 20 July and 3 August 1998. The incidence and severity of FHB were assessed by sampling 50 to 100 wheat heads at three locations in each of 64 fields between the watery-ripe and medium dough stages of development. Kernels from sampled heads were surface sterilized and incubated on potato dextrose agar under continuous cool white light for 4-5 days to identify the *Fusarium* species present . When more than one *Fusarium* species was present on a kernel single spores were grown on carnation leaf agar or synthetic nutrient agar to facilitate identification. A FHB Index was calculated as follows: average incidence (%) X average severity (%) / 100.

RESULTS AND COMMENTS: The disease was present in all fields. Percent heads infected ranged from 2 to 67%, average severity was 35%, and the FHB Index ranged from 1 to 23%. Losses were similar to 1997 and averaged 7% or about $28 M, based on projected yield losses. FHB was severe in western regions of Manitoba, especially north of Hwy #1 (Hamiota area), where high rainfall in June resulted in standing water in farm fields. As in past years, the predominant pathogen was *Fusarium graminearum,* one of the main deoxynivalenol (DON) producers, and this accounted for over 97% of the isolations. Other species found included *F. culmorum, F. sporotrichioides, F. poae,* and for the first time in our surveys, *F. sambucinum.* The FHB situation in Manitoba in 1998 was similar to that of the past two years, and while yield losses were significant, quality/grade losses were relatively small.

Table 1. Percent *Fusarium* species isolated from spring **wheat** in southern Manitoba in 1998.

***FUSARIUM* SPP.**	**COMMON WHEAT (57 fields)**	**CANADA PRAIRIE SPRING WHEAT (6 fields)**	**DURUM (1 field)**
graminearum	95.0	98.7	80.0
sporotrichioides	0.1		
culmorum	0.3		
poae	0.1		
avenaceum	0.1	1.3	4.0
sambucinum	0.6		

CROP: Wheat

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: SURVEY OF LEAF SPOT DISEASES OF WHEAT IN MANITOBA IN 1998.

INTRODUCTION AND METHODS: Surveys for leaf spot diseases of spring wheats were conducted in southern Manitoba between 20 and 30 July 1998. Leaves were collected from 93 spring wheat fields (84 common, 4 durum, 3 semi-dwarf, 1 extra strong, and 1 winter wheat) between heading and soft dough stages of development. Severity of disease on upper and lower leaves was categorized as 0, trace, 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 disease identification.

RESULTS AND COMMENTS: In May and July temperatures were average, while in June they were lower and in August higher than normal. In general, May and August were drier than normal, while above average rainfall occurred in June and July. Severity of leaf spot diseases on the upper leaves were moderately severe averaging 3.1 and severe on lower leaves levels averaging 3.8. Prevalence of diseases was analyzed for common wheat only as few fields of other types were encountered. Prevalence of all diseases, except septoria nodorum blotch, was high (Table 1). Spot blotch *(Cochliobolus sativus*) and tan spot *(Pyrenophora tritici-repentis*) were more prevalent than in recent years. Tan spot development is favoured by drier weather, and spot blotch by warm nights (1). These conditions prevailed with below-normal precipitation in May and June and above-normal night temperatures in August. Frequency of *P. tritici-repentis* isolations was highest in fields to the east of Winnipeg and in the Interlake. In southern and western areas of Manitoba, *Septoria tritici* was the dominant leaf spot pathogen, isolated from 94% of fields and accounting for nearly 43% of all isolations. *Septoria avenae* was found only at low levels.

REFERENCES:
1. Gilbert, J., S.M. Woods and A. Tekauz. 1998. Relationship between environmental variables and the prevalence and isolation frequency of leaf-spotting pathogens in spring wheat. Can. J. Plant Pathol. 20:158-164.

Table 1. Prevalence and isolation frequency of leaf spot diseases identified in 93 spring **wheat** fields in Manitoba in 1998.

	DISEASE/PATHOGEN				
	Septoria leaf blotch			**Spot blotch**	**Tan spot**
	S. nodorum	***S. tritici***	***S. avenae***	***Cochliobolus sativus***	***Pyrenophora tritici-repentis***
Fields (%)	48	94	3	91	82
Isolations (%)	8.3	42.7	0.2	25.0	23.6

CROP: Wheat

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN MANITOBA IN 1998

INTRODUCTION AND METHODS:
Twenty-seven farm fields and three large (ca. 0.5 ha) demonstration plots of winter wheat in southern Manitoba were sampled for the presence of fusarium head blight (FHB) between July 7 and 17, 1998. Because winter wheat is not widely grown in Manitoba (in 1998 it was planted on about 2% of the total wheat acreage) the farm fields were not surveyed at random; rather, their location was specified by Manitoba Agriculture personnel. The incidence and severity of FHB in each field were assessed by sampling 50 to 100 heads at each of 3 locations for disease. Disease levels were calculated as the 'FHB Index' (% incidence x % severity / 100). Infected heads were also collected from each site. Fifty kernels (random) from several heads per field were subsequently surface sterilized in 0.3% NaOCl and plated onto potato dextrose agar to determine the *Fusarium* species present.

RESULTS AND COMMENTS:
Conditions generally were favourable for the development of FHB in Manitoba, in cereal crops that headed and flowered in the latter half of June or early July. This included winter wheat. Precipitation occurred throughout June, while July and August were largely dry and warm, except in some western regions where heavy rains were common all summer.

All winter wheat fields surveyed were affected by FHB. The FHB Index, a measure of disease that takes both incidence and severity into account, averaged 5.1% (range 0.3% to 11.6%). As such, FHB was estimated to have caused yield losses in commercial winter wheat of about 3.5%. This is about half the yield loss estimated in spring wheat in Manitoba for 1998. The damage caused by FHB may have been underestimated, as many of the winter wheat fields were surveyed at earlier growth stages than desirable for disease assessment (July 7 - 9). The FHB Index in the 3 demonstration plots of CDC Clair, CDC Kestrel and Hanover winter wheat located 3 km south of Winnipeg, was much higher - 34%, 41% and 70%, respectively. The spikes in these plots, especially cv. Hanover, appeared completely 'ripe' as a result of FHB when the foliage and lower parts of plants were still green. Losses in these plots likely ranged from 30 - 50%. Hanover is an 'eastern' cultivar, not normally grown in western Canada.

This was the first comprehensive survey for FHB in the winter wheat crop in Manitoba. Anecdotal information and perception from previous years, when FHB was not apparent in the crop, suggested winter wheat either is more resistant than spring wheat, or escapes infection due to its earlier flowering. Based on the findings above, neither premise is true: winter wheat is susceptible to FHB (CDC Clair and CDC Kestrel are the main cultivars grown in Manitoba) and the crop does not necessarily escape infection, as in 1998 when moisture was plentiful during flowering.

Fusarium graminearum was the predominant species isolated from kernels of winter wheat; the average level on seed from commercial fields was 19% (range 0 to 36%). Total Fusaria averaged 20%; other *Fusarium* species therefore occurred at negligible levels.

FORAGES/ PLANTES FOURRAGÈRES

CROP: Alfalfa

LOCATION: Alberta and Saskatchewan

NAME AND AGENCY:
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TITLE: BLOSSOM BLIGHT IN ALFALFA SEED FIELDS IN SASKATCHEWAN AND MANITOBA 1998.

METHODS: In 1998, 25 commercial alfalfa seed fields, representing the main production areas of Saskatchewan and Manitoba, were sampled for the presence of *Botrytis cinerea* and *Sclerotinia sclerotiorum*. At most sites, 40 mature alfalfa blossoms were collected and plated onto agar, without surface sterilization, at each sampling date. After 6-10 days of incubation, the proportion of flowers infested with each pathogen was assessed and summarized over early, mid and late bloom periods for each site. In Saskatchewan, most of the samples were collected by growers. The intention was that fields should be sampled every 7-10 days during flowering. However, hot, dry conditions limited the incidence of infestation. As a result, many growers started sampling late or stopped early. In total, 6 fields were sampled at early bloom, 13 at mid-bloom and 11 at late bloom. In Manitoba, most of the sampling was done by research staff, with 7 fields sampled at early and mid-bloom and 8 at late bloom.

RESULTS AND COMMENTS: Weather conditions during flowering were hot and dry across most of Saskatchewan in 1998. Consequently, the incidence of both *B. cinerea* and *S. sclerotiorum* was low, and symptoms of blossom blight were rarely observed. The exception was an area in northeastern Saskatchewan, which received heavy rainfall at mid and late flowering. By late bloom, 93% of flowers in one field were infested with *B. cinerea*, and severe disease symptoms were visible in the field.

Cool, wet conditions were prevalent in Manitoba at early flowering, and *B. cinerea* and *S. sclerotiorum* occurred at moderate to high levels in most areas (Table 1). As a result, many fields were treated with fungicide to protect flowers from infection. The incidence of both pathogens declined dramatically with the onset of hot dry weather at most sites at late bloom.

ACKNOWLEDGEMENT: Thanks to the Canadian Seed Growers' Association, Saskatchewan Alfalfa Seed Producers' Association, Matching Investment Initiative of Agriculture & Agri-Food Canada and Agriculture Development Fund for funding, and to Ken Bassendowski, Bonita Wong and Judy Dalebozik for technical assistance.

Table 1. Flower infestation (mean % and range) by *Botrytis cinerea* (Bc) and *Sclerotinia sclerotiorum* (Ss) in 25 commercial **alfalfa** seed fields in Manitoba and Saskatchewan in 1998.

LOCATION AND NO. OF FIELDS	**EARLY BLOOM**		**MID-BLOOM**		**LATE BLOOM**	
	Bc	**Ss**	**Bc**	**Ss**	**Bc**	**Ss**
Saskatchewan (17 fields)	1 (0-3)	8 (0-15)	8 (0-30)	10 (0-35)	17 (0-93)	1 (0-4)
Manitoba (8 fields)	13 (0-25)	23 (0-50)	21 (0-50)	22 (0-50)	1 (0-31)	5 (0-38)

CROP: Alfalfa (*Medicago sativa* L.)

LOCATION: Alberta

NAME AND AGENCY:
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TITLE: DISEASE SURVEY OF FORAGE ALFALFA FIELDS IN ALBERTA IN 1998.

METHODS: Thirty-seven alfalfa crops in two counties and three municipal districts, including Beaver, Minburn, Wainwright, Sturgeon Valley and Smoky River in the northeast, northwest and Peace regions of Alberta (Figure 1), were surveyed in early October, 1998. The age of the surveyed crops ranged from less than one to five years. Five plants were sampled at each of five random sites for each location surveyed. Soil samples (0 - 20 cm deep) were also collected at each site and composited for later analysis. Root disease severity was estimated using a scale of 0 to 4 (0 = no disease, 1 = small lesions on root, 2 = large lesions covering at least ¼ of root circumference, 3 = large lesions covering more than ½ of the root circumference and up to ½ of the root cross-section, and 4 = large lesions covering at least ½ of the root cross-section and completely girdling root). The occurrence of foliar diseases was recorded.

RESULTS AND COMMENTS: Spring black stem and leaf spot *(Phoma medicaginis*) and pepper spot (*Leptosphaerulina briosiana)* were the most common foliar diseases and were observed in 23 and 13 surveyed fields, respectively. Neither disease caused severe crop damage. A low incidence of stemphylium leaf spot (*Stemphylium* spp.) and yellow leaf blotch (*Leptotrochila medicaginis)* were also observed in some fields. Downy mildew (*Peronospora trifoliorum*) was found in two fields in the Sturgeon District (Table 1).

Alfalfa mosaic caused by alfalfa mosaic virus (AMV) was present in 10 fields in Wainwright, Sturgeon and Smoky River (Table 1). Although the infection rates were generally low at the time surveyed, this seed-borne virus may spread extremely quickly when favourable conditions occur.

Root rot can be caused by several soil-borne pathogens such as *Pythium* spp., *Fusarium* spp., *Rhizoctonia solani*, *Sclerotinia* spp., etc. and was found in 34 of the surveyed fields (Table 1). Root rot incidence ranged from 12.5% to 100%, but severity levels were generally less than 2.0 (Table 2). Further study is required to determine the corresponding causal agents.

ACKNOWLEDGEMENT: The authors thank Natasha Page for technical assistance. The assistance of Calvin Yoder of the Alberta Department of Agriculture, Food and Rural Development at Falher is gratefully acknowledged.

Table 1. Summary of diseases observed in **alfalfa** fields surveyed in Alberta in 1998

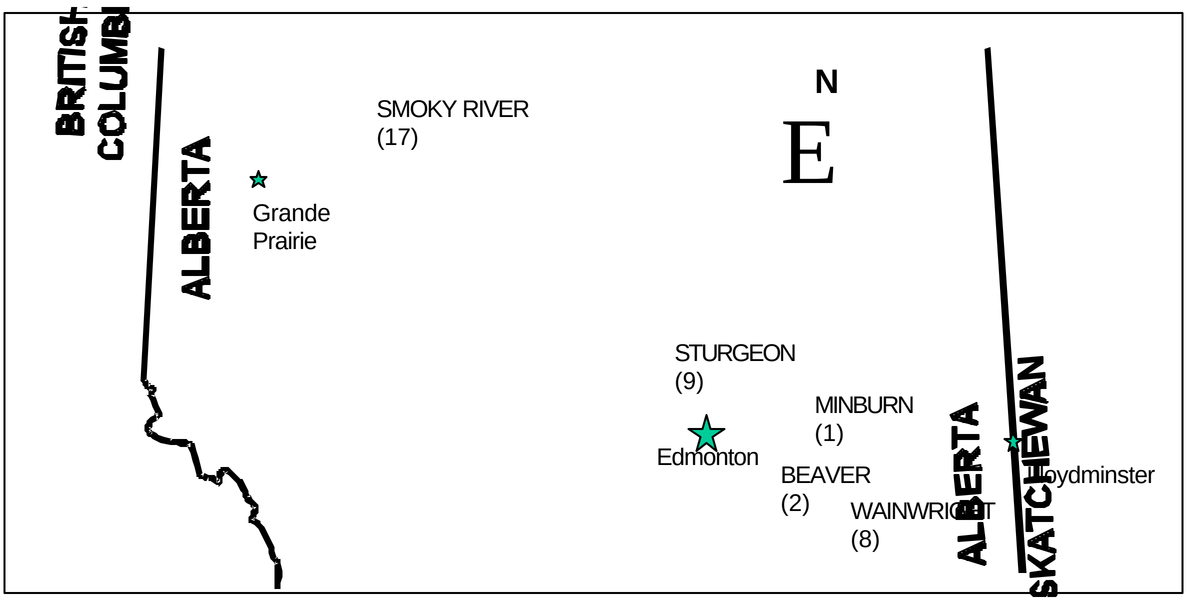
DISEASE	CAUSAL PATHOGEN	NO. FIELDS INFESTED	LOCATION (COUNTY OR MD NO.)
Spring black stem and leaf spot	*Phoma medicaginis*	23	9, 61, 90,130
Leptosphaerulina leaf spot	*Leptosphaerulina briosiana*	19	21, 61, 90,130
Stemphylium leaf spot	*Stemphylium* spp.	5	90, 130
Downy mildew	*Peronospora trifoliorum*	2	90
Yellow leaf blotch	*Leptotrochila medicaginis*	3	90, 130
Alfalfa mosaic	Alfalfa mosaic virus (AMV)	10	61, 90,130
Root rot	*Pythium* spp., *Fusarium* spp., *Rhizoctonia solani*, *Sclerotinia* spp., etc.	34	9, 21, 61, 90,130

Table 2. Occurrence of root rot in alfalfa fields surveyed in Alberta in 1998

COUNTY OR MUNICIPAL DISTRICT	NO. FIELDS SURVEYED	SEVERITY[z] (0 - 4) MEAN (RANGE)	INCIDENCE (%) MEAN (RANGE)
Minburn (26)	1	0.8	65
Beaver (9)	2	1.7	100
Wainwright (61)	8	1.1 (0.1 - 2.1)	55 (11 - 99)
Sturgeon (90)	9	0.4 (0.2 - 0.6)	34 (11 - 45)
Smoky River (130)	17	1.0 (0.3 - 1.7)	-1.4

[z] Root rot severity: 0 = no disease, 1 = small lesions on root, 2 = large lesions covering at least ¼ of root circumference, 3 = large lesions covering at least ½ of root circumference and up to ½ of root cross-section, and 4 = large lesions covering at least ½ of root cross-section and completely girdling root.

Figure 1. Distribution of surveyed alfalfa fields in Alberta in 1998. County and municipal district names are written in upper-case and numbers in parentheses indicate number of fields surveyed in each.



OILSEEDS AND SPECIAL CROPS / OLÉAGINEUX ET CULTURES SPÉCIALES

CROP: Canola

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: **DISTRIBUTION, PREVALENCE AND INCIDENCE OF CANOLA DISEASES IN MANITOBA (1998)**

METHODS: In August and September of 1998, 278 canola crops were surveyed in the eastern/interlake (59), southwest (91), northwest (57) and central (71) regions of Manitoba (Fig. 1). All crops were *Brassica napus*. All crops were assessed for the prevalence (percent crops infested) and incidence (percent plants infected per crop) of sclerotinia stem rot (*Sclerotinia sclerotiorum*), , aster yellows (phytoplasma), staghead (*Albugo candida*), foot rot (*Fusarium* spp. and *Rhizoctonia* sp.) and blackleg (*Leptosphaeria maculans*). Blackleg lesions that occurred on any part of the canola stem were assessed separately from basal stem cankers. The prevalence and percent severity of alternaria pod spot (*Alternaria* spp.) was determined.

In each canola crop, one hundred plants were selected in a regular pattern starting at a corner of the field or at a convenient access point. The edges of the fields were avoided. Twenty plants were removed from each of five points of a “W” pattern in the field. Points of the “W” were at least 20 paces apart. All plants were pulled up, removed from the field and examined for the presence of diseases.

RESULTS: A number of diseases were present in each of the four regions of Manitoba. Sclerotinia stem rot, blackleg and alternaria pod spot were the most prevalent diseases throughout the province (Table 1). The prevalence of sclerotinia-infested crops ranged from a high of 92% in the southwest region to 63% in the eastern/interlake region with a provincial mean of 82%. This increased from a prevalence of 73% in 1997 (R.G. Platford, personal communication). Mean disease incidence ranged from 8% in the eastern/interlake region to 16% in both the southwest and northwest regions. The provincial mean of 13% was similar to that reported in previous surveys (1,2) but was greater than in 1997 (R.G. Platford, personal communication) and would result in about a 6% yield loss. In 1998, moist conditions during June were very favourable for the widespread development of sclerotinia. However, in early July, hot dry weather lowered the risk of stem rot in the eastern/interlake region.

Blackleg basal cankers occurred in 77% of the crops surveyed in 1998 with disease incidence ranging from 16% in the central region to 7% in both the northwest and eastern/interlake regions and with a provincial mean of 11%. The average incidence was lower in 1997, with the highest value of 8% occurring in the central region (R.G. Platford, personal communication). When blackleg was detected in the crops surveyed in 1998, severe symptoms were observed in many cases. These caused a yield loss estimated at about 8% on a province-wide basis.

The mean prevalence of blackleg stem lesions remained essentially the same during the last two field seasons, with 73% and 72% of crops infested with stem lesions in 1997 (R.G. Platford, personal communication) and 1998, respectively. The mean incidence in 1998 was 9%. Similar results occurred in 1997 (R.G. Platford, personal communication).

The severity of alternaria pod spot was low, with means of <2% in different crop regions, but prevalence was high (Table 2). More than 50% of the crops were infested in 3 of the 4 crop regions surveyed, with the highest prevalence (100%) in the northwest region (Table 1). In the southwest region, 93% of the crops surveyed were infested with alternaria pod spot. This disease was most prevalent in the western part of the province where above normal precipitation was received.

Other diseases that were observed in the plants sampled were foot rot (in 2% of fields) and aster yellows (in 10% of fields). The disease incidence for both foot rot and aster yellows was below 5%.

REFERENCES:

1. Platford, R.G. 1996. Distribution, prevalence and incidence of canola diseases in Manitoba in 1995. Can. Plant Dis. Surv. 76: 103-105.
2. Platford, R.G. 1995. Distribution, prevalence and incidence of canola diseases in Manitoba in 1994. Can. Plant Dis. Surv. 75: 145-147.

ACKNOWLEDGEMENTS: We thank the Manitoba Canola Growers Association for financial support and the Manitoba Crop Insurance Corporation for providing a database of canola fields. The assistance of J.L Lamb in conducting this survey is also gratefully acknowledged as is the technical support of T. Henderson and B. Mitchell.

Table 1. Number of **canola** crops surveyed and disease prevalence in Manitoba in 1998.

CROP REGION	NO. of CROPS SURVEYED	SCLEROTINIA STEM ROT		BLACKLEG basal cankers		BLACKLEG stem lesions		ALTERNARIA POD SPOT	
		P[1]	DI[2]	P	DI	P	DI	P	Mean % severity
E/I	59	63	8	75	7	66	8	34	1.1
Central	71	82	9	87	16	65	9	66	1.2
SW	91	92	16	75	11	75	10	93	1.4
NW	57	84	16	71	7	81	10	100	1.7

[1] Mean percent prevalence.
[2] Mean percent disease incidence.

Table 2. Distribution of incidence (sclerotinia and blackleg) and severity (alternaria pod spot) classes in 278 crops of ***B. napus*** in Manitoba in 1998.

	PERCENTAGE OF CROPS with			
	Sclerotinia stem rot	Blackleg basal	Blackleg stem	Alternaria pod spot
0	18	23	28	25
1-5%	33	29	37	75
6-10%	15	17	14	0
11-20%	17	20	15	0
21-50%	15	11	5	0
>50%	2	0	1	0

Fig. 1. Distribution of surveyed crops in Manitoba (1998) in relation to crop regions.
(A detailed map is available from the author).

CROP: Chickpea (*Cicer arietinum*)

LOCATION: Saskatchewan

NAME AND AGENCY:
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TITLE: ASCOCHYTA BLIGHT OF CHICKPEA IN SASKATCHEWAN IN 1998

METHODS: Twenty-five chickpea fields in Saskatchewan were surveyed between July 29 and 31, 1998 (Fig. 1). All of the fields examined were sown to the resistant cultivars Sanford, Dwelly (kabuli-type) or Myles (desi-type). Ascochyta blight (*Ascochyta rabiei*) incidence and severity (Horsfall-Barratt, 0-11 scale) were assessed on 10 plants at each of five random sites per field. Samples were obtained from each field for confirmation of pathogen identification.

Infected chickpea stems and leaves were cut in small pieces and surface-disinfested in 0.5% NaOCl for 30 seconds, then rinsed twice in sterile distilled water and cultured on potato dextrose agar (PDA). In addition, lesions on disinfested stem and leaf tissue were scraped with a sterile needle and the mycelial content was shaken in 2 ml of sterile water and spread on PDA. When present, pycnidia were scraped from the lesions, shaken in sterile water to release conidia and then the conidial suspension was sprayed on PDA plates. The plates were incubated under fluorescent light for seven days.

RESULTS AND CONCLUSIONS: Symptoms of ascochyta blight were observed in 88% of the fields surveyed. In the infested fields, incidence of ascochyta ranged from 20 to 60% (Table 1). *Ascochyta rabiei* was readily isolated from each sample that showed blight symptoms. Other pathogens, such as *Botrytis* and *Fusarium* spp., were occasionally present. However, cultures that developed from scrapings of lesions generally produced only *A. rabiei*. Blight severity was generally very low (Table 1). Most fields had less than 5% of the plant area affected; the highest level observed was 19%. The low ascochyta severity observed in 1998 is due to the adoption of moderately resistant cultivars by growers and to the dry weather conditions that prevailed during the growing season.

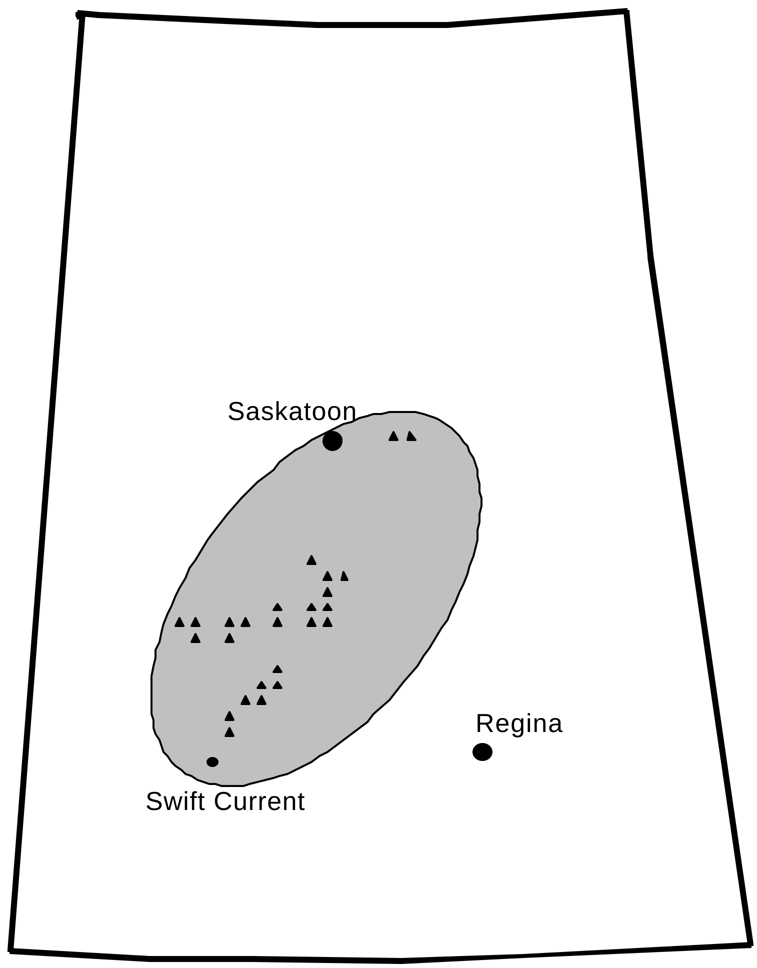
ACKNOWLEDGMENTS: We acknowledge financial support from the Agri-Food Innovation Fund.

Table 1. Incidence and severity of ascochyta blight of chickpea in Saskatchewan, 1998.

CULTIVAR	NO. OF FIELDS SURVEYED	% FIELDS with ascochyta	% ASCOCHYTA incidence range†	% ASCOCHYTA severity range†
Sanford	14	100	30-40	2-19
Dwelly	4	75	20-30	2-4
Myles	7	71	20-60	2-19
Total	25	88	20-60	2-19

†From fields with ascochyta blight symptoms.

Fig. 1. Saskatchewan map (not to scale): shading represents approximate area surveyed for ascochyta blight of chickpea in 1998. Triangles represent approximate distribution of surveyed chickpea fields.



CROP: Chickpea (*Cicer arietinum* L.)

LOCATION: Saskatchewan

NAME AND AGENCY:
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TITLE: DISEASE SURVEY OF CHICKPEA IN WEST-CENTRAL SASKATCHEWAN IN 1998

METHODS: Thirty chickpea crops in six rural municipalities, including Snipe Lake, Chesterfield, Canaan, Victory, Miry Creek and Lacadena in west-central Saskatchewan (Fig. 1), were surveyed in the pod-fill stage in July 1998. Ten plants were sampled at each of five random sites for each field surveyed. Soil samples (0 -20 cm deep) were also collected at each site and composited for each location. Root disease severity was estimated using a scale of 0 to 4 (0 = no disease, 1 = small lesions, 2 = large lesions, 3 = plant girdled, and 4 = plant dead). The incidence of ascochyta blight and other foliar diseases was recorded. All diseased plant samples were cultured onto various agar media in the laboratory to retrieve causal pathogens.

Soil population densities of *Pythium* spp. were determined by soil dilution plating onto a semiselective medium (corn meal agar plus pimaricin, ampicillin, rifampicin and PCNB)(Wang *et al.* 1995). Populations of *Rhizoctonia solani* in the soil were assessed by a soil sieving method in which soil was passed through a 0.35-mm-mesh sieve under running tap water to collect all organic debris. The debris was distributed into petri dishes containing molten (40 - 50 ºC) 1% water agar. *Rhizoctonia solani* was confirmed by transferring suspect colonies onto potato dextrose agar (PDA).

RESULTS AND COMMENTS: Ascochyta blight (*Ascochyta rabiei*) was found in 29 of the 30 fields surveyed with a relatively high incidence. In 20 of the infested fields incidence ranged from 45 to 75% (Table1). In 8 of the infested fields, more than 80% of the plants had ascochyta blight, although there was only one location where the crop was severely damaged. Most of the fields surveyed consisted of ascochyta-resistant cultivars, including Sanford (18 fields), Dwelley (2), Myles (2) and B-90 (1).

Root rots were observed in all 30 fields surveyed. The disease incidence ranged from 6% to 83% but the disease severity was generally low (Table 1). Six fields had severe root rot, especially in low areas of the field. *Fusarium* spp., *Pythium* spp. and *Rhizoctonia solani* were isolated from affected plants (Table 2). *Fusarium* spp. were most prevalent, caused the most severe symptoms and had the highest populations. *Pythium* spp. and *Rhizoctonia solani* were also retrieved from soil samples in 29 and 4 fields, respectively, but their population densities were relatively low (Table 3).

Alternaria leaf spot (*Alternaria* spp.) and sclerotinia stem rot (*Sclerotinia sclerotiorum*) were also present in some crops and the causal pathogens were recovered from plant samples (Table 2). None of these diseases caused significant crop losses.

ACKNOWLEDGEMENT: The authors gratefully thank Allen Porayko, Jodi Ferleyko and Natasha Page for technical assistance. Excellent assistance of David Nobbs of Gustafson Chemical Ltd., Rosetown, Saskatchewan is gratefully acknowledged.

LITERATURE CITED:
Wang, H., Davis, R.M. and Mauk P. 1995. Effects of irrigation, planting depth, and fungicide seed treatment on sugarbeet stand establishment. J. Sugar Beet Res. 32: 1 - 7.

Table 1. Occurrence of root rot and ascochyta blight in 30 **chickpea** fields in west-central Saskachewan in 1998

RURAL (Number)	NO. FIELDS SURVEYED	ROOT ROT		ASCOCHYTA BLIGHT INCIDENCE (%)
		Severity[z]	Incidence (%)	
Snipe Lake (259)	11	0.2 - 0.8	23 - 61	37 - 86
Chesterfield (261)	10	0.2 - 0.6	11 - 47	18 - 67
Canaan (225)	5	0.5 - 1.1	45 - 78	55 - 82
Victory (226)	2	0.4 - 1.4	29 - 93	61 - 78
Miry Creek (229)	1	0.4	34	54
Lacadena (228)	1	0.2	16	83

[z] Root rot severity: 0 = no disease, 1 = small lesions, 2 = large lesions, 3 = plant girdled, and 4 = plant dead.

Table 2. Summary of pathogens isolated from diseased **chickpea** samples from west-central Saskachewan in 1998.

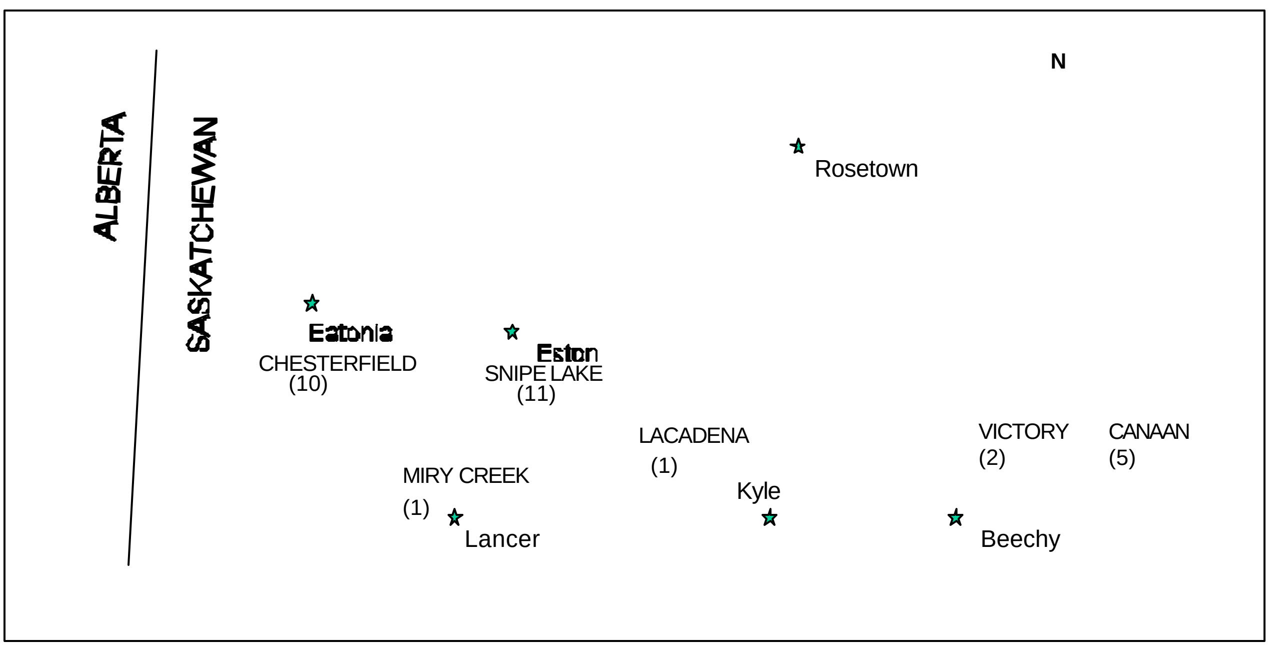
PATHOGEN	DISEASE	NO. FIELDS INFESTED	LOCATION (RURAL
Ascochyta rabiei	Ascochyta blight	29	225, 226, 228, 229, 259, 261
Fusarium spp.	Fusarium wilt/Root rot	24	225, 226, 229, 259, 261
Alternaria spp.	Alternaria leaf spot	4	225, 259, 261
Sclerotinia sclerotiorum	Sclerotinia stem rot	3	225, 259
Pythium spp.	Root rot	2	225, 229, 259, 261
Rhizoctonia solani	Root rot	1	226

Table 3. *Pythium* and *Rhizoctonia* populations in the soil from **chickpea** fields in west-central Saskachewan in 1998.

RURAL MUNICIPALITY	NO. FIELDS SAMPLED	*PYTHIUM* SPP.		*RHIZOCTONIA SOLANI*	
		No. fields infested	Population (CFU/g soil)[z]	No. fields	Population (CFU/100 g soil)
Snipe Lake	11	11	27 - 84	1	2
Chesterfield	10	10	37 - 91	0	0
Canaan	5	5	68 - 106	2	2 - 3
Victory	2	2	41 - 125	1	2
Miry Creek	1	0	0	0	0
Lacadena	1	1	113	0	0

[z] CFU = colony forming unit.

Figure 1. Distribution of surveyed chickpea fields in west-central Saskatchewan in 1998. Names of rural municipalities written in uppercase and numbers in parentheses indicate number of fields surveyed for each rural municipality.



CROP: Coneflower, narrow-leaved purple (*Echinacea angustifolia* DC.)
Coneflower, purple (*E. purpurea* (L.) Moench)

LOCATION: Central and southern Alberta

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TITLE: DISEASES OF ECHINACEA IN ALBERTA IN 1998

INTRODUCTION AND METHODS : Several diseases on echinacea were reported in 1997 in Alberta. These included aster yellows, sclerotinia stem rot and botrytis blight (1, 2, 3, 4). Five echinacea fields in Alberta were surveyed in July and August, 1998. In small gardens (< 0.5 ha), all plants were checked for presence of disease. In large fields (> 0.5 ha), the number of healthy and diseased plants was recorded in five, 1 m^2 sample areas (four corners and the centre). Disease incidence (DI) and disease severity (DS) were determined using the same methods as described in a previous report (3). Seedlings grown in greenhouses were checked for damping-off in April and May. No effort was made to determine DI and DS. Diseased roots, stems, leaves and seed samples, except those with distinct symptoms of infection by *Sclerotinia sclerotiorum*, were returned to the laboratory for microorganism isolation. Samples were sterilized in 1% NaOCl solution for 2 min, rinsed four times with sterile distilled water and transferred onto petri plates containing potato dextrose agar (PDA). The plates were placed on a laboratory bench for 10 days at room temperature. Isolated microorganisms were transferred onto PDA slants for further identification.

RESULTS AND DISCUSSION: Sclerotinia rot and aster yellows were the predominant diseases found in this survey. The DS and DI for both diseases varied with location and species (Table 1). The highest mean DI for sclerotinia rot on *Echinacea angustifolia* (Ea) was 7.6% and ranged from 0-16.0% within the field. On *Echinacea purpurea* (Ep), the highest was 16.6% with a range from 2.0-34.1%. The highest DI for aster yellows (70.3%), occurred in a 2-year-old Ep crop at Brooks. The lowest incidence (0.2%) of aster yellows occurred in a garden at St. Paul. This was due to two factors: 1) elimination of diseased plants the previous fall, and 2) higher elevation of the field relative to others surveyed. Damping-off caused by *Pythium* spp. and *Rhizoctonia solani* was found for the first time in 2-3 month-old seedlings of Ea in several greenhouses in the early spring.

The results of microorganism isolation from various parts of plants are present in Table 2. *Fusarium* spp. and *Alternaria* spp. were the two major fungal species isolated from all plant parts. *Alternaria* spp. were consistently isolated from seeds, and may play an important role in low seed germination rates, even after a long period of stratification. Other microorganisms, such as *Penicillium* spp., *Pythium* spp., and bacteria, were also involved in root infection. Samples with typical root and stem rot infection by *S. sclerotiorum* were not included in the isolation work, but a minor occurrence (1.4-2.3%) of this fungus was noted on the PDA plates. *Cylindrocarpon* spp., *Botrytis cinerea* and *Aspergillus* spp. were also isolated from root, stem and seed tissues, but at low percentages. Bacteria were present at high frequency on stems and leaves. Their pathogenicity has not yet been confirmed.

In conclusion, aster yellows and sclerotinia rot were the two most destructive diseases of echinacea crops in Alberta in 1998. Control measures for these diseases, especially organic approaches, need further study.

ACKNOWLEDGMENTS: C. Bandura assisted in the isolation of microorganisms. Financial support was provided through a grant from the Alberta Agricultural Research Institute, Edmonton.

REFERENCES:

1. Chang K.F., R.J. Howard, R.G. Gaudiel and S.F. Hwang. 1997. First report of *Sclerotinia sclerotiorum* on coneflower. Plant Dis. 81: 1093.
2. Chang K.F., R.J. Howard and S.F. Hwang. 1997. First report of Botrytis blight, caused by *Botrytis cinerea*, on coneflower. Plant Dis. 81: 1461.
3. Chang K.F., R.J. Howard, S.F. Hwang, R.G. Gaudiel and S.F. Blade. 1998. Diseases of echinacea in Alberta in 1997. Can. Plant Dis. Surv. 78: 92-94. (http://res.agr.ca/lond/pmrc/report/repmenu.html)
4. Hwang S.F., K.F. Chang, R.J. Howard, A.H. Khadhair, R.G. Gaudiel and C. Hiruki. 1997. First report of a yellows phytoplasma disease in purple coneflower (*Echinacea* spp.) in Canada. J. Plant Dis. Prot. 104: 182-192.

Table 1. Average incidence of aster yellows and sclerotinia rot (*S. sclerotiorum*) in fields of two-year-old ***Echinacea*** spp. at five locations in Alberta, 1998.

LOCATION	SPECIES	NO. PLANTS SURVEYED	SCLEROTINIA INCIDENCE (%)		ASTER YELLOWS INCIDENCE (%)	
			RANGE*	MEAN	RANGE	AVERAGE
Brooks	Ep	905	6.2-34.1	16.6	50.0-90.8	70.3
	Ea	827	3.1-14.5	7.5	2.5-25.5	11
Alix	Ea	260	0-16.0	7.6	8.0-26.0	14.9
Rosemary	Ep	147	8.3-17.0	12.1	6.5-14.6	10.8
Ponoka	Ep	250	2.0-10.0	7.2	0-2.0	1.6
St. Paul	Ea	1350	2.0-15.0	7.1	0-1.0	0.2

Ea = *Echinacea angustifolia*; Ep = *E. purpurea*

*Range = range among quadrat samples

Table 2. Percent recovery of microorganisms from infected plant parts of ***Echinacea*** spp. obtained from different locations in Alberta in 1998.

PLANT PARTS	NO. SAMPLES TESTED	ALT	FUS	BAC	PEN	PYT	RZP	SCS	MIS
Root	69	15.9	60.9	4.3	47.8	27.5	7.2	1.4	4.3
Stem	44	36.4	72.7	52.3	0	2.3	6.8	2.3	4.5
Leaf	6	66.7	100	50	0	0	0	0	0
Seed	530	45.8	41.3	0	2.1	0	0.8	0	0.9

ALT = *Alternaria* spp.; BAC = Bacteria; FUS = *Fusarium* spp.; PEN = *Penicillium* spp.; PYT = *Pythium* spp.; SCS = *Sclerotinia sclerotiorum*; RZP = *Rhizopus* spp.; MIS = Miscellaneous (Root = 2.9% *Cylindrocarpon* spp.+ 1.4% Unknown; Stem = 4.5% *Botrytis cinerea*; Seed = 0.9% *Aspergillus* spp.).

CROP: Dry Bean

LOCATION: Southern Alberta

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TITLE: SURVEY OF DISEASES OF DRY BEAN IN SOUTHERN ALBERTA IN 1998

METHODS: Twenty-one irrigated crops of dry bean were surveyed for diseases on August 26-27, 1998 in the bean production areas surrounding Bow Island and Taber, Alberta. Each crop was sampled by selecting ten sites in a U-shaped pattern, approximately 20 m apart, with each site consisting of a 3 m long section of row (Howard and Huang, 1983). The percentage incidence of plants with white mold, gray mold, and bacterial blights was calculated for each crop by averaging the results at the ten sites. The incidence of each disease was categorized for each crop according to the following scale: (1) none (0% of plants infected), (2) trace (<1%), (3) light (1-10%), (4) moderate (11-25%), (5) high (26-50%), (6) very high (>50%).

RESULTS: White mold (*Sclerotinia sclerotiorum*), gray mold (*Botrytis cinerea*) and bacterial blights (*Xanthomonas campestris* pv. *phaseoli*, *Pseudomonas syringae* pv. *phaseolicola*) were found (Table 1).

White mold was found in 20 of the 21 bean crops surveyed. The incidence of white mold ranged from 0 to 25%. The frequency of crops with moderate incidence of white mold was 38%. None of the crops surveyed had high or very high incidence of white mold.

Gray mold was present in 8 of the 21 crops with incidence ranging from 0 to 10%. The frequency of crops with trace and light incidence of gray mold was 33% and 5%, respectively. The disease was found throughout the survey area.

Bacterial blights were present in 14 of the 21 crops with incidence ranging from 0 to 10%. The frequency of crops with trace and light incidence of bacterial blights was 57% and 10%, respectively. The two crops with light incidence had been damaged by hail in mid-July. Both common blight *(X. campestris* pv. *phaseoli*) and halo blight (*P. syringae* pv. *phaseolicola*) were present in the surveyed area.

DISCUSSION: White mold, gray mold and bacterial blight have been reported as major diseases of dry bean in southern Alberta (Huang and Erickson, 1994; Huang et al., 1995; Huang et al., 1996). The same diseases were found throughout the dry bean production area in 1998. White mold continues to be the most serious disease. Although the incidence of all three diseases was reduced in 1998, they were all widely distributed.

Weather for the dry bean production area during the 1998 growing season was very wet during June, and hot and dry during July and August. The widespread but light incidences of white mold, gray mold and bacterial blights suggest that the timing of precipitation during the canopy filling, blossoming, and pod setting periods may be crucial in the development of these diseases.

REFERENCES

1. Howard, R.J. and H.C. Huang. 1983. Survey of commercial fields of dry beans for white mold disease. P. 20 in: Studies of pulse crop diseases in Southern Alberta in 1982. AHRC Pamphlet No. 83-5. Alberta Hort. Res. Cent., Alberta Agric., Brooks, Alberta.
2. Huang, H.C. and R.S. Erickson. 1994. Survey of diseases of dry bean in southern Alberta in 1993. Can. Plant Dis. Survey 74:98-99.
3. Huang, H.C., G. Saindon and R.S. Erickson. 1995. Survey of diseases of dry bean in southern Alberta in 1994. Can. Plant Dis. Survey 75: 131-132.
4. Huang, H.C., G. Saindon, R.S. Erickson and P. Ma. 1996. Survey of diseases of dry bean in southern Alberta in 1995. Can. Plant Dis. Survey 76: 93-94.

Table 1. Survey of **dry bean** diseases in southern Alberta in 1998.

	NUMBER OF CROPS		
DISEASE INCIDENCE (% plants infected)	**White mold**	**Gray mold**	**Bacterial blights**
None (0%)	1	1	7
Trace (<1%)	0	7	12
Light (1-10%)	12	1	2
Moderate (11-25%)	8	0	0
Severe (26-50%)	0	0	0
Very Severe (>50%)	0	0	0

CROP: Field bean

LOCATION: Manitoba

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TITLE: DISEASES OF FIELD BEAN IN MANITOBA IN 1998

METHODS: Diseases of field bean were surveyed at 34 locations in Manitoba in the third and fourth week of August when the plants were in the pod-fill to early maturity stages. The crops surveyed were chosen at random from regions in south-central Manitoba where most commercial field bean production takes place. Ten plants were sampled at each of five random sites for each crop surveyed. Diseases were identified by symptoms. White mold was rated as percentage of plants infected. The severity of other diseases was estimated using a scale of 0 (no disease) to 5 (whole plants severely diseased).

RESULTS AND COMMENTS: Four diseases were observed (Table 1). Bacterial blights including common bacterial blight *(Xanthomonas campestris* pv.*phaseoli*), halo blight *(Pseudomonas syringae* pv. *phaseolicola)* and bacterial brown spot *(Pseudomonas syringae* pv. *syringae)* were observed in all 34 fields surveyed and were the most severe diseases of field bean in Manitoba in 1998. Yield reduction due to bacterial blight was estimated to be at least 20%. Seed treatment with streptomycin bactericide is the only control measure recommended, but may not be available in Canada in 1999. Effective controls of bacterial blights on field bean are urgently needed in Manitoba.

Other diseases including anthracnose (*Colletotrichum lindemuthianum*), white mold (*Sclerotinia sclerotiorum*) and rust *(Uromyces appendiculatus)* were observed in 8, 7 and 7 crops, respectively. These diseases did not appear to cause significant damage.

The incidence of white mold was lower than previous years. The may have been due to the relatively warm and dry weather in July and August.

The Manitoba Agriculture Crop Diagnostic Centre received 55 samples of field bean. Of these samples, 36 were common bacterial blight, 1 halo blight, 7 fusarium root rot, 1 rust, 2 white mold, 2 herbicide injury and 6 environmental damage.

Table 1. Intensity of **bean** diseases in 34 crops of field bean in Manitoba in 1998.

DISEASE	NO. FIELDS AFFECTED	DISEASE INTENSITY*	
		Mean	**Range**
Bacterial blights	34	2.2	1.0-4.0
White mold (%)	7	1.4	0.5-4.0
Rust	7	2.4	0.5-4.0
Anthracnose	8	1.6	0.2-4.0

*White mold was rated as percent plants infected; other diseases were rated on a scale of 0 (no disease) to 5 (whole plant severely diseased).

CROP: Field pea (*Pisum sativum* L.)

LOCATION: Southern Alberta

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TITLE: FOLIAR DISEASES OF MARROWFAT FIELD PEA IN SOUTHERN ALBERTA IN 1998

METHODS: Nine commercial pea fields were sampled in early August for foliar diseases (Table 1). Ten plants per field were randomly selected and brought back to the laboratory. Diseases were identified based on symptoms on the leaves and stems. Severity of mycosphaerella blight [*Mycosphaerella pinodes* (Berk. & Bloxam) Vestergren] was estimated visually using the scale developed by Xue et al. (2, 3). Powdery mildew (*Erysiphe pisi* Syd.) was rated as follows: slight, moderate or severe. Stem pieces from each field were surface sterilized in 1% NaOCl solution for 1 minute, rinsed in sterile distilled water, then plated onto acidified potato dextrose agar to determine the types of organisms present.

RESULTS AND COMMENTS: At the time of survey most plants had reached maturity. In some fields plants had been swathed or combined. *Mycosphaerella pinodes* was consistently isolated from infected stems. Mycosphaerella blight and powdery mildew were found in all nine fields (309.6 ha) surveyed (Table 1). Severity of these diseases varied from field to field. The average severity for mycosphaerella blight was 7.0, which was much higher than had been previously reported (1, 2). Powdery mildew was slight to severe. This disease was not present in southern Alberta in 1995 (1). This survey indicated that mycosphaerella blight was widespread in irrigated marrowfat pea crops and could also have a significant impact on dryland pea production during a wet growing season in southern Alberta.

ACKNOWLEDGEMENT: We thank S.M. Sims for her assistance in this survey.

REFERENCES:

1. Huang, H.C. and R.S. Erickson. 1996. Survey of diseases of pea in southern Alberta in 1995. Can. Plant Dis. Surv. 76: 116-117.
2. Xue, A.G. and P.A. Burnett. 1994. Diseases of field pea in central Alberta in 1993. Can. Plant Dis. Surv.74: 102-103.
3. Xue, A.G., T.D. Warkentin, M.T. Greeniaus and R.C. Zimmer. 1996. Genotypic variability in seedborne infection of field pea by *Mycosphaerella pinodes* and its relation to foliar disease severity. Can. J. Plant Pathol. 18: 370-374.

Table 1. Severity of mycosphaerella blight and powdery mildew in nine marrowfat **pea** fields in southern Alberta in 1998.

FIELD NO.	FIELD LOCATION	FIELD SIZE (ha)	CULTIVAR	MYCOSPHAERELLA BLIGHT SEVERITY (0-9)	POWDERY MILDEW SEVERITY
1	Grassy Lake	52.6	Maro	6.1	moderate
2	Grassy Lake	52.6	Maro	6.1	moderate
3	Grassy Lake	16.2	Rhino	4.9	severe
4	Cranford	26.3	Maro	7.4	slight
5	Enchant	26.3	Maro	7.1	severe
6	Enchant	56.7	Maro	8.4	moderate
7	Vauxhall	26.3	Maro	7.8	slight
8	Cranford	26.3	Maro	8.0	slight
9	Cranford	26.3	Maro	N/A[y]	slight

[y] Some indication of mycosphaerella blight; peas were swathed and dry.

CROP: Field pea (*Pisum sativum* L.)

LOCATION: Alberta

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TITLE: ASCOCHYTA BLIGHT AND OTHER DISEASES OF FIELD PEA IN NORTHEASTERN ALBERTA IN 1998

METHODS: Ascochyta blight of field pea was surveyed at 21 locations in northeastern Alberta (Fig. 1) in July 1998. The crops surveyed were located in the counties of Lamont, Vermilion River and Two Hills, and were in the pod-fill stage. Five plants were sampled at each of four random sites for each field surveyed. Ascochyta blight was identified by the appearance of symptoms, and percent severity was evaluated separately for the upper, middle and lower leaves and the stems of each plant. An overall disease severity rating was derived by averaging the percentages for each structure and using a scale of 0 (no disease) to 4 (over 75% of the structure blighted). Other diseases were also recorded in the survey. Plant samples from all surveyed fields were collected and cultured onto different media in the laboratory to recover pathogens.

RESULTS AND COMMENTS: Ascochyta blight (*Ascochyta pinodes*) was found in all 21 fields surveyed (Table 1). Overall disease severity was below 1.0. Lower leaves usually had the most lesions and upper leaves had the fewest (Table 1). Disease severity in five fields in Lamont County reached over 2.0 in the lower leaves of plants. In the laboratory, *Ascochyta pinodes* was recovered from all the samples collected (Table 2).

Powdery mildew (*Erysiphe pisi)* was the second most prevalent disease after ascochyta blight; it was found in 16 of 21 fields surveyed. Over half of the fields surveyed had severe powdery mildew. Fusarium wilt and root rot (*Fusarium* spp.) were also identified in 14 fields, although none of these diseases caused serious damage. Alternaria leaf spot (*Alternaria* spp.), sclerotinia stem rot (*Sclerotinia sclerotiorum*) and root rot (*Pythium* spp. and *Rhizoctonia solani*) were also detected (Table 2).

Ascochyta blight was found at a moderate level overall. Dry weather may have reduced infection levels compared to previous years. In contrast, powdery mildew was more prevalent. The spread of this disease was related to warm, dry weather during the summer.

ACKNOWLEDGEMENT: The authors gratefully thank Allen Porayko, Danielle Lamoureux, Jodi Ferleyko and Tina Goski for technical assistance.

Table 1. Severity and lesion distribution of ascochyta blight on **field pea** samples from northeastern Alberta in 1998.

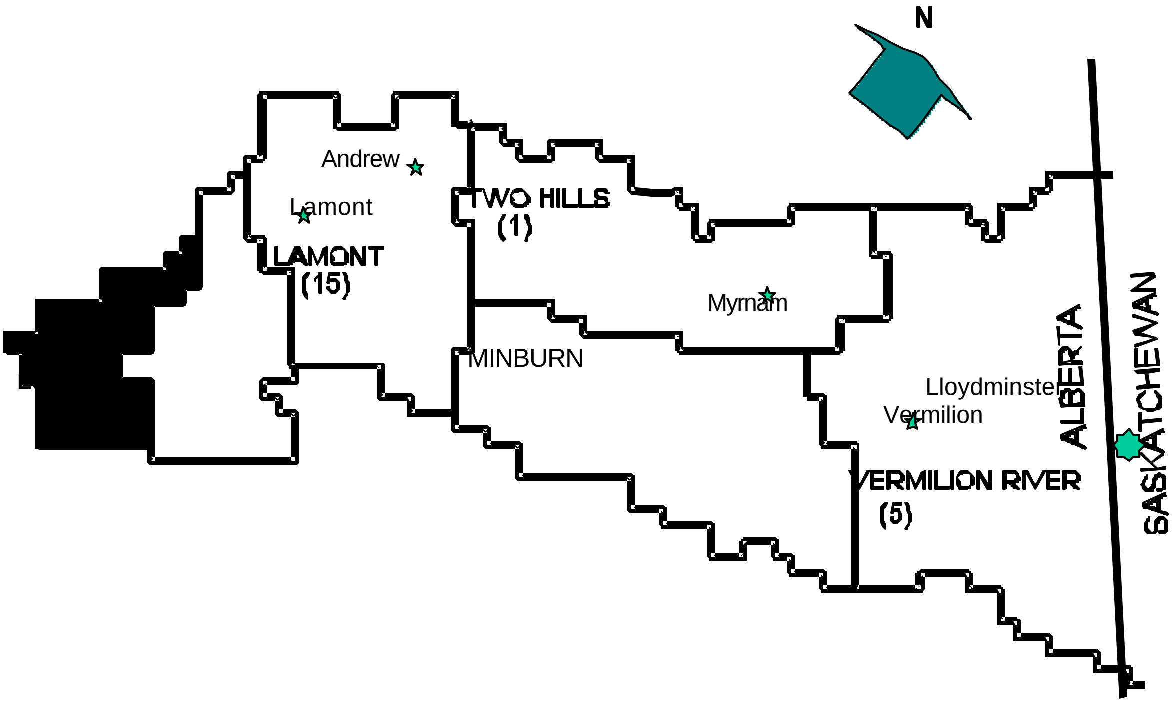
COUNTY	NO. FIELDS SURVEYED	DISEASE SEVERITY[z] (0 - 4)	MEAN LESION DISTRIBUTION ON PLANT (%)			
			Upper	Middle	Lower	Stem
Lamont	15	0.8	11	28	42	20
Vermilion River	5	1	19	32	39	10
Two Hills	1	0.8	16	34	38	13

[z] Disease severity is expressed as average means from upper, middle and lower leaves and stem of each plant surveyed using a scale of 0 (no disease) to 4 (over 75% of leaf or stem infested with ascochyta blight).

Table 2. Summary of pathogens observed on **field pea** samples from northeastern Alberta in 1998.

PATHOGEN	DISEASE	NO. FIELDS INFESTED	COUNTY
Ascochyta pinodes	Ascochyta blight	21	Lamont, Vermilion River, Two Hills
Erysiphe pisi	Powdery mildew	16	Lamont, Vermilion River
Fusarium spp.	Fusarium wilt/Root rot	14	Lamont, Vermilion River, Two Hills
Alternaria spp.	Alternaria leaf spot	4	Lamont, Vermilion River
Sclerotinia sclerotiorum	Sclerotinia stem rot	3	Lamont, Two Hills
Pythium spp.	Root rot	2	Lamont
Rhizoctonia solani	Root rot	1	Lamont

Figure 1. Distribution of surveyed pea fields in northeastern Alberta in 1998. County names written in uppercase and numbers in parentheses indicate number of fields surveyed for each county.



CROP: Field pea

LOCATION: Manitoba

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TITLE: DISEASES OF FIELD PEA IN MANITOBA IN 1998

METHODS: Crops of field pea were surveyed for root diseases at 20 different locations and for foliar diseases at 26 locations in Manitoba. The survey for root diseases was conducted in the first week of July when the crop was at the flowering stage and for foliar diseases in the third week of July when the plants were at the pod-fill to early maturity stages. The crops surveyed were chosen at random from regions in southwest and south-central Manitoba, where most field pea is grown. Ten plants were sampled at each of five random sites for each crop surveyed. Diseases were identified by symptoms. Fusarium wilt and sclerotinia rot were rated as percentage of plants infected. The severity of other diseases observed was estimated using a scale of 0 (no disease) to 9 (whole roots/plants severely diseased). Five to ten roots with disease symptoms per field were collected for isolation of fungi in the laboratory in order to confirm the visual assessment.

RESULTS AND COMMENTS: Three major root diseases were observed (Table 1). Fusarium wilt (*Fusarium oxysporum* f. sp. *pisi*) and aphanomyces root rot (*Aphanomyces euteiches*) were the most prevalent diseases and were observed in 9 and 6 of the 20 fields surveyed, respectively. Severe fusarium wilt (>10%) was observed in 7 crops and severe aphanomyces root rot was observed in 2 crops (Disease scores >6.0). These severely affected fields were only observed in the Red River region. Other root diseases, including fusarium root rot (*Fusarium solani* f. sp. *pisi*) and those caused by several unidentified pathogens, were minor and each was observed once only.

Seven foliar diseases were observed (Table 2). Mycosphaerella blight (*Mycosphaerella pinodes*) and sclerotinia stem rot (*Sclerotinia sclerotiorum*) were the most prevalent diseases, observed in 26 and 23 of the 26 fields surveyed, respectively. Severe mycosphaerella blight (Disease scores >6.0) was observed in 10 crops and severe sclerotinia stem rot (>10%) was observed in 15 crops. Powdery mildew (*Erysiphe pisi)* and septoria leaf blotch (*Septoria pisi*) were observed in 18 and 11 crops, respectively. Severity of these diseases was low and these diseases did not appear to cause significant damage. Other diseases including bacterial blight (*Pseudomonas syringae* pv. *pisi*), anthracnose (*Colletotrichum pisi*) and rust (*Uromyces viciae-fabae*) were observed in five, one and one of the crops, respectively, and appeared to be of minor importance.

Pea cultivars resistant to mycosphaerella blight are not yet available in western Canada. The control of mycosphaerella blight is mainly dependent on foliar application of fungicides. Disease levels were considered moderate to high on affected crops in 1998, but did not seem to reduce yield to a great extent. The relatively hot and dry weather in July and August led to earlier maturity and harvest than in average growing seasons in Manitoba. Yield reduction due to mycosphaerella blight was estimated at 10% on average.

Sclerotinia stem rot caused substantial damage to pea production and was estimated to reduce yield by about 15% in infested fields. Sclerotinia stem rot was also the most damaging disease of pea in Manitoba in 1994. Severe infestations in 1998 were found to be associated with *Sclerotinia*-susceptible crops (e.g. canola, sunflower and other pulses) grown in the field in previous years. Crop rotation with non-host crops for at least a 4-year interval is the only control measure recommended at present.

The Manitoba Agriculture Crop Diagnostic Centre received 15 samples of field pea. Of these samples, 6 were root rot caused by *Fusarium* spp. and *Rhizoctonia solani*, 2 mycosphaerella blight, 1 sclerotinia stem rot and 6 environmental damage.

Table 1. Intensity of root diseases in 20 crops of **field pea** in Manitoba in 1998

DISEASE	NO. FIELDS AFFECTED	DISEASE INTENSITY*	
		Mean	Range
Fusarium wilt (%)	9	15.5	4.4-25.0
Aphanomyces root rot	6	5.4	1.5-7.0
Fusarium root rot	1	1.5	1.5
Not identified	10	0.6	0.5-1.0

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

Table 2. Intensity of foliar diseases in 26 crops of **field pea** in Manitoba in 1998.

DISEASE	NO. FIELDS AFFECTED	DISEASE INTENSITY*	
		Mean	Range
Mycosphaerella blight	26	5.5	2.0-8.0
Powdery mildew	18	1.3	0.5-3.0
Bacterial blight	5	3.0	2.0-4.0
Septoria leaf blotch	11	2.9	1.0-4.0
Anthracnose	1	3.0	3.0
Sclerotinia rot (%)	23	22.1	1.0-70.0
Rust	1	5.0	5.0

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

CROP: Flax

LOCATION: Manitoba

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TITLE: DISEASES OF FLAX IN MANITOBA AND EASTERN SASKATCHEWAN IN 1998

METHODS: A total of 45 flax crops in southern Manitoba and 12 in eastern Saskatchewan were surveyed in 1998. Twenty-four crops were surveyed during the first week of August, and 33 were surveyed during the last week of August. Solin flax with low linolenic acid and yellow seed colour constituted 11% of the crops surveyed, and linseed constituted 89%. Crops surveyed were selected at random along preplanned routes in the major areas of flax 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 and severity of each disease were recorded.

In addition, 46 samples of flax plants were submitted for analysis to the Manitoba Agriculture Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Seventy percent of the flax crops surveyed in 1998 were rated excellent for stand establishment, vigour , and health; 25% were rated good, and 5% were rated intermediate. Growing conditions were generally good throughout the 1998 season except for some shortage of moisture towards the end of the season in several areas.

Pasmo (*Septoria linicola*) was observed in 58% of the crops surveyed (Table 1). The prevalance and severity of pasmo in 1998 were significantly less than in previous years (1, 2), due perhaps to the relatively dry weather towards the end of the season. In the infested crops, incidence ranged from 1 to 60% infected plants, and severity from 1 to 40% stem and leaf area affected. Only five crops had >60% infected plants with 10-40% stem and leaf area affected. The incidence and severity of pasmo vary 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 10% of flax crops in 1998 in comparison to 86% of crops in 1997 (1). Fusarium wilt severity ranged from traces to 5%, except for high severity in a field near Treherne.

Powdery mildew (*Oidium lini*) was observed again in 1998 in western Canada, but with lower prevalence and severity than in 1997 when it was first reported (1). This disease was present in 10% of crops surveyed with severity ranging from trace to 10% of the leaf area affected at the time of the survey. Frequent visits to some flax fields in southern Manitoba towards the end of the season revealed higher levels of powdery mildew and pasmo than those observed in mid August. Most of the flax crops affected by powdery mildew were near Yorkton, Saskatchewan, and in south central Manitoba.

Traces of aster yellows (phytoplasma) were observed in a few flax crops in 1998. Rust (*Melampsora lini*) was not observed in any of the 57 crops surveyed, nor in the rust-differential flax nurseries planted at Morden and Portage la Prairie.

Of the 46 flax samples submitted to the Manitoba Agriculture Crop Diagnostic Centre, seven were affected by pasmo (*Septoria linicola*), five were affected by fusarium wilt/root rot, and one by damping-off . In addition to diseases, 21 samples were affected by herbicide injury, one oedema, and 11 were damaged by various environmental factors.

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

REFERENCES

1. Rashid, K. Y., E. O. Kenaschuk, and R. G. Platford. 1998. Diseases of flax in Manitoba in 1997 and first report of powdery mildew on flax in western Canada. Can. Plant Dis. Surv. 78 (http://res.agr.ca/lond/pmrc/report/repmenu.html).
2. Rashid, K. Y., E. O. Kenaschuk, and R. G. Platford. 1997. Diseases of flax in Manitoba in 1996. Can. Plant Dis. Surv. 77 (http://res.agr.ca/lond/pmrc/report/repmenu.html).

Table 1. Incidence and severity of pasmo in 57 crops of **flax** in southern Manitoba and southeastern Saskatchewan in 1998

CROPS AFFECTED BY PASMO

No. of crops	% of crops	Disease Incidence*	Disease Severity**
24	(42%)	0	0
11	(19%)	1-5%	1-5%
9	(16%)	5-20%	1-10%
8	(14%)	20-40%	5-20%
5	(9%)	60%	10-40%

* Incidence = Percentage of infected plants in each field.

** Severity = Percentage of stem and leaf area affected.

CROP: Ginseng, American (*Panax quinquefolius* L.)

LOCATION: Central and southern Alberta

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TITLE: FOLIAR AND ROOT DISEASES OF GINSENG IN ALBERTA IN 1998

METHODS: Six ginseng gardens in central and southern Alberta were surveyed in July and September, 1998. Overall root and foliar disease incidence and overall foliar disease severity were determined according to methods described in previous reports (1, 2). Diseased root samples were returned to the laboratory for isolation of causal microorganisms on potato dextrose agar (PDA) plates. Cultures were transferred onto PDA slants for further identification.

RESULTS AND DISCUSSION: Foliar disease incidence (DI) and severity (DS) varied with location and age of the crop (Table 1). DI ranged from 18.8-67.2%, while DS ranged from 0.39-1.48. Alternaria leaf spot (*Alternaria panax*) was the most common disease in all gardens surveyed. Damping-off (*Pythium* spp.) occurred in 1- and 2-yr-old ginseng gardens. The weather in 1998 was unseasonably warm and dry during the summer resulting in lower DI and DS values than in previous years (1, 2).

Nutrient deficiencies occurred in ginseng gardens #3 and #4, but were a minor problem (Table 1). However, leaf chlorosis and reddening in garden #6 was caused by *Pythium* infection, which induced 6.8% damping-off. Soil analysis for mineral content in this garden fell within acceptable ranges. Powdery mildew (possibly *Erysiphe* sp.) was observed in an experimental ginseng planting at Brooks under a tree canopy.

DI on roots varied with location and age of the crop (Table 2). Roots harvested at Carmangay had the highest incidence (72.1%), followed by Edmonton (Crop Diversification Centre North) and Brooks (Crop Diversification Centre South). The lowest DI occurred in a 5-yr-old ginseng crop growing under an oak tree canopy at CDC South. The root sizes were smaller than those of plants grown under artificial shade at the same location.

Cylindrocarpon spp. were the major causes of root infection, followed by *Fusarium* spp., bacteria and *Cladosporium* spp. (Table 3). Bacteria were frequently isolated from symptomatic and rotted roots due to the large amount of nutrients stored in the roots. *Penicillium* spp., *Rhizopus* spp., *Aspergillus* spp., and miscellaneous microorganisms were also isolated.

ACKNOWLEDGMENTS: C. Bandura assisted in the isolation of microorganisms. Financial support was provided through a grant from the Alberta Agricultural Research Institute, Edmonton.

REFERENCES:

1. Chang K.F., R.J. Howard, R.G. Gaudiel and S.F. Hwang. 1997. The occurrence of ginseng diseases in Alberta in 1996. Can. Pl. Dis. Surv. 77:78-80. (http://res.agr.ca/lond/pmrc/report/repmenu.html)

2. Chang K.F., R.J. Howard, R.G. Gaudiel, S.F. Hwang and S.F. Blade. 1998. Diseases of ginseng in Alberta in 1997. Can. Pl. Dis. Surv. 78:89-91. (http://res.agr.ca/lond/pmrc/report/repmenu.html)

Table 1. The occurrence of foliar diseases in six **ginseng** gardens in Alberta in 1998.

GARDEN NUMBER	CROP AGE (yr)	TOTAL PLANTS SURVEYED	DISEASE SEVERITY (0-4)	DISEASE INCIDENCE (%)	NUTRIENT DEFICIENCIES (%)
1	4	256	1.48	67.2	0
2	2	567	0.48	34.0	0
3	3/4	370	0.65	32.9	7.8
4	2	525	0.39	24.9	5.8
5	3	335	0.63	22.7	0
6	2	169	0.42	18.8	13.6

Table 2. Occurrence of **ginseng root** diseases during harvest in fall, 1998, in Alberta.

LOCATION	CROP AGE (yr)	NO. ROOTS EXAMINED	DISEASE INCIDENCE (%)	
			RANGE	AVERAGE
Brooks (Lendrum Farm)	1	127	-	4.7
	2	3654	0 - 5.9	2.1
	3	42	-	14.3
Brooks (McLeod farm)	5	1425	0 - 33.3	2.9
Brooks (tree canopy)	5	510	0 - 3.3	1.4
Carmangay	5	226	-	72.1
Edmonton	5	253	14.5 - 76.1	43.2

Table 3. Percent recovery of microorganisms from diseased **ginseng** roots collected from different locations in Alberta in 1998.

LOCATION	NO. ROOTS TESTED	CYL	FUS	CLA	BAC	PEN	ASP	RZP	MIS
Brooks	26	26.9	15.3	23.1	0	0	0	3.8	0
Carmangay	151	50.1	42.4	6.0	12.6	4.6	0	5.3	1.3
Edmonton	73	29.1	15.4	11.8	17.4	0.9	1.4	0	2.4

CYL = *Cylindrocarpon* spp.; FUS = *Fusarium* spp.; CLA = *Cladosporium* spp.; BAC = Bacteria; PEN = *Penicillium* spp.; ASP = *Aspergillus* spp.; RZP = *Rhizopus* spp.; MIS = Miscellaneous

CROP: Lentil

LOCATION: Saskatchewan

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TITLE: DISEASES OF LENTIL IN SASKATCHEWAN 1998

METHODS: Forty-one lentil fields in five crop districts of Saskatchewan were surveyed for the presence of diseases in late July and early August. The fields were assessed for severity of anthracnose (*Colletotrichum truncatum*), ascochyta blight (*Ascochyta lentis*), root rot (a complex of fungi), grey mold (*Botrytis cinerea*), and white mold (*Sclerotinia sclerotiorum*). Observations were made at five sites within each field along an oval pattern starting 25 m from the edge of the field. Each disease was assigned one overall severity rating on a 0 - 4 scale: 0 = no disease; 1 = trace; 2 = slight; 3 = moderate; 4 = severe. Plant samples were taken from anthracnose infested lentil crops for isolation of the fungus.

RESULTS AND COMMENTS: Table 1 shows the incidence and severity of anthracnose, ascochyta blight and root rot in the five crop districts. Anthracnose was present in all surveyed districts and in more than half of the lentil fields. Anthracnose was the most prevalent and severe disease of lentil in 1998. Thirteen fields had trace levels, while five, three and four fields had slight, moderate or severe symptoms, respectively. Ascochyta was present in fifteen lentil crops, but mostly at trace levels. Root rot was severe in one field and occurred at trace to slight levels in six fields. Gray mold was present at low levels in three crops, and one crop had a moderate infection of white mold.

The incidence and severity of ascochyta blight in Saskatchewan was low in 1998. This was probably due to low rainfall and several periods of very high temperature in July and August, which stopped the progress of the pathogen. Anthracnose appeared to be less affected by high temperatures, and severities might have been higher in a growing season with average rainfall.

Table 1. Severity and incidence of fungal diseases of **lentil** in five crop districts of Saskatchewan, 1998.

		DISEASE SEVERITY				
PATHOGEN	**CROP DISTRICT**	**None 0**	**Trace 1**	**Slight 2**	**Mod. 3**	**Severe 4**
Anthracnose	2	0	1	0	0	1
	3B	2	2	0	2	1
	6	9	5	3	1	1
	7	3	4	2	0	1
	8	2	1	0	0	0
Ascochyta blight	2	4	1	0	0	0
	3B	7	0	0	0	0
	6	8	6	1	1	0
	7	5	5	0	0	0
	8	2	1	0	0	0
Root rot	2	5	0	0	0	0
	3B	7	0	0	0	0
	6	12	2	1	0	1
	7	7	1	2	0	0
	8	3	0	0	0	0

Figure 1. Survey of lentil anthracnose (*Colletotrichum truncatum*) in Saskatchewan, 1998. The numbers in circles indicate anthracnose severity 0 = no disease, 1 = trace, 2 = slight, 3 = moderate, 4 = severe symptoms.

A map of Saskatchewan showing the location of lentil fields in the survey is available from L. Buchwaldt.

CROP: Lentil

LOCATION: Southern Alberta

NAME AND AGENCY:
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TITLE: SURVEY OF DISEASES OF LENTIL IN SOUTHERN ALBERTA IN 1998

METHODS: Twelve dryland crops of lentil were surveyed during the late growing season (August 12-14, 1998) for gray mold caused by *Botrytis cinerea*. Lentil fields were located in the area east of New Dayton-Warner-Milk River, Alberta. Each crop was sampled by selecting ten sites in a U-shaped pattern, approximately 20 m apart, with each site consisting of 20 plants in one length of row. The percentage incidence of plants with gray mold was calculated for each crop by averaging the figures at the ten sites. The level of gray mold in each crop was categorized according to the following scale: (1) none (0% of plants infected), (2) trace (<1%), (3) light (1-10%), (4) moderate (11-25%), (5) high (26-50%), (6) very high (>50%).

Samples of diseased plants were collected, surface sterilized for 90 seconds in 70% ethanol, plated on potato dextrose agar and incubated at 20 C under light for 2 weeks, to verify the causal agent.

RESULTS: Gray mold was found in 9 of the 12 crops surveyed (Table 1). Disease incidence ranged from 0 to 23% of plants infected. The frequency of crops with moderate incidence of gray mold was 17%. None of the crops surveyed had high or very high incidence of gray mold. The disease was distributed throughout the entire lentil production area of southern Alberta.

Results of isolations of diseased plants showed that 100% of plants plated were infected with *Botrytis cinerea*.

DISCUSSION: Gray mold was found in lentil in Alberta in 1995 (Huang and Erickson, 1996) and 1997 (Huang and Erickson, 1998); in Saskatchewan in 1994 (Morrall et al, 1995); and in dry bean in southern Alberta in 1993 (Huang and Erickson, 1994) and 1994 (Huang et al, 1995). Results of the 1998 survey indicate that gray mold continues to be widespread, but was not severe on lentil in southern Alberta. Weather for the lentil production area during the 1998 growing season was very wet during June, and hot and dry during July and August. The widespread but light incidence of gray mold suggests that the timing of precipitation during the blossom period may be crucial in the development of this disease.

REFERENCES

1. Huang, H.C. and R.S. Erickson. 1994. Survey of diseases of dry bean in southern Alberta in 1993. Can. Plant Dis. Survey 74:98-99.

2. Huang, H.C. and R.S. Erickson. 1996. Survey of diseases of lentil in southern Alberta in 1995. Can. Plant Dis. Survey 76:108-109.

3. Huang, H. C. and R. S. Erickson. 1998. Survey of diseases of lentil in southern Alberta in 1997. Can. Plant Dis. Surv. 78: 101-102. (http://res.agr.ca/lond/pmrc/report/repmenu.html)

4. Huang, H.C., G. Saindon and R.S. Erickson. 1995. Survey of diseases of dry bean in southern Alberta in 1994. Can. Plant Dis. Survey 75: 131-132.

5. Morrall, R.A.A., M. Reed, J. Paisley and M. French. 1995. Seed-borne lentil diseases in Saskatchewan in 1994. Can. Plant Dis. Survey 75:150.

Table 1. Survey of **lentil** for gray mold in southern Alberta in 1998.

DISEASE INCIDENCE (% PLANTS INFECTED)	NUMBER OF CROPS
None (0%)	3
Trace (<1%)	0
Light (1-10%)	7
Moderate (11-25%)	2
High (26-50%)	0
Very High (>50%)	0

CROPS: Lentil, pea, chickpea

LOCATION: Saskatchewan

NAME AND AGENCY:
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TITLE: SEED-BORNE PATHOGENS OF LENTIL, PEA AND CHICKPEA IN SASKATCHEWAN IN 1998.

METHODS: The results of agar plate tests conducted by three Saskatchewan companies on commercial seed samples from the 1998 crop were summarized. The tests were conducted mainly to detect the pathogens causing ascochyta blight (*Didymella* [*Ascochyta*] *lentis*), anthracnose (*Colletotrichum truncatum*) and grey mould (*Botrytis cinerea*) of lentil, ascochyta blights (*Mycosphaerella* [*A.*] *pinodes* and *A. pisi*) and botrytis blight (*B. cinerea*) of pea, and ascochyta blight (*A. rabiei*) and botrytis blight (*B. cinerea*) of chickpea. Not all samples were tested for *Colletotrichum* and *Botrytis* but all were tested for their respective ascochyta blight pathogens. Figures for *Ascochyta* spp. and *B. cinerea* were classified according to crop districts [CD] of Saskatchewan (4). It was unknown which of the samples came from crops that had been treated with registered fungicides. Bravo (a.i. chlorothalonil) is registered as a foliar protectant on all three pulse crops and Crown (a.i. thiabendazole + carbathiin) is registered as a seed treatment on lentil.

RESULTS AND COMMENTS: In most areas of Saskatchewan the growing season was marked by early seeding, dry conditions until mid-late June, moderate to high rainfall for the next three to four weeks, then very dry weather until harvest. Generally above-normal temperatures prevailed throughout the summer and harvest was completed very early.

By early December about 450 lentil, 420 pea and 160 chickpea seed samples had been tested by the three companies. This constitutes a major increase in chickpea samples over recent years and reflects the growing interest in the crop.

Levels of seed-borne *Ascochyta* spp. were very variable among crop districts (Table 1), probably reflecting differences in rainfall in mid-summer. Overall, in lentil the highest recorded value was 28.0% and no infection was detected in about 44% of the samples. The corresponding figures for pea were 18.5% and 34%, and for chickpea were 3.0% and 80%. The overall levels of seed-borne *Ascochyta* spp. were higher, and the percentages of samples in which no infection was detected were lower than in 1997 (3), especially for lentil and pea. Low levels of *Ascochyta* in chickpea seed samples probably mainly reflect the use of resistant cultivars.

Based on reports received by the senior author and a survey (1), ascochyta blights were not considered to be a major problem on lentil and chickpea in Saskatchewan in 1998. The same applies to pea for much of the province, but severe epidemics developed on many crops in CD 5, where frequent rainfall occurred in midsummer. The seed infection data match the anecdotal reports.

Botrytis was detected in only 27% of lentil samples tested, 15% of pea samples and 20% of chickpea samples. Mean infection levels were low in all three crops (Table 1). The highest levels of infection were 12.0% for lentil, 4.0% for pea and 9.0% for chickpea. As with *Ascochyta*, infection levels were somewhat higher than in 1997. Variations among crop districts (Table 1) probably reflected moisture conditions shortly before harvest.

Colletotrichum truncatum, which is not a highly seed-borne pathogen, was detected in 22 (8.4%) of the lentil samples tested and from CD 1B, 2A, 2B, 3B-N, 5A, 5B, 6B and 8B. The total is a larger number than in several recent years (2,3). The highest level of seed infection was 5.0%. These data reflect a major concern with lentil anthracnose in Saskatchewan in 1998. Anecdotal reports and observations of the senior author, and a survey (1) indicate that anthracnose is spreading in Saskatchewan and in 1998 was widespread on lentil crops and sometimes very destructive. Above-normal temperatures combined with rainfall at flowering no doubt contributed to severe field infestations. In many cases farmers sprayed Bravo on lentil crops too late for optimum, if any, control of anthracnose. There is a major need for an educational program to encourage farmers to monitor lentil crops for early detection of symptoms.

REFERENCES:

1.Anderson K.L., Buchwaldt L., and Gossen B.D. 1999. Diseases of lentil in Saskatchewan 1998. Can. Plant Dis. Survey 79: (this issue).

2. Morrall R.A.A., Reed M., Paisley J., French M. and Carriere B. 1997. Seed-borne diseases of lentil, pea and chickpea in Saskatchewan in 1996. Can. Plant Dis. Survey 77: 84-85. (http://res.agr.ca/lond/pmrc/report/repmenu.html)

3. Morrall R.A.A., Stoner J., French M. and Carriere B. 1998. Seed-borne pathogens of lentil, pea and chickpea in Saskatchewan in 1997. Can. Plant Dis. Survey 78: 103-105. (http://res.agr.ca./lond/pmrc/pmrchome.html)

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 **pulse crop** seed samples tested from August to early December, 1998 by three commercial companies, and mean percent infection with *Ascochyta* (ASC) and *Botrytis* (BOT) in relation to Saskatchewan crop districts (CD) [1].

CD	LENTIL			PEA			CHICKPEA		
	# samples tested[2]	Mean % ASC	Mean % BOT	# samples tested	Mean % ASC	Mean % BOT	# samples tested	Mean % ASC	Mean % BOT
1A	3/1	0.1	0	15/8	2.4	0.1	8/5	0.7	3.7
1B	1/1	0	0.3	3/3	2.5	0	0/0	-	-
2A	17/9	0.6	0.1	3/2	0.8	0	3/2	0.2	0
2B	133/99	1.5	0.2	52/34	2.1	0.1	14/14	0	0
3A-N	14/14	2.4	0.5	11/10	0.8	0	3/1	0	0
3A-S	14/13	1.5	0	6/4	0.1	0	4/1	0.4	0
3B-N	58/41	1.4	0.1	11/7	0.5	0.1	40/25	0.1	0.3
3B-S	12/5	3.1	0.1	4/4	1.1.	0.4	4/3	0.1	1.0
4A	3/3	6.5	0.3	1/1	0	0	11/6	0	0
4B	2/1	0.8	0	4/3	0.6	0	3/2	0	0
5A	10/6	0.8	0.6	18/6	1.1	0.5	2/0	0	-
5B	16/8	4.5	2.5	28/19	4.7	0.2	0/0	-	-
6A	30/22	1.3	0.5	18/15	2.8	0.3	11/9	0.3	3.3
6B	72/56	0.4	0.2	37/18	2.0	0	14/8	0	0.2
7A	52/31	0.5	0.2	31/18	0.2	0.5	42/11	0.1	0.1
7B	5/3	0.4	0	18/15	0.6	0	4/4	0	0.1
8A	0/0	-	-	82/34	2.3	0.2	0/0	-	-
8B	1/1	1.5	1.8	38/25	1.5	0	0/0	-	-
9A	6/0	0.7	-	25/18	3.2	0.1	0/0	-	-
9B	0/0	-	-	16/12	0.3	0	0/0	-	-
Total	449/314	1.3	0.3	421/256	1.9	0.1	163/91	0.2	0.7

[1] For map of crop districts, see Reference 4.
[2] Number tested for *Ascochyta*/Number tested for *Botrytis*.

CROP: Sunflower

LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 1998

METHODS: Fifty sunflower crops in southern Manitoba and two crops in southeastern Saskatchewan were surveyed in 1998. Fifty six percent of the crops were oilseed hybrids and 44% were confectionery hybrids. Eight crops were surveyed during the third week of July, 20 in the first week of August, and 24 in the last week of August. 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 percent 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, 40 samples of sunflower plants were submitted for analysis to the Manitoba Agriculture Crop Diagnostic Centre by agricultural representatives and growers.

RESULTS AND COMMENTS: Ninety percent of the sunflower crops surveyed in 1998 had excellent to good stands and vigour, and only 10% had moderate stand and vigour. Growing conditions were generally good early in the season with dry and warm weather towards the end of the season. Sunflower crops in the Red River valley were severely infested by sunflower midge (*Contarinia schulzi*) which resulted in large numbers of deformed heads and drastically reduced yield in various locations.

Sclerotinia wilt/basal stem infection was present 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 present in 15% of the crops surveyed with incidence ranging from trace to 5% in most crops. Visits to some sunflower fields in southern Manitoba towards the end of September revealed higher incidences of head rot than observed in the month of August. Traces of head rot caused by *Rhizopus* or *Botrytis* were observed in a few crops in 1998.

Verticillium wilt was present in 17% of the crops surveyed, with incidence ranging from trace to 5% (Table 1). The prevalence and incidence of verticillium wilt in 1997 was lower than in previous years (1, 2).

Downy mildew was observed in 21% of the crops surveyed, with incidence ranging from trace to 5% (Table 1). This is the second year where dry soil conditions and above normal soil temperatures at the seedling stage may have contributed to low incidence of downy mildew. The use of Apron-treated seed for downy mildew control also probably reduced the incidence of the disease.

Rust was present in 8% of the crops surveyed, with severity ranging from trace to 10% (Table 1). The prevalence and severity of rust in 1998 was the lowest level recorded during the last several years in southern Manitoba (1, 2).

Traces to 5% leaf area covered by spots caused by *Septoria helianthi* and *Alternaria spp*. were observed in several crops surveyed in 1998. Although the time at which this survey was conducted was too early to assess *Phoma* nad *Phomopsis* stem lesions, lesions caused by *Phoma spp*. were observed in several crops at trace to 5% stem area affected, and lesions caused by *Phomopsis spp*. were observed in a few crops at trace levels.

Of the 40 samples submitted to the Manitoba Agriculture Crop Diagnostic Centre, three samples were identified as root rot caused by *Fusarium spp*., three samples were sclerotinia wilt, and one was downy mildew. In addition to diseases, 19 samples were affected by herbicide injury, and 14 damaged by insects.

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

REFERENCES

1. Rashid, K.Y. and R.G. Platford. 1998. Diseases of sunflower in Manitoba in 1997. Can. Plant Dis. Surv. 78. (http://res.agr.ca/lond/pmrc/report/repmenu.html).
2. Rashid, K.Y. and R.G. Platford. 1997. Diseases of sunflower in Manitoba in 1996. Can. Plant Dis. Surv. 77. (http://res.agr.ca/lond/pmrc/report/repmenu.html).

Table 1. Prevalence and intensity of **sunflower** diseases in southern Manitoba and southeastern Saskatchewan in 1998.

DISEASE	NO. AND % OF CROPS AFFECTED		DISEASE INDEX*	
			Mean	Range
Sclerotinia wilt	32	(62%)	0.6	T-2
Sclerotinia head rot	8	(15%)	0.6	T-1
Verticillium wilt	9	(17%)	0.5	T-1
Downy mildew	11	(21%)	0.6	T-1
Rust	4	(8%)	0.8	T-1
Stand	n/a		1.4	1-3
Vigour	n/a		1.4	1-3

* 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, and sclerotinia infections; and on disease severity measured as percent leaf area affected for rust and leaf spots. Indexes for stand and vigour are based on 1-5 scale (1= very good and 5= very poor).

VEGETABLES /LÉGUMES

CROP: Potato

LOCATION: Canada

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TITLE: CANADIAN POTATO LATE BLIGHT SURVEY IN 1997

METHODS: Strains of *Phytophthora infestans* (de Bary) were isolated from naturally-infected potato and tomato plant material. Isolates were prepared in pure cultures and studied for mating types and metalaxyl sensitivity, according to Peters (2) and Peters et al. (3), and glucose phosphate isomerase (*Gpi*) allozyme patterns according to Goodwin et al. (1). Metalaxyl sensitivity was based on 100 µg/ml metalaxyl in the medium, according to Peters (2).

RESULTS: In 1997, samples of potato and tomato suspected of having late blight were received from eight Canadian provinces: Alberta (AB), British Columbia (BC), Manitoba (MB), New Brunswick (NB), Ontario (ON), Prince Edward Island (PEI), Quebec (QC) and Saskatchewan (SK). Samples were received from July to November with most during September. 73%, 74%, 60%, 51%, and 70% of those received from BC, MB, NB, PEI, and QC, respectively, were late blight-infected (Table 1). Many of them were also infected by one or more of the following fungi: *Verticillium* sp., *Alternaria* sp., *Fusarium* sp., and *Rhizoctonia solani*. Tomato samples were received only from BC and PEI. Samples from AB, ON and SK did not have late blight. No samples were submitted from Nova Scotia or Newfoundland. Only minor appearances of late blight were recorded in these provinces, and very dry conditions apparently prevented further disease development.
A1 mating type isolates had the g-11 *Gpi*-allozyme genotype and were either metalaxyl-moderately resistant (MMR) or metalaxyl-highly resistant (MHR) (Table 2). A2 mating type isolates were found to have the US-8 *Gpi* genotype, and to be metalaxyl sensitive (MS), MMR, or MHR. However, a few isolates from BC were found to have the g-11 genotype while they were of the A2 mating type.
Most of tested isolates were either A2/US-8/MS (36%) or A2/US-8/MMR (41%). These two combinations were found in samples from all five provinces. Isolates with other genotypes were found in BC, MB, or QC (Table 2).
This study showed a decrease in resistance to metalaxyl, in general, of Canadian A2 mating type isolates, compared to A2 mating type isolates tested in 1996 when using the same metalaxyl concentration (100 µg/ml).

REFERENCES:
1. Goodwin, S. B., Schneider, R. E., and Fry, W. E. 1995. Use of cellulose-acetate electrophoresis for rapid identification of allozyme genotype of *Phytophthora infestans*. Plant Dis. 79: 1181-1185.
2. Peters, R. D. 1998. Characterization of evolving populations of *Phytophthora infestans* causing late blight of potato in Canada. Ph.D. thesis, The University of Guelph, ON, Canada.
3. Peters, R. D., Platt, H. W., and Hall, R. 1998. Long-term survival of *Phytophthora infestans* on liquid media prepared from autoclaved seeds. Can. J. Plant Pathol. 20:165-170.

Table 1. Total and late blight-infected **potato and tomato** samples received from across Canada in 1997.

PROVINCES	HOST PART	TOTAL RECEIVED	LATE BLIGHT-INFECTED (%)	
AB	Potato plant	5	0	(0)
BC	Potato plant	43	30	(69.8)
	Tubers	2	2	(100)
	Tomato	7	6	(85.7)
MB	Potato plant	26	20	(76.9)
	Tubers	1	0	(0)
NB	Potato plant	4	2	(50)
	Tubers	1	1	(100)
ON	Potato plant	3	0	(100)
PEI	Potato plant	64	31	(48.4)
	Tubers	12	5	(41.7)
	Tomato	9	7	(77.8)
QC	Potato plant	9	6	(77.8)
	Tubers	1	1	(100)
SK	Tubers	6	0	(0)
Total		193	111	(57.5)

Table 2. Distribution of different populations of *P. infestans* in Canadian provinces in 1997.

	HOST	# OF ISOLATES	CANADIAN PROVINCES
A1, g-11, MMR	potato	19	BC
	tomato	8	BC
A1, g-11, MHR	potato	10	BC, MB
	tomato	8	BC
A2, US-8, MS	potato	144	BC, MB, NB, PEI, QC
	tomato	19	PEI
A2, US-8, MMR	potato	157	BC, MB, NB, PEI, QC
	tomato	13	PEI
A2, US-8, MHR	potato	2	BC, QC
	tomato	1	BC
A2, g-11, MMR	potato	3	BC
A2, g-11, MHR	potato	1	BC

A1 and A2 represent mating types.
MS, MMR, and MHR: sensitive, moderately, and highly resistant to metalaxyl, respectively.
US-8 and g-11 represent the *Glucose phosphate isomerase (Gpi)* genotypes.

FRUIT, NUTS and BERRIES, ORNAMENTALS, and TURFGRASS/
FRUIT, FRUITS À ÉCALE et BAIES, PLANTES ORNEMENTALES et GAZON

CROP: Apple

LOCATION: British Columbia

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TITLE: DRY EYE ROT (BLOSSOM END ROT) OF APPLE IN BRITISH COLUMBIA

INTRODUCTION: Dry eye rot, also known as blossom-end rot, has been reported on apples in Europe, New Zealand, and the United States (Jones and Aldwinkle, 1990). It is suspected to occur in British Columbia but the causal agent was not identified. Calyx-end rot caused by *Sclerotinia sclerotiorum* (Lib.) de Bary, and dry eye rot caused by *Botrytis cinerea* Pers. produce virtually identical symptoms (Jones and Sutton, 1996). The disease is characterized by red discolouration at the base of one or more sepals on the calyx end of the fruit. Eventually the epidermis over the infected area turns dark brown or black. *B. cinerea* infection may occur at any time during flowering and is favoured by rain and humid weather (Tronsmo and Raa, 1977). In a study of McIntosh apples in New York the symptoms of the disease became prevalent in July on as many as 6% of the fruit (Palmiter, 1951).

METHODS: Apples cv. Gala bearing symptoms of dry eye rot were collected from six orchards from the Okanagan Valley of British Columbia in July, 1997. The apples were tested for infection by *B. cinerea* using a technique adapted from Northover and Cerkauskas (1994). Apples from each orchard sample were surface-disinfested in 70% ethanol for 10 sec and in 0.5% NaOCl with 0.01% Triton X-100 for 4 min, followed by a sterile water rinse. Fruit were dipped in paraquat (6g/L) for 1 min, allowed to drip dry and placed in containers maintained at high relative humidity. A smaller number of apples from each orchard not subjected to treatment were also placed in these chambers. The containers were incubated at 20EC for 17 days when the apples were examined for fungal growth. Visual appearance, and microscopic examination of typical conidial structures from the fungus infecting the fruit, were used to confirm the presence of *B. cinerea.*

RESULTS: The paraquat-treated fruit from all six orchards that were surveyed were infected by *B. cinerea*. All the fruit from four orchards was infected and only two of the 19 fruit that were tested did not develop *B. cinerea.* *B. cinerea* grew from 12 of 19 fruit that were not treated with paraquat and occurred on fruit from five of the six orchards. Fruit not infected by *B. cinerea* were free of mold growth.

DISCUSSION: It was clear from this survey that the above described symptoms on apples was caused by *B. cinerea* and the disease was dry eye rot. To the best of my knowledge this is the first report of dry eye rot in British Columbia. It was interesting that a few of the paraquat-treated apples did not develop fungal growth. This could mean that the *B. cinerea* that infected these fruit had either died after infection or infections were superficial and killed by surface sterilization. This is consistent with the observation that usually apples with dry eye rot do not decay but fall off the tree before harvest. However, if harvested, about 50% of the affected fruit decay from gray mold in storage (Jones and Aldwinkle, 1990). The disease is not common in the Okanagan Valley but in 1997 occurred in numerous orchards probably because of prolonged wet weather in the spring. The disease was observed again in 1998 but at a much lower level.

REFERENCES

Jones, A.L., and H.S. Aldwinckle, eds. 1990. Compendium of Apple and Pear Diseases. St. Paul, Minn.: American Phytopathological Society.

Jones, A.L., and T.S. Sutton. 1996. Diseases of Tree Fruits in the East. Michigan State University Extension, NCR 45.

Northover, J. and R.F. Cerkauskas. 1994. Detection and significance of symptomless latent infections of *Monilinia fructicola* in plums. Can J. Plant Pathol. 16:30-36.

Palmiter, D. H. 1951. A blossom end rot of apples in New York caused by *Botrytis.* Plant Dis. Rep., 35:435-436.

Tronsmo, A. and J. Raa. 1977. Life cycle of the dry eye rot pathogen *Botrytis cinerea* Pers. on apple. Phytopath. Z. 89:203-207.

CROP: Juniper

LOCATION: Ontario

NAME AND AGENCY:
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TITLE: **JUNIPER RUST SPECIES IN AN ONTARIO NURSERY, 1998**

METHODS: In early May, 1998, samples of juniper rust were collected from Guelph, Ontario and Georgetown, Ontario to determine the prevalent species. In mid-May, 1998, a nursery near Georgetown, Ontario was examined for the occurrence of juniper rust diseases on six different cultivars of *Juniperus scopulorum*. Each tree was inspected for at least five minutes to inventory all rust infections. The number of infections by each rust species, and the height and location of each tree were recorded. Ten trees per cultivar were examined.

RESULTS: Although species and cultivars were mixed between rows in the nursery near Georgetown, Ontario, no rust infections were found on any cultivar of *J. chinensis*. Only cultivars of *J. scopulorum* were found to have rust infections. Among nine species of *Gymnosporangium* which occur on junipers in eastern Canada (Parmelee, 1965), three species were found on samples collected. *Gymnosporangium clavipes* (causing quince rust) was readily distinguishable due to the fusiform swellings on twigs and larger branches. While both *G. globosum* (causing hawthorn rust) and *G. juniperi-virginianae* (causing cedar-apple rust) formed galls, those of *G. juniperi-virginianae* were much larger. When present, telial horns could also be used to distinguish these latter two species: those of *G. juniperi-virginianae* were longer and more cylindrical than those of *G. globosum* which were shorter and wider. These descriptions of the *Gymnosporangium* species follow those found in Sinclair et al. (1989).

In addition to macromorphology, microscopic features (Parmelee, 1965; Laundon, 1977a,b,c) were also used especially where identification was not certain. Teliospores of *G. clavipes* can be identified by the carotiform shape of the pedicel. Spores of *G. globosum* and *G. juniperi-virginianae* have cylindrical pedicels, but these species are distinguishable by the shape and size of the spore body. Spores of *G. globosum* are approximately 20 µm by 40 µm, and are ellipsoid with obtuse ends. Spores of *G. juniperi-virginianae* are longer averaging 20 µm by 60 µm, and are also ellipsoid but with tapered ends.

There were striking differences between *J. scopulorum* cultivars in incidence of different rust infections (Table 1). Only the cultivar Moffettii had visible infections of *G. juniperi-virginianae*. Among juniper species, *J. scopulorum* and *J. virginiana* are the most susceptible to this fungus, with only a few cultivars of *J. chinensis* and *J. horizontalis* susceptible (Sinclair et al. 1987). Wichita blue showed very high levels of infection by *G. globosum*, but all cultivars showed some level of infection. The most common juniper hosts of this fungus are *J. scopulorum* and *J. virginiana*, with *J. horizontalis* and *J. communis* less common (Sinclair et al., 1987). *Gymnosporangium clavipes* was found on all cultivars except Gray Gleam. This fungus is recorded on *J. virginiana*, *J. scopulorum*, *J. horizontalis*, *J. communis* and a few other species (Sinclair et al., 1987)

In an early paper on susceptibility of juniper cultivars to two rust species in Illinois, cultivars of *J. scopulorum* were found to be very susceptible to *G. juniperi-virginianae* but resistant to *G. clavipes* (Himelick & Neely, 1960). A more recent report on susceptibility of juniper cultivars to *G. juniperi-virginianae* in Kansas found almost no infections on *J. chinensis* cultivars, and low to heavy infections on different cultivars of *J. virginiana* and *J. scopulorum* (Tisserat & Pair, 1997). Among the cultivars in common between that study and the current one, moderate levels of rust infection were found on Moffettii and Gray Gleam, low levels on Skyrocket and Wichita Blue, and none on Medora. These results differ from those presented in Table 1, and this illustrates that disease ratings may differ between different locations, and hence more local testing of susceptibility should be conducted before recommending juniper cultivars for rust disease resistance.

REFERENCES

Himelick, E.G. and D. Neely. Juniper hosts of cedar-apple and cedar-hawthorn rust. Plant Disease Reporter 44:109-112.

Laundon, G. 1977a. *Gymnosporangium clavipes*. CMI Descriptions of Pathogenic Fungi and Bacteria No. 543. Commonwealth Mycol. Inst., Kew, England.

Laundon, G. 1977b. *Gymnosporangium globosum*. CMI Descriptions of Pathogenic Fungi and Bacteria No. 546. Commonwealth Mycol. Inst., Kew, England.

Laundon, G. 1977c. *Gymnosporangium juniperi-virginianae*. CMI Descriptions of Pathogenic Fungi and Bacteria No. 547. Commonwealth Mycol. Inst., Kew, England.

Parmelee, J.A. 1965. The genus *Gymnosporangium* in eastern Canada. Can. J. Bot. 43:239-267.

Sinclair, W.A., H.H. Lyon and W.T. Johnson. 1989. Diseases of trees and shrubs. Comstock Publishing, Ithaca, New York. p.240-249.

Tisserat, N.A., and J.C. Pair. 1997. Susceptibility of selected juniper cultivars to cedar-apple rust, Kabatina tip blight, Cercospora needle blight and Botryosphaeria canker. J. Environ. Hort. 15:160-163.

Table 1. Incidence of *Gymnosporangium* rusts on *Juniperus scopulorum* cultivars in an Ontario nursery in late May 1998.

CULTIVAR	NUMBER OF INFECTIONS PER TREE			AVERAGE HEIGHT
	G. clavipes	***G. globosum***	***G. juniperi-virginianae***	
Skyrocket	27.2 ± 0.97[a]	27.3 ± 1.10	0 ± 0	163 cm
Wichita blue	7.9 ± 0.36	84.1 ± 2.43	0 ± 0	169 cm
Greenspire	2.4 ± 0.53	5.3 ± 0.38	0 ± 0	139 cm
Medora	0.3 ± 0.05	9.3 ± 0.72	0 ± 0	140 cm
Gray Gleam	0 ± 0	2.6 ± 0.20	0 ± 0	108 cm
Moffettii	12.5 ± 0.74	27.4 ± 1.26	0.2 ± 0.04	158 cm

[a] Number of rust infections are followed by standard error calculated from 10 trees per cultivar.

CROP: Turfgrass

LOCATION: British Columbia

NAME AND AGENCY:
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TITLE: SPECIES OF *PYTHIUM* ASSOCIATED WITH CROWN AND ROOT ROT OF GOLF COURSE TURFGRASS IN BRITISH COLUMBIA IN 1997

METHODS: In 1997, 50 out of 92 turfgrass samples from golf greens submitted to the BCMAF Plant Diagnostic Laboratory, Abbotsford, were selected for molecular identification of *Pythium* species by a RBDH (reverse dot blot hybridization) assay (1) following initial diagnosis. The samples came from 24 golf courses in southern and central British Columbia. The turf was primarily creeping bentgrass (*Agrostis palustris*), occasionally mixed with *Poa annua*. Pythium crown and/or root rot disease was diagnosed by staff of the BCMAF Plant Diagnostic Laboratory based on the presence of yellow or brown roots and/or crowns, yellowing leaves and thinning turf, damage usually occurring in patches or circular spots and by microscopic observation of *Pythium*-like oospores, sporangia and/or mycelium in necrotic roots or crowns. Most samples were examined within 24-48 hours of receipt. We noted the size, type (smooth-walled or ornamented), and colour (yellow or hyaline) of oogonia and oospores, the presence and size of sporangia or presence of *Pythium*-like mycelium in discoloured roots, and the plant symptoms. Immediately following the microscopic examination, small sub-samples of symptomatic plants were washed and frozen at -20^{o}C prior to molecular analysis.

Molecular analysis for *Pythium* was a three-step procedure. DNA was extracted from the frozen turfgrass samples and purified using the FastPrep™ system (BIO/CAN Scientific Inc.). The DNA was then simultaneously labelled and amplified by polymerase chain reaction (PCR) using oomycete-specific primers developed in C. A. Lévesque's lab and synthesized by Genosys Biotechnologies Inc. PCR was followed by reverse dot blot hybridization (RDBH) of the amplified DNA to a grid of species-specific *Pythium* oligonucleotides bound to a membrane (1). RDBH membranes were provided by C. A. Lévesque.

RESULTS: Under the microscope, *Pythium* or oomycete-like structures (oogonia, oospores, sporangia or mycelium) were found in 47 out of the 50 samples selected for RDBH. Of these, RDBH analysis confirmed that a *Pythium* species was present in 41 out of 50 (82%). In the remaining 9 samples, RDBH yielded an "oomycete only" in 7 and "no oomycete" in 2.

The RBDH assay identified *P. volutum* as the most prevalent *Pythium* species, representing 80% (33/41) of all *Pythium* species and 89% of all potentially pathogenic *Pythium* species detected. In most cases (27/32) where *P*. *graminicola* was suspected by the presence of large, round smooth-walled oospores in roots and crowns under the microscope, only *P*. *volutum* was identified by RBDH. Comparison of the oogonia and oospores with published descriptions of *P*. *volutum* and *P*. *graminicola* confirmed that the *Pythium* species observed was more similar to *P*. *volutum* than *P*. *graminicola*. For example, in addition to round, thick-walled oospores ranging from 12 to 32 F*m* in diameter, most samples of affected roots also contained large, oblong, oospores (20-28 X 36-52 F*m* in diameter) which, among species pathogenic to turfgrass, are produced only by *P*. *volutum* and *P*. *aristosporum* (2). Pure cultures of *P*. *graminicola* can be identified by RBDH but this species was not detected in any of the plant tissue samples analysed in this study.

Among the 24 golf courses, RBDH detected a potentially pathogenic *Pythium* species in 75%, which indicates at least some level of probable pythium root disease. *P. volutum* was the most common species identified (on 66.7% of golf courses). Other potential pathogens identified were *P. aristosporum* (3 golf courses), *P. vanterpoolii* (1 golf course) and *P. torulosum* (1 golf course).

REFERENCES

1. Lévesque, C. A., Harlton, C., de Cock, W.A.M. 1998. Identification of some oomycetes by reverse dot blot hybridization. Phytopathology 88:213-222.
2. Waterhouse, G.M. 1968. The Genus *Pythium* Pringhsheim. Mycological Papers, Commonwealth Mycological Institute, Kew 110:1-50.

End of CPD survey - Author Index follows.

There were no individual submissions for the following sections: Forest trees, Cereals - east.

See Diagnostic laboratory Reports.

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